CONSTRUCTION CONTRACT

New York City
Department of
Environmental Protection
59-17 Junction Boulevard
Flushing, New York 11373

Lisa F. Garcia
Commissioner

Joseph Vaicels
Assistant Commissioner
Agency Chief Contracting Officer

Invitation for Bids for Furnishing all Labor and Material Necessary and Required for:

Contract: **CSO-FC-DF**

Description: **CONSTRUCTION OF FLUSHING CREEK CSO DISINFECTION FACILITIES**

Volume 2 of 2
Contract Terms and Specifications
(with separate Bid Booklet and Drawings)

AUGUST 2026

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CONTRACT CSO-FC-DF
CONSTRUCTION OF FLUSHING CREEK CSO DISINFECTION FACILITIES

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Notice To Bidders

Web-based access to BEDC EHS information

In conjunction with the requirements of Detailed Specification 01 35 27 – Environmental, Health and Safety (EHS) Requirements, DEP's Bureau of Engineering Design & Construction (BEDC) has provided the most recent version of DEP's EHS Policies and Procedures, BEDC EHS Standards, and other DEP EHS guidelines and additional information on the DEP Knowledge Reservoir of the BEDC web-based Project Management Information System (PMIS) at the following website: https://app.e-builder.net/public/publicLanding.aspx?QS=33fcd8611637450095d280fe48f856f1

For any question regarding the website, contact BEDC EHS at (718) 595-6228 or bedcehs@dep.nyc.gov.

Compliance with the latest versions of DEP EHS Policies and Procedures, BEDC EHS Standards, and DEP Guidelines are required on all DEP Contract work.

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Rev. 7/2020

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NOTICE TO NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION CONTRACTORS

Please be advised that all notices required to be submitted to the New York City Department of Environmental Protection ("DEP") Commissioner pursuant to Article 11, Article 27, Article 30, and Article 78[1] of the City of New York Standard Construction Contract must now instead be submitted electronically to the following email address: commcontractnotices@dep.nyc.gov.[2] Upon receipt, DEP will send an acknowledgement via email. The DEP Commissioner will no longer accept physical copies of said notices.

If a contractor is unable to comply with this notice, please contact commcontractnotices@dep.nyc.gov immediately to make alternative arrangements.

Please note the above email address may only accept messages that are ten megabytes or smaller. If your submission is larger than that, please contact commcontractnotices@dep.nyc.gov to request a link that will allow you to upload the documents.

Thank you for your anticipated cooperation.

[1]Please note that Article 78 appears only in the 2017 City of New York Standard Construction Contract.
[2]Please be advised that this notice only applies to documents that must be submitted to the DEP Commissioner. Please follow the contract and the Procurement Board Policy Rules when submitting documents to the Comptroller of the City of New York, the Contract Dispute Resolution Board, or any other entity.

CITY OF NEW YORK

STANDARD CONSTRUCTION CONTRACT

March 2017

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CITY OF NEW YORK
STANDARD CONSTRUCTION CONTRACT

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WITNESSETH:

The parties, in consideration of the mutual agreements contained herein, agree as follows:

CHAPTER I: THE CONTRACT AND DEFINITIONS

ARTICLE 1. THE CONTRACT

1.1 Except for titles, subtitles, headings, running headlines, tables of contents and indices (all of which are printed herein merely for convenience), the following, except for such portions thereof as may be specifically excluded, shall be deemed to be part of this **Contract**:

1.1.1 All provisions required by law to be inserted in this **Contract**, whether actually inserted or not;

1.1.2 The Contract Drawings and Specifications;

1.1.3 The General Conditions and Special Conditions, if any;

1.1.4 The **Contract**;

1.1.5 The Information for Bidders; Request for Proposals; Notice of Solicitation and Proposal For Bids; Bid or Proposal, and, if used, the Bid Booklet;

1.1.6 All Addenda issued prior to the receipt of the bids; the Notice of Award; Performance and Payment Bonds, if required; and the Notice to Proceed or the Order to Work.

1.2 Should any conflict occur in or between the Drawings and Specifications, the **Contractor** shall be deemed to have estimated the most expensive way of doing the **Work**, unless the **Contractor** shall have asked for and obtained a decision in writing from the **Commissioner** of the **Agency** that is entering into this **Contract**, before the submission of its bid, as to what shall govern.

ARTICLE 2. DEFINITIONS

2.1 The following words and expressions, or pronouns used in their stead, shall, wherever they appear in this Contract, be construed as follows, unless a different meaning is clear from the context:

2.1.1 **"Addendum"** or **"Addenda"** shall mean the additional Contract provisions and/or technical clarifications issued in writing by the Commissioner prior to the receipt of bids.

2.1.2 **"Agency"** shall mean a city, county, borough or other office, position, department, division, bureau, board or commission, or a corporation, institution or agency of government, the expenses of which are paid in whole or in part from the City treasury.

2.1.3 **"Agency Chief Contracting Officer" (ACCO)** shall mean a person delegated authority by the Commissioner to organize and supervise the procurement activity of subordinate Agency staff in conjunction with the CCPO, or his/her duly authorized representative.

2.1.4 **"Allowance"** shall mean a sum of money which the Agency may include in the total amount of the Contract for such specific contingencies as the Agency believes may be necessary to complete the Work, *e.g.*, lead or asbestos remediation, and for which the Contractor will be paid on the basis of stipulated unit prices or a formula set forth in the Contract or negotiated between the parties provided, however, that if the Contractor is not directed to use the Allowance, the Contractor shall have no right to such money and it shall be deducted from the total amount of the Contract.

2.1.5 **"City"** shall mean the City of New York.

2.1.6 **"City Chief Procurement Officer" (CCPO)** shall mean a person delegated authority by the Mayor to coordinate and oversee the procurement activity of Mayoral agency staff, including the ACCO and any offices which have oversight responsibility for the procurement of construction, or his/her duly authorized representative.

2.1.7 **"Commissioner"** shall mean the head of the Agency that has entered into this Contract, or his/her duly authorized representative.

2.1.8 **"Comptroller"** shall mean the Comptroller of the City of New York.

2.1.9 **"Contract"** or **"Contract Documents"** shall mean each of the various parts of the contract referred to in Article 1 hereof, both as a whole and severally.

2.1.10 **"Contract Drawings"** shall mean only those drawings specifically entitled as such and listed in the Specifications or in any Addendum, or any drawings furnished by the Commissioner, pertaining or supplemental thereto.

2.1.11 **"Contract Work"** shall mean everything required to be furnished and done by the Contractor by any one or more of the parts of the Contract referred to in Article 1, except Extra Work as hereinafter defined.

2.1.12 **"Contractor"** shall mean the entity which executed this Contract, whether a corporation, firm, partnership, joint venture, individual, or any combination thereof, and its, their, his/her successors, personal representatives, executors, administrators, and assigns, and any person, firm, partnership, joint venture, individual, or corporation which shall at any time be substituted in the place of the Contractor under this Contract.

2.1.13 **"Days"** shall mean calendar days, except where otherwise specified.

2.1.14 **"Engineer"** or **"Architect"** or **"Project Manager"** shall mean the person so designated in writing by the Commissioner in the Notice to Proceed or the Order to Work to act as such in relation to this Contract, including a private Architect or Engineer or Project Manager, as the case may be. Subject to written approval by the Commissioner, the Engineer, Architect or Project Manager may designate an authorized representative.

2.1.15 **"Engineering Audit Officer" (EAO)** shall mean the person so designated by the Commissioner to perform responsible auditing functions hereunder.

2.1.16 **"Extra Work"** shall mean Work other than that required by the Contract at the time of award which is authorized by the Commissioner pursuant to Chapter VI of this Contract.

2.1.17 **"Federal-Aid Contract"** shall mean a contract in which the United States (federal) Government provides financial funding as so designated in the Information for Bidders.

2.1.18 **"Final Acceptance"** shall mean final written acceptance of all the Work by the Commissioner, a copy of which shall be sent to the Contractor.

2.1.19 **"Final Approved Punch List"** shall mean a list, approved pursuant to Article 14.2.2, specifying those items of Work to be completed by the Contractor after Substantial Completion and dates for the completion of each item of Work.

2.1.20 **"Law"** or **"Laws"** shall mean the Constitution of the State of New York, the New York City Charter, the New York City Administrative Code, a statute of the United States or of the State of New York, a local law of the City of New York, any ordinance, rule or regulation having the force of law, or common law.

2.1.21 **"Materialman"** shall mean any corporation, firm, partnership, joint venture, or individual, other than employees of the Contractor, who or which contracts with the Contractor or any Subcontractor, to fabricate or deliver, or who actually fabricates or delivers, plant, materials or equipment to be incorporated in the Work.

2.1.22 **"Means and Methods of Construction"** shall mean the labor, materials, temporary structures, tools, plant, and construction equipment, and the manner and time of their use, necessary to accomplish the result intended by this Contract.

2.1.23**"Notice to Proceed" or "Order to Work"** shall mean the written notice issued by the Commissioner specifying the time for commencement of the Work and the Engineer, Architect or Project Manager.

2.1.24 **"Other Contractor(s)"** shall mean any contractor (other than the entity which executed this Contract or its Subcontractors) who or which has a contract with the City for work on or adjacent to the building or Site of the Work.

2.1.25 **"Payroll Taxes"** shall mean State Unemployment Insurance (SUI), Federal Unemployment Insurance (FUI), and payments pursuant to the Federal Insurance Contributions Act (FICA).

2.1.26 **"Project"** shall mean the public improvement to which this Contract relates.

2.1.27 **"Procurement Policy Board" (PPB)** shall mean the Agency of the City of New York whose function is to establish comprehensive and consistent procurement policies and rules which shall have broad application throughout the City.

2.1.28 **"Required Quantity"** in a unit price Contract shall mean the actual quantity of any item of Work or materials which is required to be performed or furnished in order to comply with the Contract.

2.1.29 **"Resident Engineer"** shall mean the representative of the Commissioner duly designated by the Commissioner to be his/her representative at the site of the Work.

2.1.30 **"Site"** shall mean the area upon or in which the Contractor's operations are carried on, and such other areas adjacent thereto as may be designated as such by the Engineer.

2.1.31 **"Small Tools"** shall mean items that are ordinarily required for a worker's job function, including but not limited to, equipment that ordinarily has no licensing, insurance or substantive storage costs associated with it; such as circular and chain saws, impact drills, threaders, benders, wrenches, socket tools, etc.

2.1.32 **"Specifications"** shall mean all of the directions, requirements, and standards of performance applying to the Work as hereinafter detailed and designated under the Specifications.

2.1.33 **"Subcontractor"** shall mean any person, firm or corporation, other than employees of the Contractor, who or which contracts with the Contractor or with its subcontractors to furnish, or actually furnishes labor, or labor and materials, or labor and equipment, or superintendence, supervision and/or management at the Site. Wherever the word Subcontractor appears, it shall also mean sub-Subcontractor.

2.1.34 **"Substantial Completion"** shall mean the written determination by the Engineer that the Work required under this Contract is substantially, but not entirely, complete and the approval of the **Final Approved Punch List**.

2.1.35 **"Work"** shall mean all services required to complete the Project in accordance with the Contract Documents, including without limitation, labor, material, superintendence, management, administration, equipment, and incidentals, and obtaining any and all permits, certifications and licenses as may be necessary and required to complete the Work, and shall include both Contract Work and Extra Work.

CHAPTER II: THE WORK AND ITS PERFORMANCE

ARTICLE 3. CHARACTER OF THE WORK

3.1 Unless otherwise expressly provided in the **Contract Drawings**, **Specifications,** and **Addenda**, the **Work** shall be performed in accordance with the best modern practice, utilizing, unless otherwise specified in writing, new and unused materials of standard first grade quality and workmanship and design of the highest quality, to the satisfaction of the **Commissioner**.

ARTICLE 4. MEANS AND METHODS OF CONSTRUCTION

4.1 Unless otherwise expressly provided in the **Contract Drawings**, **Specifications,** and **Addenda**, the **Means and Methods of Construction** shall be such as the **Contractor** may choose; subject, however, to the **Engineer's** right to reject the **Means and Methods of Construction** proposed by the **Contractor** which in the opinion of the **Engineer**:

4.1.1 Will constitute or create a hazard to the **Work**, or to persons or property; or

4.1.2 Will not produce finished **Work** in accordance with the terms of the **Contract**; or

4.1.3 Will be detrimental to the overall progress of the **Project**.

4.2 The **Engineer's** approval of the **Contractor's Means and Methods of Construction**, or his/her failure to exercise his/her right to reject such means or methods, shall not relieve the **Contractor**

of its obligation to complete the **Work** as provided in this **Contract**; nor shall the exercise of such right to reject create a cause of action for damages.

ARTICLE 5. COMPLIANCE WITH LAWS

5.1 The **Contractor** shall comply with all **Laws** applicable to this **Contract** and to the **Work** to be done hereunder.

5.2 Procurement Policy Board Rules: This **Contract** is subject to the Rules of the **PPB** ("**PPB** Rules") in effect at the time of the bid opening for this **Contract**. In the event of a conflict between the **PPB** Rules and a provision of this **Contract**, the **PPB** Rules shall take precedence.

5.3 Noise Control Code provisions.

5.3.1 In accordance with the provisions of Section 24-216(b) of the Administrative Code of the **City** ("Administrative Code"), Noise Abatement Contract Compliance, devices and activities which will be operated, conducted, constructed or manufactured pursuant to this **Contract** and which are subject to the provisions of the **City** Noise Control Code shall be operated, conducted, constructed, or manufactured without causing a violation of the Administrative Code. Such devices and activities shall incorporate advances in the art of noise control development for the kind and level of noise emitted or produced by such devices and activities, in accordance with regulations issued by the **Commissioner** of the **City** Department of Environmental Protection.

5.3.2 The **Contractor** agrees to comply with Section 24-219 of the Administrative Code and implementing rules codified at 15 Rules of the City of New York ("RCNY") Section 28-100 *et seq*. In accordance with such provisions, the **Contractor**, if the **Contractor** is the responsible party under such regulations, shall prepare and post a Construction Noise Mitigation Plan at each **Site**, in which the **Contractor** shall certify that all construction tools and equipment have been maintained so that they operate at normal manufacturers operating specifications. If the **Contractor** cannot make this certification, it must have in place an Alternative Noise Mitigation Plan approved by the **City** Department of Environmental Protection. In addition, the **Contractor**'s certified Construction Noise Mitigation Plan is subject inspection by the **City** Department of Environmental Protection in accordance with Section 28-101 of Title 15 of RCNY. No **Contract Work** may take place at a **Site** unless there is a Construction Noise Mitigation Plan or approved Alternative Noise Mitigation Plan in place. In addition, the **Contractor** shall create and implement a noise mitigation training program. Failure to comply with these requirements may result in fines and other penalties pursuant to the applicable provisions of the Administrative Code and RCNY.

5.4 Ultra Low Sulfur Diesel Fuel: In accordance with the provisions of Section 24-163.3 of the Administrative Code, the **Contractor** specifically agrees as follows:

5.4.1 Definitions. For purposes of this Article 5.4, the following definitions apply:

5.4.1(a) "Contractor" means any person or entity that enters into a Public Works Contract with a **City Agency**, or any person or entity that enters into an agreement with such person or entity, to perform work or provide labor or services related to such Public Works Contract.

5.4.1(b) "Motor Vehicle" means any self-propelled vehicle designed for transporting persons or property on a street or highway.

5.4.1(c) "Nonroad Engine" means an internal combustion engine (including the fuel system) that is not used in a Motor Vehicle or a vehicle used solely for competition, or that is not subject to standards promulgated under Section 7411 or Section 7521 of Title 42 of the United States Code, except that this term shall apply to internal combustion engines used to power generators, compressors or similar equipment used in any construction program or project.

5.4.1(d) "Nonroad Vehicle" means a vehicle that is powered by a Nonroad Engine, fifty (50) horsepower and greater, and that is not a Motor Vehicle or a vehicle used solely for competition, which shall include, but not be limited to, excavators, backhoes, cranes, compressors, generators, bulldozers, and similar equipment, except that this term shall not apply to horticultural maintenance vehicles used for landscaping purposes that are powered by a Nonroad Engine of sixty-five (65) horsepower or less and that are not used in any construction program or project.

5.4.1(e) "Public Works Contract" means a contract with a **City Agency** for a construction program or project involving the construction, demolition, restoration, rehabilitation, repair, renovation, or abatement of any building, structure, tunnel, excavation, roadway, park or bridge; a contract with a **City Agency** for the preparation for any construction program or project involving the construction, demolition, restoration, rehabilitation, repair, renovation, or abatement of any building, structure, tunnel, excavation, roadway, park or bridge; or a contract with a **City Agency** for any final work involved in the completion of any construction program or project involving the construction, demolition, restoration, rehabilitation, repair, renovation, or abatement of any building, structure, tunnel, excavation, roadway, park or bridge.

5.4.1(f) "Ultra Low Sulfur Diesel Fuel" means diesel fuel that has a sulfur content of no more than fifteen parts per million (15 ppm).

5.4.2 Ultra Low Sulfur Diesel Fuel

5.4.2(a) All **Contractors** shall use Ultra Low Sulfur Diesel Fuel in diesel-powered Nonroad Vehicles in the performance of this **Contract**.

5.4.2(b) Notwithstanding the requirements of Article 5.4.2(a), **Contractors** may use diesel fuel that has a sulfur content of no more than thirty parts per million (30 ppm) to fulfill the requirements of this Article 5.4.2, where the Commissioner of the **City** Department of Environmental Protection ("DEP Commissioner") has issued a determination that a sufficient quantity of Ultra Low Sulfur Diesel Fuel is not available to meet the needs of **Agencies** and **Contractors**. Any such determination shall expire after six (6) months unless renewed.

5.4.2(c) **Contractors** shall not be required to comply with this Article 5.4.2 where the **City Agency** letting this **Contract** makes a written finding, which is approved, in writing, by the DEP Commissioner, that a sufficient quantity of Ultra Low Sulfur Diesel Fuel, or diesel fuel that has a sulfur content of no more than thirty parts per million (30 ppm) is not available to meet the requirements of Section 24-163.3 of the Administrative Code, provided that such **Contractor** in its fulfillment of the

requirements of this **Contract**, to the extent practicable, shall use whatever quantity of Ultra Low Sulfur Diesel Fuel or diesel fuel that has a sulfur content of no more than thirty parts per million (30 ppm) is available. Any finding made pursuant to this Article 5.4.2(c) shall expire after sixty (60) **Days**, at which time the requirements of this Article 5.4.2 shall be in full force and effect unless the **City Agency** renews the finding in writing and such renewal is approved by the DEP Commissioner.

5.4.2(d) **Contractors** may check on determinations and approvals issued by the DEP Commissioner pursuant to Section 24-163.3 of the Administrative Code, if any, at www.dep.nyc.gov or by contacting the **City Agency** letting this **Contract**.

5.4.2(e) The requirements of this Article 5.4.2 do not apply where they are precluded by federal or State funding requirements or where the **Contract** is an emergency procurement.

5.4.3 Best Available Technology

5.4.3(a) All **Contractors** shall utilize the best available technology for reducing the emission of pollutants for diesel-powered Nonroad Vehicles in the performance of this **Contract**. For determinations of best available technology for each type of diesel-powered Nonroad Vehicle, **Contractors** shall comply with the regulations of the **City** Department of Environmental Protection, as and when adopted, Chapter 14 of Title 15 of the Rules of the City of New York (RCNY). The **Contractor** shall fully document all steps in the best available technology selection process and shall furnish such documentation to the **City Agency** or the DEP Commissioner upon request. The **Contractor** shall retain all documentation generated in the best available technology selection process for as long as the selected best available technology is in use.

5.4.3(b) No **Contractor** shall be required to replace best available technology for reducing the emission of pollutants or other authorized technology utilized for a diesel-powered Nonroad Vehicle in accordance with the provisions of this Article 5.4.3 within three (3) years of having first utilized such technology for such vehicle.

5.4.3(c) This Article 5.4.3 shall not apply to any vehicle used to satisfy the requirements of a specific Public Works Contract for fewer than twenty (20) **Days**.

5.4.3(d) The **Contractor** shall not be required to comply with this Article 5.4.3 with respect to a diesel-powered Nonroad Vehicle under the following circumstances:

5.4.3(d)(i) Where the **City Agency** makes a written finding, which is approved, in writing, by the DEP Commissioner, that the best available technology for reducing the emission of pollutants as required by this Article 5.4.3 is unavailable for such vehicle, the **Contractor** shall use whatever technology for reducing the emission of pollutants, if any, is available and appropriate for such vehicle.

5.4.3(d)(ii) Where the DEP Commissioner has issued a written waiver based upon the **Contractor** having demonstrated to the DEP Commissioner that the use of the best available technology for reducing the emission of pollutants might endanger the operator of such vehicle or those working near such vehicle, due to engine malfunction, the **Contractor** shall use whatever technology for

reducing the emission of pollutants, if any, is available and appropriate for such vehicle, which would not endanger the operator of such vehicle or those working near such vehicle.

5.4.3(d)(iii) In determining which technology to use for the purposes of Articles 5.4.3(d)(i) and 5.4.3(d)(ii) above, the **Contractor** shall primarily consider the reduction in emissions of particulate matter and secondarily consider the reduction in emissions of nitrogen oxides associated with the use of such technology, which shall in no event result in an increase in the emissions of either such pollutant.

5.4.3(d)(iv) The **Contractor** shall submit requests for a finding or a waiver pursuant to this Article 5.4.3(d) in writing to the DEP Commissioner, with a copy to the **ACCO** of the **City Agency** letting this **Contract**. Any finding or waiver made or issued pursuant to Articles 5.4.3(d)(i) and 5.4.3(d)(ii) above shall expire after one hundred eighty (180) **Days**, at which time the requirements of Article 5.4.3(a) shall be in full force and effect unless the **City Agency** renews the finding, in writing, and the DEP Commissioner approves such finding, in writing, or the DEP Commissioner renews the waiver, in writing.

5.4.3(e) The requirements of this Article 5.4.3 do not apply where they are precluded by federal or State funding requirements or where the **Contract** is an emergency procurement.

5.4.4 Section 24-163 of the Administrative Code. The **Contractor** shall comply with Section 24-163 of the Administrative Code related to the idling of the engines of motor vehicles while parking.

5.4.5 Compliance

5.4.5(a) The **Contractor's** compliance with Article 5.4 may be independently monitored. If it is determined that the **Contractor** has failed to comply with any provision of Article 5.4, any costs associated with any independent monitoring incurred by the **City** shall be reimbursed by the **Contractor**.

5.4.5(b) Any **Contractor** who violates any provision of Article 5.4, except as provided in Article 5.4.5(c) below, shall be liable for a civil penalty between the amounts of one thousand ($1,000) and ten thousand ($10,000) dollars, in addition to twice the amount of money saved by such **Contractor** for failure to comply with Article 5.4.

5.4.5(c) No **Contractor** shall make a false claim with respect to the provisions of Article 5.4 to a **City Agency**. Where a **Contractor** has been found to have done so, such **Contractor** shall be liable for a civil penalty of twenty thousand ($20,000) dollars, in addition to twice the amount of money saved by such **Contractor** in association with having made such false claim.

5.4.6 Reporting

5.4.6(a) For all Public Works Contracts covered by this Article 5.4, the **Contractor** shall report to the **City Agency** the following information:

5.4.6(a)(i) The total number of diesel-powered Nonroad Vehicles used to fulfill the requirements of this Public Works Contract;

5.4.6(a)(ii) The number of such Nonroad Vehicles that were powered by Ultra Low Sulfur Diesel Fuel;

5.4.6(a)(iii) The number of such Nonroad Vehicles that utilized the best available technology for reducing the emission of pollutants, including a breakdown by vehicle model and the type of technology;

5.4.6(a)(iv) The number of such Nonroad Vehicles that utilized such other authorized technology in accordance with Article 5.4.3, including a breakdown by vehicle model and the type of technology used for each such vehicle;

5.4.6(a)(v) The locations where such Nonroad Vehicles were used; and

5.4.6(a)(vi) Where a determination is in effect pursuant to Article 5.4.2(b) or 5.4.2(c), detailed information concerning the **Contractor's** efforts to obtain Ultra Low Sulfur Diesel Fuel or diesel fuel that has a sulfur content of no more than thirty parts per million (30 ppm).

5.4.6(b) The **Contractor** shall submit the information required by Article 5.4.6(a) at the completion of **Work** under the Public Works Contract and on a yearly basis no later than August 1 throughout the term of the Public Works Contract. The yearly report shall cover **Work** performed during the preceding fiscal year (July 1 - June 30).

5.5 Ultra Low Sulfur Diesel Fuel. In accordance with the Coordinated Construction Act for Lower Manhattan, as amended:

5.5.1 Definitions. For purposes of this Article 5.5, the following definitions apply:

5.5.1(a) "Lower Manhattan" means the area to the south of and within the following lines: a line beginning at a point where the United States pierhead line in the Hudson River as it exists now or may be extended would intersect with the southerly line of West Houston Street in the Borough of Manhattan extended, thence easterly along the southerly side of West Houston Street to the southerly side of Houston Street, thence easterly along the southerly side of Houston Street to the southerly side of East Houston Street, thence northeasterly along the southerly side of East Houston Street to the point where it would intersect with the United States pierhead line in the East River as it exists now or may be extended, including tax lots within or immediately adjacent thereto.

5.5.1(b) "Lower Manhattan Redevelopment Project" means any project in Lower Manhattan that is funded in whole or in part with federal or State funding, or any project intended to improve transportation between Lower Manhattan and the two air terminals in the **City** known as LaGuardia Airport and John F. Kennedy International Airport, or between Lower Manhattan and the air terminal in Newark known as Newark Liberty International Airport, and that is funded in whole or in part with federal funding.

5.5.1(c) "Nonroad Engine" means an internal combustion engine (including the fuel system) that is not used in a Motor Vehicle or a vehicle used solely for competition, or that is not subject to standards promulgated under Section 7411 or Section 7521 of Title 42 of the United States Code, except that this term shall apply to internal combustion engines used to power generators, compressors or similar equipment used in any construction program or project.

5.5.1(d) "Nonroad Vehicle" means a vehicle that is powered by a Nonroad Engine, fifty (50) horsepower (HP) and greater, and that is not a Motor Vehicle or a vehicle used solely for competition, which shall include, but not be limited to, excavators, backhoes, cranes, compressors, generators, bulldozers, and similar equipment, except that this terms shall not apply to horticultural maintenance vehicles used for landscaping purposes that are powered by a Nonroad Engine of sixty-five (65) HP or less and that are not used in any construction program or project.

5.5.1(e) "Ultra Low Sulfur Diesel Fuel" means diesel fuel that has a sulfur content of no more than fifteen parts per million (15 ppm).

5.5.2 Requirements. **Contractors** and **Subcontractors** are required to use only Ultra Low Sulfur Diesel Fuel to power the diesel-powered Nonroad Vehicles with engine HP rating of fifty (50) HP and above used on a Lower Manhattan Redevelopment Project and, where practicable, to reduce the emission of pollutants by retrofitting such Nonroad Vehicles with oxidation catalysts, particulate filters, or technology that achieves lowest particulate matter emissions.

5.6 Pesticides. In accordance with Section 17-1209 of the Administrative Code, to the extent that the **Contractor** or any **Subcontractor** applies pesticides to any property owned or leased by the **City**, the **Contractor,** and any **Subcontractor** shall comply with Chapter 12 of the Administrative Code.

5.7 Waste Treatment, Storage, and Disposal Facilities and Transporters. In connection with the **Work**, the **Contractor** and any **Subcontractor** shall use only those waste treatment, storage, and disposal facilities and waste transporters that possess the requisite license, permit or other governmental approval necessary to treat, store, dispose, or transport the waste, materials or hazardous substances.

5.8 Environmentally Preferable Purchasing. The **Contractor** shall ensure that products purchased or leased by the **Contractor** or any **Subcontractor** for the **Work** that are not specified by the **City** or are submitted as equivalents to a product specified by the **City** comply with the requirements of the New York City Environmentally Preferable Purchasing Program contained in Chapter 11 of Title 43 of the RCNY, pursuant to Chapter 3 of Title 6 of the Administrative Code.

ARTICLE 6. INSPECTION

6.1 During the progress of the **Work** and up to the date of **Final Acceptance**, the **Contractor** shall at all times afford the representatives of the **City** every reasonable, safe, and proper facility for inspecting all **Work** done or being done at the **Site** and also for inspecting the manufacture or preparation of materials and equipment at the place of such manufacture or preparation.

6.2 The **Contractor's** obligation hereunder shall include the uncovering or taking down of finished **Work** and its restoration thereafter; provided, however, that the order to uncover, take down and restore shall be in writing, and further provided that if **Work** thus exposed proves satisfactory, and if the **Contractor** has complied with Article 6.1, such uncovering or taking down and restoration shall be

considered an item of **Extra Work** to be paid for in accordance with the provisions of Article 26. If the **Work** thus exposed proves unsatisfactory, the **City** has no obligation to compensate the **Contractor** for the uncovering, taking down or restoration.

6.3 Inspection and approval by the **Commissioner**, the **Engineer**, **Project Manager**, or **Resident Engineer**, of finished **Work** or of **Work** being performed, or of materials and equipment at the place of manufacture or preparation, shall not relieve the **Contractor** of its obligation to perform the **Work** in strict accordance with the **Contract**. Finished or unfinished **Work** not found to be in strict accordance with the **Contract** shall be replaced as directed by the **Engineer**, even though such **Work** may have been previously approved and paid for. Such corrective **Work** is **Contract Work** and shall not be deemed **Extra Work**.

6.4 Rejected **Work** and materials shall be promptly taken down and removed from the **Site**, which must at all times be kept in a reasonably clean and neat condition.

ARTICLE 7. PROTECTION OF WORK AND OF PERSONS AND PROPERTY; NOTICES AND INDEMNIFICATION

7.1 During the performance of the **Work** and up to the date of **Final Acceptance**, the **Contractor** shall be under an absolute obligation to protect the finished and unfinished **Work** against any damage, loss, injury, theft and/or vandalism and in the event of such damage, loss, injury, theft and/or vandalism, it shall promptly replace and/or repair such **Work** at the **Contractor's** sole cost and expense, as directed by the **Resident Engineer**. The obligation to deliver finished **Work** in strict accordance with the **Contract** prior to **Final Acceptance** shall be absolute and shall not be affected by the **Resident Engineer's** approval of, or failure to prohibit, the **Means and Methods of Construction** used by the **Contractor**.

7.2 During the performance of the **Work** and up to the date of **Final Acceptance**, the **Contractor** shall take all reasonable precautions to protect all persons and the property of the **City** and of others from damage, loss or injury resulting from the **Contractor's**, and/or its **Subcontractors'** operations under this **Contract.** The **Contractor's** obligation to protect shall include the duty to provide, place or replace, and adequately maintain at or about the **Site** suitable and sufficient protection such as lights, barricades, and enclosures.

7.3 The **Contractor** shall comply with the notification requirements set forth below in the event of any loss, damage or injury to **Work**, persons or property, or any accidents arising out of the operations of the **Contractor** and/or its **Subcontractors** under this **Contract**.

7.3.1 The **Contractor** shall make a full and complete report in writing to the **Resident Engineer** within three (3) **Days** after the occurrence.

7.3.2 The **Contractor** shall also send written notice of any such event to all insurance carriers that issued potentially responsive policies (including commercial general liability insurance carriers for events relating to the **Contractor**'s own employees) no later than twenty (20) days after such event and again no later than twenty (20) days after the initiation of any claim and/or action resulting therefrom. Such notice shall contain the following information: the number of the insurance policy, the name of the Named Insured, the date and location of the incident, and the identity of the persons injured or property damaged. For any policy on which the **City** and/or the **Engineer**, **Architect**, or **Project Manager** are Additional Insureds, such notice shall expressly specify that "this notice is

being given on behalf of the City of New York as Additional Insured, such other Additional Insureds, as well as the Named Insured."

7.3.2(a) Whenever such notice is sent under a policy on which the **City** is an Additional Insured, the **Contractor** shall provide copies of the notice to the **Comptroller,** the **Commissioner** and the **City** Corporation Counsel. The copy to the **Comptroller** shall be sent to the Insurance Unit, NYC Comptroller's Office, 1 Centre Street – Room 1222, New York, New York, 10007. The copy to the **Commissioner** shall be sent to the address set forth in Schedule A of the General Conditions. The copy to the **City** Corporation Counsel shall be sent to Insurance Claims Specialist, Affirmative Litigation Division, New York City Law Department, 100 Church Street, New York, New York 10007.

7.3.2(b) If the **Contractor** fails to provide any of the foregoing notices to any appropriate insurance carrier(s) in a timely and complete manner, the **Contractor** shall indemnify the **City** for all losses, judgments, settlements, and expenses, including reasonable attorneys' fees, arising from an insurer's disclaimer of coverage citing late notice by or on behalf of the **City**.

7.4 To the fullest extent permitted by law, the **Contractor** shall defend, indemnify, and hold the **City**, its employees, and officials (the "Indemnitees") harmless against any and all claims (including but not limited to claims asserted by any employee of the **Contractor** and/or its **Subcontractors**) and costs and expenses of whatever kind (including but not limited to payment or reimbursement of attorneys' fees and disbursements) allegedly arising out of or in any way related to the operations of the **Contractor** and/or its **Subcontractors** in the performance of this **Contract** or from the **Contractor's** and/or its **Subcontractors'** failure to comply with any of the provisions of this **Contract** or of the **Law**. Such costs and expenses shall include all those incurred in defending the underlying claim and those incurred in connection with the enforcement of this Article 7.4 by way of cross-claim, third-party claim, declaratory action or otherwise. The parties expressly agree that the indemnification obligation hereunder contemplates (1) full indemnity in the event of liability imposed against the Indemnitees without negligence and solely by reason of statute, operation of **Law** or otherwise; and (2) partial indemnity in the event of any actual negligence on the part of the Indemnitees either causing or contributing to the underlying claim (in which case, indemnification will be limited to any liability imposed over and above that percentage attributable to actual fault whether by statute, by operation of **Law**, or otherwise). Where partial indemnity is provided hereunder, all costs and expenses shall be indemnified on a pro rata basis.

7.4.1 Indemnification under Article 7.4 or any other provision of the **Contract** shall operate whether or not **Contractor** or its **Subcontractors** have placed and maintained the insurance specified under Article 22.

7.5 The provisions of this Article 7 shall not be deemed to create any new right of action in favor of third parties against the **Contractor** or the **City**.

CHAPTER III: TIME PROVISIONS

ARTICLE 8. COMMENCEMENT AND PROSECUTION OF THE WORK

8.1 The **Contractor** shall commence the **Work** on the date specified in the **Notice to Proceed** or the **Order to Work**. The time for performance of the **Work** under the **Contract** shall be computed from

the date specified in the **Notice to Proceed** or the **Order to Work**. **TIME BEING OF THE ESSENCE** to the **City**, the **Contractor** shall thereafter prosecute the **Work** diligently, using such **Means and Methods of Construction** as are in accord with Article 4 herein and as will assure its completion not later than the date specified in this Contract, or on the date to which the time for completion may be extended.

ARTICLE 9. PROGRESS SCHEDULES

9.1 To enable the **Work** to be performed in an orderly and expeditious manner, the **Contractor**, within fifteen (15) **Days** after the **Notice to Proceed** or **Order to Work**, unless otherwise directed by the **Engineer**, shall submit to the **Engineer** a proposed progress schedule based on the Critical Path Method in the form of a bar graph or in such other form as specified by the **Engineer**, and monthly cash flow requirements, showing:

9.1.1 The anticipated time of commencement and completion of each of the various operations to be performed under this **Contract**; and

9.1.2 The sequence and interrelation of each of these operations with the others and with those of other related contracts; and

9.1.3 The estimated time required for fabrication or delivery, or both, of all materials and equipment required for the **Work**, including the anticipated time for obtaining required approvals pursuant to Article 10; and

9.1.4 The estimated amount in dollars the **Contractor** will claim on a monthly basis.

9.2 The proposed schedule shall be revised as directed by the **Engineer**, until finally approved by the **Engineer**, and after such approval, subject to the provisions of Article 11, shall be strictly adhered to by the **Contractor**.

9.3 If the **Contractor** shall fail to adhere to the approved progress schedule, or to the schedule as revised pursuant to Article 11, it shall promptly adopt such other or additional **Means and Methods of Construction**, at its sole cost and expense, as will make up for the time lost and will assure completion in accordance with the approved progress schedule. The approval by the **City** of a progress schedule which is shorter than the time allotted under the **Contract** shall not create any liability for the **City** if the approved progress schedule is not met.

9.4 The **Contractor** will not receive any payments until the proposed progress schedule is submitted.

ARTICLE 10. REQUESTS FOR INFORMATION OR APPROVAL

10.1 From time to time as the **Work** progresses and in the sequence indicated by the approved progress schedule, the **Contractor** shall submit to the **Engineer** a specific request in writing for each item of information or approval required by the **Contractor**. These requests shall state the latest date upon which the information or approval is actually required by the **Contractor**, and shall be submitted in a reasonable time in advance thereof to provide the **Engineer** a sufficient time to act upon such submissions, or any necessary re-submissions thereof.

10.2 The **Contractor** shall not have any right to an extension of time on account of delays due to the **Contractor's** failure to submit requests for the required information or the required approval in accordance with the above requirements.

ARTICLE 11. NOTICE OF CONDITIONS CAUSING DELAY AND DOCUMENTATION OF DAMAGES CAUSED BY DELAY

11.1 After the commencement of any condition which is causing or may cause a delay in completion of the **Work**, including conditions for which the **Contractor** may be entitled to an extension of time, the following notifications and submittals are required:

11.1.1 Within fifteen (15) **Days** after the **Contractor** becomes aware or reasonably should be aware of each such condition, the **Contractor** must notify the **Resident Engineer** or **Engineer**, as directed by the **Commissioner**, in writing of the existence, nature and effect of such condition upon the approved progress schedule and the **Work**, and must state why and in what respects, if any, the condition is causing or may cause a delay. Such notice shall include a description of the construction activities that are or could be affected by the condition and may include any recommendations the **Contractor** may have to address the delay condition and any activities the **Contractor** may take to avoid or minimize the delay.

11.1.2 If the **Contractor** shall claim to be sustaining damages for delay as provided for in this Article 11,within forty-five (45) **Days** from the time such damages are first incurred for each such condition, the **Contractor** shall submit to the **Commissioner** a verified written statement of the details and estimates of the amounts of such damages, including categories of expected damages and projected monthly costs, together with documentary evidence of such damages as the **Contractor** may have at the time of submission ("statement of delay damages"), as further detailed in Article 11.6. The **Contractor** may submit the above statement within such additional time as may be granted by the **Commissioner** in writing upon written request therefor.

11.1.3 Articles 11.1.1 and 11.1.2 do not relieve the **Contractor** of its obligation to comply with the provisions of Article 44.

11.2 Failure of the **Contractor** to strictly comply with the requirements of Article 11.1.1 may, in the discretion of the **Commissioner**, be deemed sufficient cause to deny any extension of time on account of delay arising out of such condition. Failure of the **Contractor** to strictly comply with the requirements of both Articles 11.1.1 and 11.1.2 shall be deemed a conclusive waiver by the **Contractor** of any and all claims for damages for delay arising from such condition and no right to recover on such claims shall exist.

11.3 When appropriate and directed by the **Engineer**, the progress schedule shall be revised by the **Contractor** until finally approved by the **Engineer**. The revised progress schedule must be strictly adhered to by the **Contractor**.

11.4 Compensable Delays

11.4.1 The **Contractor** agrees to make claim only for additional costs attributable to delay in the performance of this **Contract** necessarily extending the time for completion of the **Work** or resulting from acceleration directed by the **Commissioner** and required to maintain the progress schedule, occasioned solely by any act or omission to act of the **City** listed below. The **Contractor** also agrees that delay from any other cause shall be

compensated, if at all, solely by an extension of time to complete the performance of the **Work**.

11.4.1.1 The failure of the **City** to take reasonable measures to coordinate and progress the **Work** to the extent required by the **Contract**, except that the City shall not be responsible for the **Contractor's** obligation to coordinate and progress the **Work** of its **Subcontractors**.

11.4.1.2 Unreasonable delays attributable to the review of shop drawings, the issuance of change orders, or the cumulative impact of change orders that were not brought about by any act or omission of the **Contractor**.

11.4.1.3 The unavailability of the **Site** caused by acts or omissions of the **City**..

11.4.1.4 The issuance by the **Engineer** of a stop work order that was not brought about through any act or omission of the **Contractor**.

11.4.1.5 Differing site conditions or environmental hazards that were neither known nor reasonably ascertainable on a pre-bid inspection of the **Site** or review of the bid documents or other publicly available sources, and that are not ordinarily encountered in the **Project**'s geographical area or neighborhood or in the type of **Work** to be performed.

11.4.1.6 Delays caused by the **City's** bad faith or its willful, malicious, or grossly negligent conduct;

11.4.1.7 Delays not contemplated by the parties;

11.4.1.8 Delays so unreasonable that they constitute an intentional abandonment of the **Contract** by the **City**; and

11.4.1.9 Delays resulting from the **City's** breach of a fundamental obligation of the **Contract**.

11.4.2 No claim may be made for any alleged delay in **Substantial Completion** of the **Work** if the **Work** will be or is substantially completed by the date of **Substantial Completion** provided for in Schedule A unless acceleration has been directed by the **Commissioner** to meet the date of **Substantial Completion** set forth in Schedule A, or unless there is a provision in the **Contract** providing for additional compensation for early completion.

11.4.3 The provisions of this Article 11 apply only to claims for additional costs attributable to delay and do not preclude determinations by the **Commissioner** allowing reimbursements for additional costs for **Extra Work** pursuant to Articles 25 and 26 of this **Contract**. To the extent that any cost attributable to delay is reimbursed as part of a change order, no additional claim for compensation under this Article 11 shall be allowed.

11.5 Non-Compensable Delays. The **Contractor** agrees to make no claim for, and is deemed to have included in its bid prices for the various items of the **Contract**, the extra/additional costs attributable to any delays caused by or attributable to the items set forth below. For such items, the **Contractor** shall be compensated, if at all, solely by an extension of time to complete the performance of the **Work**, in accordance with the provisions of Article 13. Such extensions of time will be granted, if at all, pursuant to the grounds set forth in Article 13.3.

11.5.1 The acts or omissions of any third parties, including but not limited to **Other Contractors**, public/ governmental bodies (other than **City Agencies**), utilities or private enterprises, who are disclosed in the **Contract Documents** or are ordinarily encountered or generally recognized as related to the **Work**;

11.5.2 Any situation which was within the contemplation of the parties at the time of entering into the **Contract**, including any delay indicated or disclosed in the **Contract Documents** or that would be generally recognized by a reasonably prudent contractor as related to the nature of the **Work**, and/or the existence of any facility or appurtenance owned, operated or maintained by any third party, as indicated or disclosed in the **Contract Documents** or ordinarily encountered or generally recognized as related to the nature of the **Work**;

11.5.3 Restraining orders, injunctions or judgments issued by a court which were caused by a Contractor's submission, action or inaction or by a Contractor's **Means and Methods of Construction**, or by third parties, unless such order, injunction or judgment was the result of an act or omission by the **City**;

11.5.4 Any labor boycott, strike, picketing, lockout or similar situation;

11.5.5 Any shortages of supplies or materials, or unavailability of equipment, required by the **Contract Work**;

11.5.6 Climatic conditions, storms, floods, droughts, tidal waves, fires, hurricanes, earthquakes, landslides or other catastrophes or acts of God, or acts of war or of the public enemy or terrorist acts, including the **City's** reasonable responses thereto; and

11.5.7 **Extra Work** which does not significantly affect the overall completion of the **Contract**, reasonable delays in the review or issuance of change orders or field orders and/or in shop drawing reviews or approvals.

11.6 Required Content of Submission of Statement of Delay Damages

11.6.1 In the verified written statement of delay damages required by Article 11.1.2, the following information shall be provided by the **Contractor**:

11.6.1.1 For each delay, the start and end dates of the claimed periods of delay and, in addition, a description of the operations that were delayed, an explanation of how they were delayed, and the reasons for the delay, including identifying the applicable act or omission of the City listed in Article 11.4.

11.6.1.2 A detailed factual statement of the claim providing all necessary dates, locations and items of **Work** affected by the claim.

11.6.1.3 The estimated amount of additional compensation sought and a breakdown of that amount into categories as described in Article 11.7.

11.6.1.4 Any additional information requested by the **Commissioner**.

11.7 Recoverable Costs

11.7.1 Delay damages may be recoverable for the following costs actually and necessarily incurred in the performance of the **Work**:

11.7.1.1 Direct labor, including payroll taxes (subject to statutory wage caps) and supplemental benefits, based on time and materials records;

11.7.1.2 Necessary materials (including transportation to the **Site**), based on time and material records;

11.7.1.3 Reasonable rental value of necessary plant and equipment other than small tools, plus fuel/energy costs according to the applicable formula set forth in Articles 26.2.4 and/or 26.2.8, based on time and material records;

11.7.1.4 Additional insurance and bond costs;

11.7.1.5 Extended **Site** overhead, field office rental, salaries of field office staff, on-site project managers and superintendents, field office staff vehicles, **Project-**specific storage, field office utilities and telephone, and field office consumables;

11.7.1.6 Labor escalation costs based on actual costs;

11.7.1.7 Materials and equipment escalation costs based on applicable industry indices unless documentation of actual increased cost is provided;

11.7.1.8 Additional material and equipment storage costs based on actual documented costs and additional costs necessitated by extended manufacturer warranty periods; and

11.7.1.9 Extended home office overhead calculated based on the following formula:

(1) Subtract from the original **Contract** amount the amount earned by original contractual **Substantial Completion** date (not including change orders);

(2) Remove 15% overhead and profit from the calculation in item (1) by dividing the results of item (1) by 1.15;

(3) Multiply the result of item (2) by 7.25% for the total home office overhead;

(4) Multiply the result of item (3) by 7.25% for the total profit; and

(5) The total extended home office overhead will be the total of items (3) and (4).

11.7.2 Recoverable Subcontractor Costs. When the **Work** is performed by a **Subcontractor**, the **Contractor** may be paid the actual and necessary costs of such subcontracted **Work** as outlined above in Articles 11.7.1.1 through 11.7.1.8, and an additional overhead of 5% of the costs outlined in Articles 11.7.1.1 through 11.7.1.3.

11.7.3 Non-Recoverable Costs. The parties agree that the **City** will have no liability for the following items and the **Contractor** agrees it shall make no claim for the following items:

11.7.3.1 Profit, or loss of anticipated or unanticipated profit, except as provided in Article 11.7.1.9;

11.7.3.2 Consequential damages, including, but not limited to, construction or bridge loans or interest paid on such loans, loss of bonding capacity, bidding opportunities, or interest in investment, or any resulting insolvency;

11.7.3.3 Indirect costs or expenses of any nature except those included in Article 11.7.1;

11.7.3.4 Direct or indirect costs attributable to performance of **Work** where the **Contractor**, because of situations or conditions within its control, has not progressed the **Work** in a satisfactory manner; and

11.7.3.5 Attorneys' fees and dispute and claims preparation expenses.

11.8 Any claims for delay under this Article 11 are not subject to the jurisdiction of the Contract Dispute Resolution Board pursuant to the dispute resolution process set forth in Article 27.

11.9 Any compensation provided to the **Contractor** in accordance with this Article 11 will be made pursuant to a claim filed with the **Comptroller**. Nothing in this Article 11 extends the time for the **Contractor** to file an action with respect to a claim within six months after **Substantial Completion** pursuant to Article 56.

ARTICLE 12. COORDINATION WITH OTHER CONTRACTORS

12.1 During the progress of the **Work**, **Other Contractors** may be engaged in performing other work or may be awarded other contracts for additional work on this **Project**. In that event, the **Contractor** shall coordinate the **Work** to be done hereunder with the work of such **Other Contractors** and the **Contractor** shall fully cooperate with such **Other Contractors** and carefully fit its own **Work** to that provided under other contracts as may be directed by the **Engineer**. The **Contractor** shall not commit or permit any act which will interfere with the performance of work by any **Other Contractors**.

12.2 If the **Engineer** determines that the **Contractor** is failing to coordinate its **Work** with the work of **Other Contractors** as the **Engineer** has directed, then the **Commissioner** shall have the right to withhold any payments otherwise due hereunder until the **Contractor** completely complies with the **Engineer's** directions.

12.3 The **Contractor** shall notify the **Engineer** in writing if any **Other Contractor** on this **Project** is failing to coordinate its work with the **Work** of this **Contract**. If the **Engineer** finds such charges to be true, the **Engineer** shall promptly issue such directions to the **Other Contractor** with respect thereto as the situation may require. The **City** shall not, however, be liable for any damages suffered by any **Other Contractor's** failure to coordinate its work with the **Work** of this **Contract** or by reason of the **Other Contractor's** failure to promptly comply with the directions so issued by the **Engineer**, or by reason of any **Other Contractor's** default in performance, it being understood that the **City** does not guarantee the responsibility or continued efficiency of any contractor. The **Contractor** agrees to make no claim against the **City** for any damages relating to or arising out of any directions issued by the **Engineer** pursuant to this Article 12 (including but not limited to the failure of any **Other Contractor** to comply or promptly comply with such directions), or the failure of any **Other Contractor** to coordinate its work, or the default in performance of any **Other Contractor**.

12.4 The **Contractor** shall indemnify and hold the **City** harmless from any and all claims or judgments for damages and from costs and expenses to which the **City** may be subjected or which it may suffer or incur by reason of the **Contractor's** failure to comply with the **Engineer's** directions promptly; and the **Comptroller** shall have the right to exercise the powers reserved in Article 23 with respect to any claims which may be made for damages due to the **Contractor's** failure to comply with the **Engineer's** directions promptly. Insofar as the facts and **Law** relating to any claim would preclude the **City** from being completely indemnified by the **Contractor**, the **City** shall be partially indemnified by the **Contractor** to the fullest extent provided by **Law**.

12.5 Should the **Contractor** sustain any damage through any act or omission of any **Other Contractor** having a contract with the **City** for the performance of work upon the **Site** or of work which may be necessary to be performed for the proper prosecution of the **Work** to be performed hereunder, or through any act or omission of a subcontractor of such **Other Contractor**, the **Contractor** shall have no claim against the **City** for such damage, but shall have a right to recover such damage from the **Other**

Contractor under the provision similar to the following provisions which apply to this **Contract** and have been or will be inserted in the contracts with such **Other Contractors**:

12.5.1 Should any **Other Contractor** having or who shall hereafter have a contract with the **City** for the performance of work upon the **Site** sustain any damage through any act or omission of the **Contractor** hereunder or through any act or omission of any **Subcontractor** of the **Contractor**, the **Contractor** agrees to reimburse such **Other Contractor** for all such damages and to defend at its own expense any action based upon such claim and if any judgment or claim (even if the allegations of the action are without merit) against the **City** shall be allowed the **Contractor** shall pay or satisfy such judgment or claim and pay all costs and expenses in connection therewith and agrees to indemnify and hold the **City** harmless from all such claims. Insofar as the facts and **Law** relating to any claim would preclude the **City** from being completely indemnified by the **Contractor**, the **City** shall be partially indemnified by the **Contractor** to the fullest extent provided by **Law**.

12.6 The **City's** right to indemnification hereunder shall in no way be diminished, waived or discharged by its recourse to assessment of liquidated damages as provided in Article 15, or by the exercise of any other remedy provided for by **Contract** or by **Law**.

ARTICLE 13. EXTENSION OF TIME FOR PERFORMANCE

13.1 If performance by the **Contractor** is delayed for a reason set forth in Article 13.3, the **Contractor** may be allowed a reasonable extension of time in conformance with this Article 13 and the **PPB** Rules.

13.2 Any extension of time may be granted only by the **ACCO** or by the Board for the Extension of Time (hereafter "Board") (as set forth below) upon written application by the **Contractor**.

13.3 Grounds for Extension: If such application is made, the **Contractor** shall be entitled to an extension of time for delay in completion of the **Work** caused solely:

13.3.1 By the acts or omissions of the **City**, its officials, agents or employees; or

13.3.2 By the act or omissions of **Other Contractors** on this **Project**; or

13.3.3 By supervening conditions entirely beyond the control of either party hereto (such as, but not limited to, acts of God or the public enemy, excessive inclement weather, war or other national emergency making performance temporarily impossible or illegal, or strikes or labor disputes not brought about by any act or omission of the **Contractor**).

13.3.4 The **Contractor** shall, however, be entitled to an extension of time for such causes only for the number of **Days** of delay which the **ACCO** or the Board may determine to be due solely to such causes, and then only if the **Contractor** shall have strictly complied with all of the requirements of Articles 9 and 10.

13.4 The **Contractor** shall not be entitled to receive a separate extension of time for each of several causes of delay operating concurrently, but, if at all, only for the actual period of delay in completion of the **Work** as determined by the **ACCO** or the Board, irrespective of the number of causes contributing to produce such delay. If one of several causes of delay operating concurrently results from any act, fault or omission of the **Contractor** or of its **Subcontractors** or **Materialmen**, and would of itself (irrespective

of the concurrent causes) have delayed the **Work**, no extension of time will be allowed for the period of delay resulting from such act, fault or omission.

13.5 The determination made by the **ACCO** or the Board on an application for an extension of time shall be binding and conclusive on the **Contractor**.

13.6 The **ACCO** or the Board acting entirely within their discretion may grant an application for an extension of time for causes of delay other than those herein referred.

13.7 Permitting the **Contractor** to continue with the **Work** after the time fixed for its completion has expired, or after the time to which such completion may have been extended has expired, or the making of any payment to the **Contractor** after such time, shall in no way operate as a waiver on the part of the **City** of any of its rights under this **Contract**.

13.8 Application for Extension of Time:

13.8.1 Before the **Contractor's** time extension request will be considered, the **Contractor** shall notify the **ACCO** of the condition which allegedly has caused or is causing the delay, and shall submit a written application to the **ACCO** identifying:

13.8.1(a) The **Contractor**; the registration number; and **Project** description;

13.8.1(b) Liquidated damage assessment rate, as specified in the **Contract**;

13.8.1(c) Original total bid price;

13.8.1(d) The original **Contract** start date and completion date;

13.8.1(e) Any previous time extensions granted (number and duration); and

13.8.1(f) The extension of time requested.

13.8.2 In addition, the application for extension of time shall set forth in detail:

13.8.2(a) The nature of each alleged cause of delay in completing the **Work**;

13.8.2(b) The date upon which each such cause of delay began and ended and the number of **Days** attributable to each such cause;

13.8.2(c) A statement that the **Contractor** waives all claims except for those delineated in the application, and the particulars of any claims which the **Contractor** does not agree to waive. For time extensions for **Substantial Completion** and final completion payments, the application shall include a detailed statement of the dollar amounts of each element of claim item reserved; and

13.8.2(d) A statement indicating the **Contractor's** understanding that the time extension is granted only for purposes of permitting continuation of **Contract** performance and payment for **Work** performed and that the **City** retains its right to conduct an investigation and assess liquidated damages as appropriate in the future.

13.9 Analysis and Approval of Time Extensions:

13.9.1 For time extensions for partial payments, a written determination shall be made by the **ACCO** who may, for good and sufficient cause, extend the time for the performance of the **Contract** as follows:

13.9.1(a) If the **Work** is to be completed within six (6) months, the time for performance may be extended for sixty (60) **Days**;

13.9.1(b) If the **Work** is to be completed within less than one (1) year but more than six (6) months, an extension of ninety (90) **Days** may be granted;

13.9.1(c) If the **Contract** period exceeds one (1) year, besides the extension granted in Article 13.9.1(b), an additional thirty (30) **Days** may be granted for each multiple of six (6) months involved beyond the one (1) year period; or

13.9.1(d) If exceptional circumstances exist, the **ACCO** may extend the time for performance beyond the extensions in Articles 13.9.1(a), 13.9.1(b), and 13.9.1(c). In that event, the **ACCO** shall file with the Mayor's Office of Contract Services a written explanation of the exceptional circumstances.

13.9.2 For extensions of time for **Substantial Completion** and final completion payments, the **Engineer**, in consultation with the **ACCO**, shall prepare a written analysis of the delay (including a preliminary determination of the causes of delay, the beginning and end dates for each such cause of delay, and whether the delays are excusable under the terms of this **Contract**). The report shall be subject to review by and approval of the Board, which shall have authority to question its analysis and determinations and request additional facts or documentation. The report as reviewed and made final by the Board shall be made a part of the **Agency** contract file. Neither the report itself nor anything contained therein shall operate as a waiver or release of any claim the **City** may have against the **Contractor** for either actual or liquidated damages.

13.9.3 Approval Mechanism for Time Extensions for **Substantial Completion** or Final Completion Payments: An extension shall be granted only with the approval of the Board which is comprised of the **ACCO** of the **Agency**, the **City** Corporation Counsel, and the **Comptroller**, or their authorized representatives.

13.9.4 Neither the granting of any application for an extension of time to the **Contractor** or any **Other Contractor** on this **Project** nor the papers, records or reports related to any application for or grant of an extension of time or determination related thereto shall be referred to or offered in evidence by the **Contractor** or its attorneys in any action or proceeding.

13.10 No Damage for Delay: The **Contractor** agrees to make no claim for damages for delay in the performance of this **Contract** occasioned by any act or omission to act of the **City** or any of its representatives, except as provided for in Article 11.

ARTICLE 14. COMPLETION AND FINAL ACCEPTANCE OF THE WORK

14.1 Date for **Substantial Completion**: The **Contractor** shall substantially complete the **Work** within the time fixed in Schedule A of the General Conditions, or within the time to which such **Substantial Completion** may be extended.

14.2 Determining the Date of **Substantial Completion**: The **Work** will be deemed to be substantially complete when the two conditions set forth below have been met.

14.2.1 Inspection: The **Engineer** or **Resident Engineer**, as applicable, has inspected the **Work** and has made a written determination that it is substantially complete.

14.2.2 Approval of **Final Approved Punch List** and Date for **Final Acceptance**: Following inspection of the **Work**, the **Engineer/Resident Engineer** shall furnish the **Contractor** with a final punch list, specifying all items of **Work** to be completed and proposing dates for the completion of each specified item of **Work**. The **Contractor** shall then submit in writing to the **Engineer/Resident Engineer** within ten (10) **Days** of the **Engineer/Resident Engineer** furnishing the final punch list either acceptance of the dates or proposed alternative dates for the completion of each specified item of **Work**. If the **Contractor** neither accepts the dates nor proposes alternative dates within ten (10) **Days**, the schedule proposed by the **Engineer/Resident Engineer** shall be deemed accepted. If the **Contractor** proposes alternative dates, then, within a reasonable time after receipt, the **Engineer/Resident Engineer**, in a written notification to the **Contractor**, shall approve the **Contractor's** completion dates or, if they are unable to agree, the **Engineer/Resident Engineer** shall establish dates for the completion of each item of **Work**. The latest completion date specified shall be the date for **Final Acceptance** of the **Work**.

14.3 Date of **Substantial Completion**. The date of approval of the **Final Approved Punch List**, shall be the date of **Substantial Completion**. The date of approval of the **Final Approved Punch List** shall be either (a) if the **Contractor** approves the final punch list and proposed dates for completion furnished by the **Engineer/Resident Engineer**, the date of the **Contractor**'s approval; or (b) if the **Contractor** neither accepts the dates nor proposes alternative dates, ten (10) **Days** after the **Engineer/Resident Engineer** furnishes the **Contractor** with a final punch list and proposed dates for completion; or (c) if the **Contractor** proposes alternative dates, the date that the **Engineer/Resident Engineer** sends written notification to the **Contractor** either approving the **Contractor**'s proposed alternative dates or establishing dates for the completion for each item of **Work**.

14.4 Determining the Date of **Final Acceptance**: The **Work** will be accepted as final and complete as of the date of the **Engineer**'s/**Resident Engineer**'s inspection if, upon such inspection, the **Engineer/Resident Engineer** finds that all items on the **Final Approved Punch List** are complete and no further **Work** remains to be done. The **Commissioner** will then issue a written determination of **Final Acceptance**.

14.5 Request for Inspection: Inspection of the **Work** by the **Engineer/Resident Engineer** for the purpose of **Substantial Completion** or **Final Acceptance** shall be made within fourteen (14) **Days** after receipt of the **Contractor's** written request therefor.

14.6 Request for Re-inspection: If upon inspection for the purpose of **Substantial Completion** or **Final Acceptance**, the **Engineer/Resident Engineer** determines that there are items of **Work** still to be performed, the **Contractor** shall promptly perform them and then request a re-inspection. If upon re-inspection, the **Engineer/Resident Engineer** determines that the **Work** is substantially complete or finally accepted, the date of such re-inspection shall be the date of **Substantial Completion** or **Final Acceptance**. Re-inspection by the **Engineer/Resident Engineer** shall be made within ten (10) **Days** after receipt of the **Contractor's** written request therefor.

14.7 Initiation of Inspection by the **Engineer/Resident Engineer**: If the **Contractor** does not request inspection or re-inspection of the **Work** for the purpose of **Substantial Completion** or **Final Acceptance**, the **Engineer/Resident Engineer** may initiate such inspection or re-inspection.

ARTICLE 15. LIQUIDATED DAMAGES

15.1 In the event the **Contractor** fails to substantially complete the **Work** within the time fixed for such **Substantial Completion** in Schedule A of the General Conditions, plus authorized time extensions, or if the **Contractor**, in the sole determination of the **Commissioner**, has abandoned the **Work**, the **Contractor** shall pay to the **City** the sum fixed in Schedule A of the General Conditions, for each and every **Day** that the time consumed in substantially completing the **Work** exceeds the time allowed therefor; which said sum, in view of the difficulty of accurately ascertaining the loss which the **City** will suffer by reason of delay in the **Substantial Completion** of the **Work** hereunder, is hereby fixed and agreed as the liquidated damages that the **City** will suffer by reason of such delay, and not as a penalty. This Article 15 shall also apply to the **Contractor** whether or not the **Contractor** is defaulted pursuant to Chapter X of this **Contract**. Neither the failure to assess liquidated damages nor the granting of any time extension shall operate as a waiver or release of any claim the **City** may have against the **Contractor** for either actual or liquidated damages.

15.2 Liquidated damages received hereunder are not intended to be nor shall they be treated as either a partial or full waiver or discharge of the **City's** right to indemnification, or the **Contractor's** obligation to indemnify the **City**, or to any other remedy provided for in this **Contract** or by **Law**.

15.3 The **Commissioner** may deduct and retain out of the monies which may become due hereunder, the amount of any such liquidated damages; and in case the amount which may become due hereunder shall be less than the amount of liquidated damages suffered by the **City**, the **Contractor** shall be liable to pay the difference.

ARTICLE 16. OCCUPATION OR USE PRIOR TO COMPLETION

16.1 Unless otherwise provided for in the **Specifications**, the **Commissioner** may take over, use, occupy or operate any part of the **Work** at any time prior to **Final Acceptance**, upon written notification to the **Contractor**. The **Engineer** or **Resident Engineer**, as applicable, shall inspect the part of the **Work** to be taken over, used, occupied, or operated, and will furnish the **Contractor** with a written statement of the **Work**, if any, which remains to be performed on such part. The **Contractor** shall not object to, nor interfere with, the **Commissioner's** decision to exercise the rights granted by Article 16. In the event the **Commissioner** takes over, uses, occupies, or operates any part of the **Work:**

16.1.1 the **Engineer/Resident Engineer** shall issue a written determination of **Substantial Completion** with respect to such part of the **Work**;

16.1.2 the **Contractor** shall be relieved of its absolute obligation to protect such part of the unfinished **Work** in accordance with Article 7;

16.1.3 the **Contractor's** guarantee on such part of the **Work** shall begin on the date of such use by the **City**; and;

16.1.4 the **Contractor** shall be entitled to a return of so much of the amount retained in accordance with Article 21 as it relates to such part of the **Work**, except so much thereof as may be retained under Articles 24 and 44.

CHAPTER IV: SUBCONTRACTS AND ASSIGNMENTS

ARTICLE 17. SUBCONTRACTS

17.1 The **Contractor** shall not make subcontracts totaling an amount more than the percentage of the total **Contract** price fixed in Schedule A of the General Conditions, without prior written permission from the **Commissioner**. All subcontracts made by the **Contractor** shall be in writing. No **Work** may be performed by a **Subcontractor** prior to the **Contractor** entering into a written subcontract with the **Subcontractor** and complying with the provisions of this Article 17.

17.2 Before making any subcontracts, the **Contractor** shall submit a written statement to the **Commissioner** giving the name and address of the proposed **Subcontractor**; the portion of the **Work** and materials which it is to perform and furnish; the cost of the subcontract; the VENDEX questionnaire if required; the proposed subcontract if requested by the **Commissioner**; and any other information tending to prove that the proposed **Subcontractor** has the necessary facilities, skill, integrity, past experience, and financial resources to perform the **Work** in accordance with the terms and conditions of this **Contract**.

17.3 In addition to the requirements in Article 17.2, **Contractor** is required to list the **Subcontractor** in the web based Subcontractor Reporting System through the City's Payee Information Portal (PIP), available at www.nyc.gov/pip.[1] For each **Subcontractor** listed, **Contractor** is required to provide the following information: maximum contract value, description of **Subcontractor's** Work, start and end date of the subcontract and identification of the **Subcontractor**'s industry. Thereafter, **Contractor** will be required to report in the system the payments made to each **Subcontractor** within 30 days of making the payment. If any of the required information changes throughout the Term of the **Contract**, **Contractor** will be required to revise the information in the system.

Failure of the **Contractor** to list a **Subcontractor** and/or to report **Subcontractor** payments in a timely fashion may result in the **Commissioner** declaring the **Contractor** in default of the **Contract** and will subject **Contractor** to liquidated damages in the amount of $100 per day for each day that the **Contractor** fails to identify a **Subcontractor** along with the required information about the **Subcontractor** and/or fails to report payments to a **Subcontractor**, beyond the time frames set forth herein or in the notice from the **City**. Article 15 shall govern the issue of liquidated damages.

17.4 If an approved **Subcontractor** elects to subcontract any portion of its subcontract, the proposed sub-subcontract shall be submitted in the same manner as directed above.

17.5 The **Commissioner** will notify the **Contractor** in writing whether the proposed **Subcontractor** is approved. If the proposed **Subcontractor** is not approved, the **Contractor** may submit another proposed **Subcontractor** unless the **Contractor** decides to do the **Work**. No **Subcontractor** shall be permitted to enter or perform any work on the **Site** unless approved.

17.6 Before entering into any subcontract hereunder, the **Contractor** shall provide the proposed **Subcontractor** with a complete copy of this document and inform the proposed **Subcontractor** fully and completely of all provisions and requirements of this **Contract** relating either directly or indirectly to the **Work** to be performed and the materials to be furnished under such subcontract, and every such

[1] In order to use the new system, a PIP account will be required. Detailed instructions on creating a PIP account and using the new system are also available at www.nyc.gov/pip. Additional assistance with PIP may be obtained by emailing the Financial Information Services Agency Help Desk at pip@fisa.nyc.gov.

Subcontractor shall expressly stipulate that all labor performed and materials furnished by the **Subcontractor** shall strictly comply with the requirements of this **Contract**.

17.7 Documents given to a prospective **Subcontractor** for the purpose of soliciting the **Subcontractor's** bid shall include either a copy of the bid cover or a separate information sheet setting forth the **Project** name, the **Contract** number (if available), the **Agency** (as noted in Article 2.1.6), and the **Project's** location.

17.8 The **Commissioner's** approval of a **Subcontractor** shall not relieve the **Contractor** of any of its responsibilities, duties, and liabilities hereunder. The **Contractor** shall be solely responsible to the **City** for the acts or defaults of its **Subcontractor** and of such **Subcontractor's** officers, agents, and employees, each of whom shall, for this purpose, be deemed to be the agent or employee of the **Contractor** to the extent of its subcontract.

17.9 If the **Subcontractor** fails to maintain the necessary facilities, skill, integrity, past experience, and financial resources (other than due to the **Contractor's** failure to make payments where required) to perform the **Work** in accordance with the terms and conditions of this **Contract**, the **Contractor** shall promptly notify the **Commissioner** and replace such **Subcontractor** with a newly approved **Subcontractor** in accordance with this Article 17.

17.10 The **Contractor** shall be responsible for ensuring that all **Subcontractors** performing **Work** at the **Site** maintain all insurance required by **Law**.

17.11 The **Contractor** shall promptly, upon request, file with the **Engineer** a conformed copy of the subcontract and its cost. The subcontract shall provide the following:

17.11.1 Payment to **Subcontractors**: The agreement between the **Contractor** and its **Subcontractor** shall contain the same terms and conditions as to method of payment for **Work**, labor, and materials, and as to retained percentages, as are contained in this **Contract**.

17.11.2 Prevailing Rate of Wages: The agreement between the **Contractor** and its **Subcontractor** shall include the prevailing wage rates and supplemental benefits to be paid in accordance with Labor Law Section 220.

17.11.3 Section 6-123 of the Administrative Code: Pursuant to the requirements of Section 6-123 of the Administrative Code, every agreement between the **Contractor** and a **Subcontractor** in excess of fifty thousand ($50,000) dollars shall include a provision that the **Subcontractor** shall not engage in any unlawful discriminatory practice as defined in Title VIII of the Administrative Code (Section 8-101 *et seq.*).

17.11.4 All requirements required pursuant to federal and/or state grant agreement(s), if applicable to the **Work**.

17.12 The **Commissioner** may deduct from the amounts certified under this **Contract** to be due to the **Contractor**, the sum or sums due and owing from the **Contractor** to the **Subcontractors** according to the terms of the said subcontracts, and in case of dispute between the **Contractor** and its **Subcontractor**, or **Subcontractors**, as to the amount due and owing, the **Commissioner** may deduct and withhold from the amounts certified under this **Contract** to be due to the **Contractor** such sum or sums as may be claimed by such **Subcontractor**, or **Subcontractors**, in a sworn affidavit, to be due and owing until such time as such claim or claims shall have been finally resolved.

17.13 On contracts where performance bonds and payment bonds are executed, the **Contractor** shall include on each requisition for payment the following data: **Subcontractor's** name, value of the subcontract, total amount previously paid to **Subcontractor** for **Work** previously requisitioned, and the amount, including retainage, to be paid to the **Subcontractor** for **Work** included in the requisition.

17.14 On **Contracts** where performance bonds and payment bonds are not executed, the **Contractor** shall include with each requisition for payment submitted hereunder, a signed statement from each and every **Subcontractor** and/or **Materialman** for whom payment is requested in such requisition. Such signed statement shall be on the letterhead of the **Subcontractor** and/or **Materialman** for whom payment is requested and shall (i) verify that such **Subcontractor** and/or **Materialman** has been paid in full for all **Work** performed and/or material supplied to date, exclusive of any amount retained and any amount included on the current requisition, and (ii) state the total amount of retainage to date, exclusive of any amount retained on the current requisition.

ARTICLE 18. ASSIGNMENTS

18.1 The **Contractor** shall not assign, transfer, convey or otherwise dispose of this **Contract**, or the right to execute it, or the right, title or interest in or to it or any part thereof, or assign, by power of attorney or otherwise any of the monies due or to become due under this **Contract**, unless the previous written consent of the **Commissioner** shall first be obtained thereto, and the giving of any such consent to a particular assignment shall not dispense with the necessity of such consent to any further or other assignments.

18.2 Such assignment, transfer, conveyance or other disposition of this **Contract** shall not be valid until filed in the office of the **Commissioner** and the **Comptroller**, with the written consent of the **Commissioner** endorsed thereon or attached thereto.

18.3 Failure to obtain the previous written consent of the **Commissioner** to such an assignment, transfer, conveyance or other disposition, may result in the revocation and annulment of this **Contract**. The **City** shall thereupon be relieved and discharged from any further liability to the **Contractor**, its assignees, transferees or sublessees, who shall forfeit and lose all monies therefor earned under the **Contract**, except so much as may be required to pay the **Contractor's** employees.

18.4 The provisions of this clause shall not hinder, prevent, or affect an assignment by the **Contractor** for the benefit of its creditors made pursuant to the **Laws** of the State of New York.

18.5 This **Contract** may be assigned by the **City** to any corporation, agency or instrumentality having authority to accept such assignment.

CHAPTER V: CONTRACTOR'S SECURITY AND GUARANTEE

ARTICLE 19. SECURITY DEPOSIT

19.1 If performance and payment bonds are required, the **City** shall retain the bid security to ensure that the successful bidder executes the **Contract** and furnishes the required payment and performance security within ten (10) **Days** after notice of the award of the **Contract**. If the successful bidder fails to execute the **Contract** and furnish the required payment and performance security, the **City** shall retain such bid security as set forth in the Information for Bidders. If the successful bidder executes the

Contract and furnishes the required payment and performance security, the **City** shall return the bid security within a reasonable time after the furnishing of such bonds and execution of the **Contract** by the **City**.

19.2 If performance and payment bonds are not required, the bid security shall be retained by the **City** as security for the **Contractor**'s faithful performance of the **Contract**. If partial payments are provided, the bid security will be returned to the **Contractor** after the sum retained under Article 21 equals the amount of the bid security, subject to other provisions of this **Contract**. If partial payments are not provided, the bid security will be released when final payment is certified by the **City** for payment.

19.3 If the **Contractor** is declared in default under Article 48 prior to the return of the deposit, or if any claim is made such as referred to in Article 23, the amount of such deposit, or so much thereof as the **Comptroller** may deem necessary, may be retained and then applied by the **Comptroller**:

19.3.1 To compensate the **City** for any expense, loss or damage suffered or incurred by reason of or resulting from such default, including the cost of re-letting and liquidated damages; or

19.3.2 To indemnify the **City** against any and all claims.

ARTICLE 20. PAYMENT GUARANTEE

20.1 On **Contracts** where one hundred (100%) percent performance bonds and payment bonds are executed, this Article 20 does not apply.

20.2 In the event the terms of this **Contract** do not require the **Contractor** to provide a payment bond or where the **Contract** does not require a payment bond for one hundred (100%) percent of the **Contract** price, the **City** shall, in accordance with the terms of this Article 20, guarantee payment of all lawful claims for:

20.2.1 Wages and compensation for labor performed and/or services rendered; and

20.2.2 Materials, equipment, and supplies provided, whether incorporated into the **Work** or not, when demands have been filed with the **City** as provided hereinafter by any person, firm, or corporation which furnished labor, material, equipment, supplies, or any combination thereof, in connection with the **Work** performed hereunder (hereinafter referred to as the "beneficiary") at the direction of the **City** or the **Contractor**.

20.3 The provisions of Article 20.2 are subject to the following limitations and conditions:

20.3.1 If the **Contractor** provides a payment bond for a value that is less than one hundred (100%) percent of the value of the **Contract Work**, the payment bond provided by the **Contractor** shall be primary (and non-contributing) to the payment guarantee provided under this Article 20.

20.3.2 The guarantee is made for the benefit of all beneficiaries as defined in Article 20.2 provided that those beneficiaries strictly adhere to the terms and conditions of Article 20.3.4 and 20.3.5.

20.3.3 Nothing in this Article 20 shall prevent a beneficiary providing labor, services or material for the **Work** from suing the **Contractor** for any amounts due and owing the beneficiary by the **Contractor**.

20.3.4 Every person who has furnished labor or material, to the **Contractor** or to a **Subcontractor** of the **Contractor**, in the prosecution of the **Work** and who has not been paid in full therefor before the expiration of a period of ninety (90) **Days** after the date on which the last of the labor was performed or material was furnished by him/her for which the claim is made, shall have the right to sue on this payment guarantee in his/her own name for the amount, or the balance thereof, unpaid at the time of commencement of the action; provided, however, that a person having a direct contractual relationship with a **Subcontractor** of the **Contractor** but no contractual relationship express or implied with the **Contractor** shall not have a right of action upon the guarantee unless he/she shall have given written notice to the **Contractor** within one hundred twenty (120) **Days** from the date on which the last of the labor was performed or the last of the material was furnished, for which his/her claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the material was furnished or for whom the labor was performed. The notice shall be served by delivering the same personally to the **Contractor** or by mailing the same by registered mail, postage prepaid, in an envelope addressed to the **Contractor** at any place where it maintains an office or conducts its business; provided, however, that where such notice is actually received by the **Contractor** by other means, such notice shall be deemed sufficient.

20.3.5 Except as provided in Labor Law Section 220-g, no action on this payment guarantee shall be commenced after the expiration of the one-year limitations period set forth in Section 137(4)(b) of the State Finance Law.

20.3.6 The **Contractor** shall promptly forward to the **City** any notice or demand received pursuant to Article 20.3.4. The **Contractor** shall inform the **City** of any defenses to the notice or demand and shall forward to the **City** any documents the **City** requests concerning the notice or demand.

20.3.7 All demands made against the **City** by a beneficiary of this payment guarantee shall be presented to the **Engineer** along with all written documentation concerning the demand which the **Engineer** deems reasonably appropriate or necessary, which may include, but shall not be limited to: the subcontract; any invoices presented to the **Contractor** for payment; the notarized statement of the beneficiary that the demand is due and payable, that a request for payment has been made of the **Contractor** and that the demand has not been paid by the **Contractor** within the time allowed for such payment by the subcontract; and copies of any correspondence between the beneficiary and the **Contractor** concerning such demand. The **City** shall notify the **Contractor** that a demand has been made. The **Contractor** shall inform the **City** of any defenses to the demand and shall forward to the **City** any documents the **City** requests concerning the demand.

20.3.8 The **City** shall make payment only if, after considering all defenses presented by the **Contractor**, it determines that the payment is due and owing to the beneficiary making the demand.

20.3.9 No beneficiary shall be entitled to interest from the **City**, or to any other costs, including, but not limited to, attorneys' fees, except to the extent required by State Finance Law Section 137.

20.4 Upon the receipt by the **City** of a demand pursuant to this Article 20, the **City** may withhold from any payment otherwise due and owing to the **Contractor** under this **Contract** an amount sufficient to satisfy the demand.

20.4.1 In the event the **City** determines that the demand is valid, the **City** shall notify the **Contractor** of such determination and the amount thereof and direct the **Contractor** to immediately pay such amount to the beneficiary. In the event the **Contractor**, within seven (7) **Days** of receipt of such notification from the **City**, fails to pay the beneficiary, such failure shall constitute an automatic and irrevocable assignment of payment by the **Contractor** to the beneficiary for the amount of the demand determined by the **City** to be valid. The **Contractor**, without further notification or other process, hereby gives its unconditional consent to such assignment of payment to the beneficiary and authorizes the **City**, on its behalf, to take all necessary actions to implement such assignment of payment, including without limitation the execution of any instrument or documentation necessary to effectuate such assignment.

20.4.2 In the event that the amount otherwise due and owing to the **Contractor** by the **City** is insufficient to satisfy such demand, the **City** may, at its option, require payment from the **Contractor** of an amount sufficient to cover such demand and exercise any other right to require or recover payment which the **City** may have under **Law** or **Contract**.

20.4.3 In the event the **City** determines that the demand is invalid, any amount withheld pending the **City**'s review of such demand shall be paid to the **Contractor**; provided, however, no lien has been filed. In the event a claim or an action has been filed, the terms and conditions set forth in Article 23 shall apply. In the event a lien has been filed, the parties will be governed by the provisions of the Lien Law of the State of New York.

20.5 The provisions of this Article 20 shall not prevent the **City** and the **Contractor** from resolving disputes in accordance with the **PPB** Rules, where applicable.

20.6 In the event the **City** determines that the beneficiary is entitled to payment pursuant to this Article 20, such determination and any defenses and counterclaims raised by the **Contractor** shall be taken into account in evaluating the **Contractor's** performance.

20.7 Nothing in this Article 20 shall relieve the **Contractor** of the obligation to pay the claims of all persons with valid and lawful claims against the **Contractor** relating to the **Work**.

20.8 The **Contractor** shall not require any performance, payment or other bonds of any **Subcontractor** if this **Contract** does not require such bonds of the **Contractor**.

20.9 The payment guarantee made pursuant to this Article 20 shall be construed in a manner consistent with Section 137 of the State Finance Law and shall afford to persons furnishing labor or materials to the **Contractor** or its **Subcontractors** in the prosecution of the **Work** under this **Contract** all of the rights and remedies afforded to such persons by such section, including but not limited to, the right to commence an action against the **City** on the payment guarantee provided by this Article 20 within the one-year limitations period set forth in Section 137(4)(b).

ARTICLE 21. RETAINED PERCENTAGE

21.1 If this **Contract** requires one hundred (100%) percent performance and payment security, then as further security for the faithful performance of this **Contract**, the **Commissioner** shall deduct, and

retain until the substantial completion of the **Work**, five (5%) percent of the value of **Work** certified for payment in each partial payment voucher.

21.2 If this **Contract** does not require one hundred (100%) percent performance and payment security and if the price for which this **Contract** was awarded does not exceed one million ($1,000,000) dollars, then as further security for the faithful performance of this **Contract**, the **Commissioner** shall deduct, and retain until the substantial completion of the **Work**, five (5%) percent of the value of **Work** certified for payment in each partial payment voucher.

21.3 If this **Contract** does not require one hundred (100%) percent performance and payment security and if the price for which this **Contract** was awarded exceeds one million ($1,000,000) dollars, then as further security for the faithful performance of this **Contract,** the **Commissioner** shall deduct, and retain until the substantial completion of the **Work**, up to ten (10%) percent of the value of **Work** certified for payment in each partial payment voucher. The percentage to be retained is set forth in Schedule A of the General Conditions.

ARTICLE 22. INSURANCE

22.1 Types of Insurance: The **Contractor** shall procure and maintain the following types of insurance if, and as indicated, in Schedule A of the General Conditions (with the minimum limits and special conditions specified in Schedule A). Such insurance shall be maintained from the date the **Contractor** is required to provide Proof of Insurance pursuant to Article 22.3.1 through the date of completion of all required **Work** (including punch list work as certified in writing by the **Resident Engineer**), except for insurance required pursuant to Article 22.1.4, which may terminate upon **Substantial Completion** of the **Contract**. All insurance shall meet the requirements set forth in this Article 22. Wherever this Article requires that insurance coverage be "at least as broad" as a specified form (including all ISO forms), there is no obligation that the form itself be used, provided that the **Contractor** can demonstrate that the alternative form or endorsement contained in its policy provides coverage at least as broad as the specified form.

22.1.1 Commercial General Liability Insurance: The **Contractor** shall provide Commercial General Liability Insurance covering claims for property damage and/or bodily injury, including death, which may arise from any of the operations under this **Contract**. Coverage under this insurance shall be at least as broad as that provided by the latest edition of Insurance Services Office ("ISO") Form CG 0001. Such insurance shall be "occurrence" based rather than "claims-made" and include, without limitation, the following types of coverage: premises operations; products and completed operations; contractual liability (including the tort liability of another assumed in a contract); broad form property damage; independent contractors; explosion, collapse and underground (XCU); construction means and methods; and incidental malpractice. Such insurance shall contain a "per project" aggregate limit, as specified in Schedule A, that applies separately to operations under this **Contract**.

22.1.1(a) Such Commercial General Liability Insurance shall name the **City** as an Additional Insured. Coverage for the City shall specifically include the **City's** officials and employees, be at least as broad as the latest edition of ISO Form CG 20 10 and provide completed operations coverage at least as broad as the latest edition of ISO Form CG 20 37.

22.1.1(b) Such Commercial General Liability Insurance shall name all other entities designated as additional insureds in Schedule A but only for claims arising from the

Contractor's operations under this **Contract**, with coverage at least as broad as the latest edition of ISO Form CG 20 26.

22.1.1(c) If the **Work** requires a permit from the Department of Buildings pursuant to 1 RCNY Section 101-08, the **Contractor** shall provide Commercial General Liability Insurance with limits of at least those required by 1 RCNY section 101-08 or greater limits required by the Agency in accordance with Schedule A. If the **Work** does not require such a permit, the minimum limits shall be those provided for in Schedule A.

22.1.1(d) If any of the **Work** includes repair of a waterborne vessel owned by or to be delivered to the **City**, such Commercial General Liability shall include, or be endorsed to include, Ship Repairer's Legal Liability Coverage to protect against, without limitation, liability arising from navigation of such vessels prior to delivery to and acceptance by the **City**.

22.1.2 Workers' Compensation Insurance, Employers' Liability Insurance, and Disability Benefits Insurance: The **Contractor** shall provide, and shall cause its **Subcontractors** to provide, Workers Compensation Insurance, Employers' Liability Insurance, and Disability Benefits Insurance in accordance with the **Laws** of the State of New York on behalf of all employees providing services under this **Contract** (except for those employees, if any, for which the **Laws** require insurance only pursuant to Article 22.1.3).

22.1.3 United States Longshoremen's and Harbor Workers Act and/or Jones Act Insurance: If specified in Schedule A of the General Conditions or if required by **Law**, the **Contractor** shall provide insurance in accordance with the United States Longshoremen's and Harbor Workers Act and/or the Jones Act, on behalf of all qualifying employees providing services under this **Contract**.

22.1.4 Builders Risk Insurance: If specified in Schedule A of the General Conditions, the **Contractor** shall provide Builders Risk Insurance on a completed value form for the total value of the **Work** through **Substantial Completion** of the **Work** in its entirety. Such insurance shall be provided on an All Risk basis and include coverage, without limitation, for windstorm (including named windstorm), storm surge, flood and earth movement. Unless waived by the **Commissioner**, it shall include coverage for ordinance and law, demolition and increased costs of construction, debris removal, pollutant clean up and removal, and expediting costs. Such insurance shall cover, without limitation, (a) all buildings and/or structures involved in the **Work**, as well as temporary structures at the **Site**, and (b) any property that is intended to become a permanent part of such building or structure, whether such property is on the **Site**, in transit or in temporary storage. Policies shall name the **Contractor** as Named Insured and list the **City** as both an Additional Insured and a Loss Payee as its interest may appear.

22.1.4(a) Policies of such insurance shall specify that, in the event a loss occurs at an occupied facility, occupancy of such facility is permitted without the consent of the issuing insurance company.

22.1.4(b) Such insurance may be provided through an Installation Floater, at the **Contractor's** option, if it otherwise conforms with the requirements of this Article 22.1.4.

22.1.5 Commercial Automobile Liability Insurance: The **Contractor** shall provide Commercial Automobile Liability Insurance for liability arising out of ownership,

maintenance or use of any owned (if any), non-owned and hired vehicles to be used in connection with this **Contract**. Coverage shall be at least as broad as the latest edition of ISO Form CA0001. If vehicles are used for transporting hazardous materials, the Automobile Liability Insurance shall be endorsed to provide pollution liability broadened coverage for covered vehicles (endorsement CA 99 48) as well as proof of MCS 90.

22.1.6 Contractors Pollution Liability Insurance: If specified in Schedule A of the General Conditions, the **Contractor** shall maintain, or cause the **Subcontractor** doing such **Work** to maintain, Contractors Pollution Liability Insurance covering bodily injury and property damage. Such insurance shall provide coverage for actual, alleged or threatened emission, discharge, dispersal, seepage, release or escape of pollutants (including asbestos), including any loss, cost or expense incurred as a result of any cleanup of pollutants (including asbestos) or in the investigation, settlement or defense of any claim, action, or proceedings arising from the operations under this **Contract**. Such insurance shall be in the **Contractor's** name and list the **City** as an Additional Insured and any other entity specified in Schedule A. Coverage shall include, without limitation, (a) loss of use of damaged property or of property that has not been physically injured, (b) transportation, and (c) non-owned disposal sites.

22.1.6(a) Coverage for the **City** as Additional Insured shall specifically include the **City's** officials and employees and be at least as broad as provided to the **Contractor** for this **Project**.

22.1.6(b) If such insurance is written on a claims-made policy, such policy shall have a retroactive date on or before the effective date of this **Contract**, and continuous coverage shall be maintained, or an extended discovery period exercised, for a period of not less than three (3) years from the time the **Work** under this **Contract** is completed.

22.1.7 Marine Insurance:

22.1.7(a) Marine Protection and Indemnity Insurance: If specified in Schedule A of the General Conditions or if the **Contractor** engages in marine operations in the execution of any part of the **Work**, the **Contractor** shall maintain, or cause the **Subcontractor** doing such Work to maintain, Marine Protection and Indemnity Insurance with coverage at least as broad as Form SP-23. The insurance shall provide coverage for the **Contractor** or **Subcontractor** (whichever is doing this **Work**) and for the **City** (together with its officials and employees) and any other entity specified in Schedule A as an Additional Insured for bodily injury and property damage arising from marine operations under this **Contract**. Coverage shall include, without limitation, injury or death of crew members (if not fully provided through other insurance), removal of wreck, damage to piers, wharves and other fixed or floating objects and loss of or damage to any other vessel or craft, or to property on such other vessel or craft.

22.1.7(b) Hull and Machinery Insurance: If specified in Schedule A of the General Conditions or if the **Contractor** engages in marine operations in the execution of any part of the **Work**, the **Contractor** shall maintain, or cause the **Subcontractor** doing such **Work** to maintain, Hull and Machinery Insurance with coverage for the **Contractor** or **Subcontractor** (whichever is doing this Work) and for the **City** (together with its officials and employees) as Additional Insured at least as broad as the latest edition of American Institute Tug Form for all tugs used under this

Contract and Collision Liability at least as broad as the latest edition of American Institute Hull Clauses.

22.1.7(c) Marine Pollution Liability Insurance: If specified in Schedule A of the General Conditions or if the **Contractor** engages in marine operations in the execution of any part of the **Work**, the **Contractor** shall maintain, or cause the **Subcontractor** doing such Work to maintain, Marine Pollution Liability Insurance covering itself (or the Subcontractor doing such Work) as Named Insured and the **City** (together with its officials and employees) and any other entity specified in Schedule A as an Additional Insured. Coverage shall be at least as broad as that provided by the latest edition of Water Quality Insurance Syndicate Form and include, without limitation, liability arising from the discharge or substantial threat of a discharge of oil, or from the release or threatened release of a hazardous substance including injury to, or economic losses resulting from, the destruction of or damage to real property, personal property or natural resources.

22.1.8 The **Contractor** shall provide such other types of insurance, at such minimum limits and with such conditions, as are specified in Schedule A of the General Conditions.

22.2 General Requirements for Insurance Coverage and Policies:

22.2.1 All required insurance policies shall be maintained with companies that may lawfully issue the required policy and have an A.M. Best rating of at least A-/VII or a Standard and Poor's rating of at least A, unless prior written approval is obtained from the **City** Corporation Counsel.

22.2.2 The **Contractor** shall be solely responsible for the payment of all premiums for all required policies and all deductibles and self-insured retentions to which such policies are subject, whether or not the **City** is an insured under the policy.

22.2.3 In his/her sole discretion, the **Commissioner** may, subject to the approval of the **Comptroller** and the **City** Corporation Counsel, accept Letters of Credit and/or custodial accounts in lieu of required insurance.

22.2.4 The **City's** limits of coverage for all types of insurance required pursuant to Schedule A of the General Conditions shall be the greater of (i) the minimum limits set forth in Schedule A or (ii) the limits provided to the **Contractor** as Named Insured under all primary, excess, and umbrella policies of that type of coverage.

22.2.5 The **Contractor** may satisfy its insurance obligations under this Article 22 through primary policies or a combination of primary and excess/umbrella policies, so long as all policies provide the scope of coverage required herein.

22.2.6 Policies of insurance provided pursuant to this Article 22 shall be primary and non-contributing to any insurance or self-insurance maintained by the **City**.

22.3 Proof of Insurance:

22.3.1 For all types of insurance required by Article 22.1 and Schedule A, except for insurance required by Articles 22.1.4 and 22.1.7, the **Contractor** shall file proof of insurance in accordance with this Article 22.3 within ten (10) **Days** of award. For insurance

provided pursuant to Articles 22.1.4 and 22.1.7, proof shall be filed by a date specified by the **Commissioner** or ten (10) **Days** prior to the commencement of the portion of the **Work** covered by such policy, whichever is earlier.

22.3.2 For Workers' Compensation Insurance provided pursuant to Article 22.1.2, the **Contractor** shall submit one of the following forms: C-105.2 Certificate of Workers' Compensation Insurance; U-26.3 - State Insurance Fund Certificate of Workers' Compensation Insurance; Request for WC/DB Exemption (Form CE-200); equivalent or successor forms used by the New York State Workers' Compensation Board; or other proof of insurance in a form acceptable to the **Commissioner**. For Disability Benefits Insurance provided pursuant to Article 22.1.2, the Contractor shall submit DB-120.1 - Certificate Of Insurance Coverage Under The NYS Disability Benefits Law, Request for WC/DB Exemption (Form CE-200); equivalent or successor forms used by the New York State Workers' Compensation Board; or other proof of insurance in a form acceptable to the **Commissioner**. ACORD forms are not acceptable.

22.3.3 For policies provided pursuant to all of Article 22.1 other than Article 22.1.2, the **Contractor** shall submit one or more Certificates of Insurance on forms acceptable to the **Commissioner**. All such Certificates of Insurance shall certify (a) the issuance and effectiveness of such policies of insurance, each with the specified minimum limits (b) for insurance secured pursuant to Article 22.1.1 that the **City** and any other entity specified in Schedule A is an Additional Insured thereunder; (c) in the event insurance is required pursuant to Article 22.1.6 and/or Article 22.1.7, that the City is an Additional Insured thereunder; (d) the company code issued to the insurance company by the National Association of Insurance Commissioners (the NAIC number); and (e) the number assigned to the **Contract** by the **City**. All such Certificates of Insurance shall be accompanied by either a duly executed "Certification by Insurance Broker or Agent" in the form contained in Part III of Schedule A or copies of all policies referenced in such Certificate of Insurance as certified by an authorized representative of the issuing insurance carrier. If any policy is not available at the time of submission, certified binders may be submitted until such time as the policy is available, at which time a certified copy of the policy shall be submitted.

22.3.4 Documentation confirming renewals of insurance shall be submitted to the **Commissione**r prior to the expiration date of coverage of policies required under this **Contract**. Such proofs of insurance shall comply with the requirements of Articles 22.3.2 and 22.3.3.

22.3.5 The **Contractor** shall be obligated to provide the **City** with a copy of any policy of insurance provided pursuant to this Article 22 upon the demand for such policy by the **Commissioner** or the **City** Corporation Counsel.

22.4 Operations of the **Contractor**:

22.4.1 The **Contractor** shall not commence the **Work** unless and until all required certificates have been submitted to and accepted by the **Commissioner**. Acceptance by the **Commissioner** of a certificate does not excuse the **Contractor** from securing insurance consistent with all provisions of this Article 22 or of any liability arising from its failure to do so.

22.4.2 The **Contractor** shall be responsible for providing continuous insurance coverage in the manner, form, and limits required by this **Contract** and shall be authorized to perform **Work** only during the effective period of all required coverage.

22.4.3 In the event that any of the required insurance policies lapse, are revoked, suspended or otherwise terminated, for whatever cause, the **Contractor** shall immediately stop all **Work**, and shall not recommence **Work** until authorized in writing to do so by the **Commissioner**. Upon quitting the **Site**, except as otherwise directed by the **Commissioner**, the **Contractor** shall leave all plant, materials, equipment, tools, and supplies on the **Site**. **Contract** time shall continue to run during such periods and no extensions of time will be granted. The **Commissioner** may also declare the **Contractor** in default for failure to maintain required insurance.

22.4.4 In the event the **Contractor** receives notice, from an insurance company or other person, that any insurance policy required under this Article 22 shall be cancelled or terminated (or has been cancelled or terminated) for any reason, the **Contractor** shall immediately forward a copy of such notice to both the **Commissioner** and the New York City Comptroller, attn: Office of Contract Administration, Municipal Building, One Centre Street, room 1005, New York, New York 10007. Notwithstanding the foregoing, the **Contractor** shall ensure that there is no interruption in any of the insurance coverage required under this Article 22.

22.4.5 Where notice of loss, damage, occurrence, accident, claim or suit is required under an insurance policy maintained in accordance with this Article 22, the **Contractor** shall notify in writing all insurance carriers that issued potentially responsive policies of any such event relating to any operations under this **Contract** (including notice to Commercial General Liability insurance carriers for events relating to the **Contractor**'s own employees) no later than 20 days after such event. For any policy where the **City** is an Additional Insured, such notice shall expressly specify that "this notice is being given on behalf of the City of New York as Insured as well as the Named Insured." Such notice shall also contain the following information: the number of the insurance policy, the name of the named insured, the date and location of the damage, occurrence, or accident, and the identity of the persons or things injured, damaged or lost. The **Contractor** shall simultaneously send a copy of such notice to the City of New York c/o Insurance Claims Specialist, Affirmative Litigation Division, New York City Law Department, 100 Church Street, New York, New York 10007.

22.4.6 In the event of any loss, accident, claim, action, or other event that does or can give rise to a claim under any insurance policy required under this Article 22, the **Contractor** shall at all times fully cooperate with the **City** with regard to such potential or actual claim.

22.5 **Subcontractor** Insurance: In the event the **Contractor** requires any **Subcontractor** to procure insurance with regard to any operations under this **Contract** and requires such **Subcontractor** to name the **Contractor** as an **Additional Insured** thereunder, the **Contractor** shall ensure that the **Subcontractor** name the **City**, including its officials and employees, as an Additional Insured with coverage at least as broad as the most recent edition of ISO Form CG 20 26.

22.6 Wherever reference is made in Article 7 or this Article 22 to documents to be sent to the **Commissioner** (e.g., notices, filings, or submissions), such documents shall be sent to the address set forth in Schedule A of the General Conditions. In the event no address is set forth in Schedule A, such documents are to be sent to the **Commissioner's** address as provided elsewhere in this **Contract**.

22.7 Apart from damages or losses covered by insurance provided pursuant to Articles 22.1.2, 22.1.3, or 22.1.5, the **Contractor** waives all rights against the **City**, including its officials and employees, for any damages or losses that are covered under any insurance required under this Article 22 (whether or

not such insurance is actually procured or claims are paid thereunder) or any other insurance applicable to the operations of the **Contractor** and/or its employees, agents, or **Subcontractors**.

22.8 In the event the **Contractor** utilizes a self-insurance program to satisfy any of the requirements of this Article 22, the **Contractor** shall ensure that any such self-insurance program provides the **City** with all rights that would be provided by traditional insurance under this Article 22, including but not limited to the defense and indemnification obligations that insurers are required to undertake in liability policies.

22.9 Materiality/Non-Waiver: The **Contractor's** failure to secure policies in complete conformity with this Article 22, or to give an insurance company timely notice of any sort required in this **Contract** or to do anything else required by this Article 22 shall constitute a material breach of this **Contract**. Such breach shall not be waived or otherwise excused by any action or inaction by the **City** at any time.

22.10 Pursuant to General Municipal Law Section 108, this **Contract** shall be void and of no effect unless **Contractor** maintains Workers' Compensation Insurance for the term of this **Contract** to the extent required and in compliance with the New York State Workers' Compensation Law.

22.11 Other Remedies: Insurance coverage provided pursuant to this Article 22 or otherwise shall not relieve the **Contractor** of any liability under this **Contract**, nor shall it preclude the **City** from exercising any rights or taking such other actions available to it under any other provisions of this **Contract** or **Law**.

ARTICLE 23. MONEY RETAINED AGAINST CLAIMS

23.1 If any claim shall be made by any person or entity (including **Other Contractors** with the **City** on this **Project**) against the **City** or against the **Contractor** and the **City** for any of the following:

(a) An alleged loss, damage, injury, theft or vandalism of any of the kinds referred to in Articles 7 and 12, plus the reasonable costs of defending the **City**, which in the opinion of the **Comptroller** may not be paid by an insurance company (for any reason whatsoever); or

(b) An infringement of copyrights, patents or use of patented articles, tools, etc., as referred to in Article 57; or

(c) Damage claimed to have been caused directly or indirectly by the failure of the **Contractor** to perform the **Work** in strict accordance with this **Contract,**

the amount of such claim, or so much thereof as the **Comptroller** may deem necessary, may be withheld by the **Comptroller**, as security against such claim, from any money due hereunder. The **Comptroller**, in his/her discretion, may permit the **Contractor** to substitute other satisfactory security in lieu of the monies so withheld.

23.2 If an action on such claim is timely commenced and the liability of the **City**, or the **Contractor**, or both, shall have been established therein by a final judgment of a court of competent jurisdiction, or if such claim shall have been admitted by the **Contractor** to be valid, the **Comptroller** shall pay such judgment or admitted claim out of the monies retained by the **Comptroller** under the provisions of this Article 23, and return the balance, if any, without interest, to the **Contractor**.

ARTICLE 24. MAINTENANCE AND GUARANTY

24.1 The **Contractor** shall promptly repair, replace, restore or rebuild, as the **Commissioner** may determine, any finished **Work** in which defects of materials or workmanship may appear or to which damage may occur because of such defects, during the one (1) year period subsequent to the date of **Substantial Completion** (or use and occupancy in accordance with Article 16), except where other periods of maintenance and guaranty are provided for in Schedule A.

24.2 As security for the faithful performance of its obligations hereunder, the **Contractor**, upon filing its requisition for payment on **Substantial Completion**, shall deposit with the **Commissioner** a sum equal to one (1%) percent of the price (or the amount fixed in Schedule A of the General Conditions) in cash or certified check upon a state or national bank and trust company or a check of such bank and trust company signed by a duly authorized officer thereof and drawn to the order of the **Comptroller**, or obligations of the **City**, which the **Comptroller** may approve as of equal value with the sum so required.

24.3 In lieu of the above, the **Contractor** may make such security payment to the **City** by authorizing the **Commissioner** in writing to deduct the amount from the **Substantial Completion** payment which shall be deemed the deposit required above.

24.4 If the **Contractor** has faithfully performed all of its obligations hereunder the **Commissioner** shall so certify to the **Comptroller** within five (5) **Days** after the expiration of one (1) year from the date of **Substantial Completion** and acceptance of the **Work** or within thirty (30) **Days** after the expiration of the guarantee period fixed in the **Specifications**. The security payment shall be repaid to the **Contractor** without interest within thirty (30) **Days** after certification by the **Commissioner** to the **Comptroller** that the **Contractor** has faithfully performed all of its obligations hereunder.

24.5 Notice by the **Commissioner** to the **Contractor** to repair, replace, rebuild or restore such defective or damaged **Work** shall be timely, pursuant to this article, if given not later than ten (10) **Days** subsequent to the expiration of the one (1) year period or other periods provided for herein.

24.6 If the **Contractor** shall fail to repair, replace, rebuild or restore such defective or damaged **Work** promptly after receiving such notice, the **Commissioner** shall have the right to have the **Work** done by others in the same manner as provided for in the completion of a defaulted **Contract**, under Article 51.

24.7 If the security payment so deposited is insufficient to cover the cost of such **Work**, the **Contractor** shall be liable to pay such deficiency on demand by the **Commissioner**.

24.8 The **Engineer's** certificate setting forth the fair and reasonable cost of repairing, replacing, rebuilding or restoring any damaged or defective **Work** when performed by one other than the **Contractor**, shall be binding and conclusive upon the **Contractor** as to the amount thereof.

24.9 The **Contractor** shall obtain all manufacturers' warranties and guaranties of all equipment and materials required by this **Contract** in the name of the **City** and shall deliver same to the **Commissioner**. All of the **City's** rights and title and interest in and to said manufacturers' warranties and guaranties may be assigned by the **City** to any subsequent purchasers of such equipment and materials or lessees of the premises into which the equipment and materials have been installed.

CHAPTER VI: CHANGES, EXTRA WORK, AND DOCUMENTATION OF CLAIM

ARTICLE 25. CHANGES

25.1 Changes may be made to this **Contract** only as duly authorized in writing by the **Commissioner** in accordance with the **Law** and this **Contract**. All such changes, modifications, and amendments will become a part of the **Contract**. **Work** so ordered shall be performed by the **Contractor**.

25.2 **Contract** changes will be made only for **Work** necessary to complete the **Work** included in the original scope of the **Contract** and/or for non-material changes to the scope of the **Contract**. Changes are not permitted for any material alteration in the scope of **Work** in the **Contract**.

25.3 The **Contractor** shall be entitled to a price adjustment for **Extra Work** performed pursuant to a written change order. Adjustments to price shall be computed in one or more of the following ways:

25.3.1 By applicable unit prices specified in the **Contract**; and/or

25.3.2 By agreement of a fixed price; and/or

25.3.3 By time and material records; and/or

25.3.4 In any other manner approved by the **CCPO**.

25.4 All payments for change orders are subject to pre-audit by the **Engineering Audit Officer** and may be post-audited by the **Comptroller** and/or the **Agency**.

ARTICLE 26. METHODS OF PAYMENT FOR OVERRUNS AND EXTRA WORK

26.1 Overrun of Unit Price Item: An overrun is any quantity of a unit price item which the **Contractor** is directed to provide which is in excess of one hundred twenty-five (125%) percent of the estimated quantity for that item set forth in the bid schedule.

26.1.1For any unit price item, the **Contractor** will be paid at the unit price bid for any quantity up to one hundred twenty-five (125%) percent of the estimated quantity for that item set forth in the bid schedule. If during the progress of the **Work**, the actual quantity of any unit price item required to complete the **Work** approaches the estimated quantity for that item, and for any reason it appears that the actual quantity of any unit price item necessary to complete the **Work** will exceed the estimated quantity for that item by twenty-five (25%) percent, the **Contractor** shall immediately notify the **Engineer** of such anticipated overrun. The **Contractor** shall not be compensated for any quantity of a unit price item provided which is in excess of one hundred twenty-five (125%) percent of the estimated quantity for that item set forth in the bid schedule without written authorization from the **Engineer**.

26.1.2 If the actual quantity of any unit price item necessary to complete the **Work** will exceed one hundred twenty five (125%) percent of the estimated quantity for that item set forth in the bid schedule, the **City** reserves the right and the **Contractor** agrees to negotiate a new unit price for such item. In no event shall such negotiated new unit price exceed the unit bid price. If the **City** and **Contractor** cannot agree on a new unit price, then the **City** shall order the **Contractor** and the **Contractor** agrees to provide additional quantities of

the item on the basis of time and material records for the actual and reasonable cost as determined under Article 26.2, but in no event at a unit price exceeding the unit price bid.

26.2 **Extra Work:** For **Extra Work** where payment is by agreement on a fixed price in accordance with Article 25.3.2, the price to be paid for such **Extra Work** shall be based on the fair and reasonable estimated cost of the items set forth below. For **Extra Work** where payment is based on time and material records in accordance with Article 25.3.3, the price to be paid for such **Extra Work** shall be the actual and reasonable cost of the items set forth below, calculated in accordance with the formula specified therein, if any.

26.2.1 Necessary materials (including transportation to the **Site**); plus

26.2.2 Necessary direct labor, including payroll taxes (subject to statutory wage caps) and supplemental benefits; plus

26.2.3 Sales and personal property taxes, if any, required to be paid on materials not incorporated into such **Extra Work**; plus

26.2.4 Reasonable rental value of **Contractor**-owned (or **Subcontractor**-owned, as applicable), necessary plant and equipment other than **Small Tools**, plus fuel/energy costs. Except for fuel costs for pick-up trucks which shall be reimbursed based on a consumption of five (5) gallons per shift, fuel costs shall be reimbursed based on actual costs or, in the absence of auditable documentation, the following fuel consumption formula per operating hour: (.035) x (HP rating) x (Fuel cost/gallon). Reasonable rental value is defined as the lower of either seventy-five percent of the monthly prorated rental rates established in "The AED Green Book, Rental Rates and Specifications for Construction Equipment" published by Equipment Watch (the "Green Book"), or seventy-five percent of the monthly prorated rental rates established in the "Rental Rate Blue Book for Construction Equipment" published by Equipment Watch (the "Blue Book") (the applicable Blue Book rate being for rental only without the addition of any operational costs listed in the Blue Book). The reasonable rental value is deemed to be inclusive of all operating costs except for fuel/energy consumption and equipment operator's wages/costs. For multiple shift utilization, reimbursement shall be calculated as follows: first shift shall be seventy-five (75%) percent of such rental rates; second shift shall be sixty (60%) percent of the first shift rate; and third shift shall be forty (40%) percent of the first shift rate. Equipment on standby shall be reimbursed at one-third (1/3) the prorated monthly rental rate. **Contractor**-owned (or **Subcontractor**-owned, as applicable) equipment includes equipment from rental companies affiliated with or controlled by the **Contractor** (or **Subcontractor**, as applicable)**,** as determined by the **Commissioner**. In establishing cost reimbursement for non-operating **Contractor**-owned (or **Subcontractor**-owned, as applicable) equipment (scaffolding, sheeting systems, road plates, etc.), the **City** may restrict reimbursement to a purchase-salvage/life cycle basis if less than the computed rental costs; plus

26.2.5 Necessary installation and dismantling of such plant and equipment, including transportation to and from the **Site**, if any, provided that, in the case of non-**Contractor**-owned (or non-**Subcontractor**-owned, as applicable) equipment rented from a third party, the cost of installation and dismantling are not allowable if such costs are included in the rental rate; plus

26.2.6 Necessary fees charged by governmental entities; plus

26.2.7 Necessary construction-related service fees charged by non-governmental entities, such as landfill tipping fees; plus

26.2.8 Reasonable rental costs of non-**Contractor**-owned (or non-**Subcontractor**-owned, as applicable) necessary plant and equipment other than **Small Tools**, plus fuel/energy costs. Except for fuel costs for pick-up trucks which shall be reimbursed based on a consumption of five (5) gallons per shift, fuel costs shall be reimbursed based on actual costs or, in the absence of auditable documentation, the following fuel consumption formula per hour of operation: (.035) x (HP rating) x (Fuel cost/gallon). In lieu of renting, the **City** reserves the right to direct the purchase of non-operating equipment (scaffolding, sheeting systems, road plates, etc.), with payment on a purchase-salvage/life cycle basis, if less than the projected rental costs; plus

26.2.9 Workers' Compensation Insurance, and any insurance coverage expressly required by the **City** for the performance of the **Extra Work** which is different than the types of insurance required by Article 22 and Schedule A of the General Conditions. The cost of Workers' Compensation Insurance is subject to applicable payroll limitation caps and shall be based upon the carrier's Manual Rate for such insurance derived from the applicable class Loss Cost ("LC") and carrier's Lost Cost Multiplier ("LCM") approved by the New York State Department of Financial Services, and with the exception of experience rating, rate modifiers as promulgated by the New York Compensation Insurance Rating Board ("NYCIRB"); plus

26.2.10 Additional costs incurred as a result of the **Extra Work** for performance and payment bonds; plus

26.2.11 Twelve percent (12%) percent of the total of items in Articles 26.2.1 through 26.2.5 as compensation for overhead, except that no percentage for overhead will be allowed on **Payroll Taxes** or on the premium portion of overtime pay or on sales and personal property taxes. Overhead shall include without limitation, all costs and expenses in connection with administration, management superintendence, small tools, and insurance required by Schedule A of the General Conditions other than Workers' Compensation Insurance; plus

26.2.12 Ten (10%) percent of the total of items in Articles 26.2.1 through 26.2.5, plus the items in Article 26.2.11, as compensation for profit, except that no percentage for profit will be allowed on **Payroll Taxes** or on the premium portion of overtime pay or on sales and personal property taxes; plus

26.2.13 Five (5%) percent of the total of items in Articles 26.2.6 through 26.2.10 as compensation for overhead and profit.

26.3 Where the **Extra Work** is performed in whole or in part by other than the **Contractor's** own forces pursuant to Article 26.2, the **Contractor** shall be paid, subject to pre-audit by the **Engineering Audit Officer**, the cost of such **Work** computed in accordance with Article 26.2 above, plus an additional allowance of five (5%) percent to cover the **Contractor's** overhead and profit.

26.4 Where a change is ordered, involving both **Extra Work** and omitted or reduced **Contract Work,** the **Contract** price shall be adjusted, subject to pre-audit by the **EAO**, in an amount based on the difference between the cost of such **Extra Work** and of the omitted or reduced **Work**.

26.5 Where the **Contractor** and the **Commissioner** can agree upon a fixed price for **Extra Work** in accordance with Article 25.3.2 or another method of payment for **Extra Work** in accordance with

Article 25.3.4, or for **Extra Work** ordered in connection with omitted **Work**, such method, subject to pre-audit by the **EAO**, may, at the option of the **Commissioner**, be substituted for the cost plus a percentage method provided in Article 26.2; provided, however, that if the **Extra Work** is performed by a **Subcontractor**, the **Contractor** shall not be entitled to receive more than an additional allowance of five (5%) percent for overhead and profit over the cost of such **Subcontractor's Work** as computed in accordance with Article 26.2.

ARTICLE 27. RESOLUTION OF DISPUTES

27.1 All disputes between the **City** and the **Contractor** of the kind delineated in this Article 27.1 that arise under, or by virtue of, this **Contract** shall be finally resolved in accordance with the provisions of this Article 27 and the **PPB** Rules. This procedure for resolving all disputes of the kind delineated herein shall be the exclusive means of resolving any such disputes.

27.1.1 This Article 27 shall not apply to disputes concerning matters dealt with in other sections of the **PPB** Rules, or to disputes involving patents, copyrights, trademarks, or trade secrets (as interpreted by the courts of New York State) relating to proprietary rights in computer software.

27.1.2 This Article 27 shall apply only to disputes about the scope of **Work** delineated by the **Contract**, the interpretation of **Contract** documents, the amount to be paid for **Extra Work** or disputed work performed in connection with the **Contract**, the conformity of the **Contractor's Work** to the **Contract**, and the acceptability and quality of the **Contractor's Work**; such disputes arise when the **Engineer**, **Resident Engineer**, **Engineering Audit Officer**, or other designee of the **Commissioner** makes a determination with which the **Contractor** disagrees.

27.2 All determinations required by this Article 27 shall be made in writing clearly stated, with a reasoned explanation for the determination based on the information and evidence presented to the party making the determination. Failure to make such determination within the time required by this Article 27 shall be deemed a non-determination without prejudice that will allow application to the next level.

27.3 During such time as any dispute is being presented, heard, and considered pursuant to this Article 27, the **Contract** terms shall remain in force and the **Contractor** shall continue to perform **Work** as directed by the **ACCO** or the **Engineer**. Failure of the **Contractor** to continue **Work** as directed shall constitute a waiver by the **Contractor** of its claim.

27.4 Presentation of Disputes to **Commissioner**.

Notice of Dispute and Agency Response. The **Contractor** shall present its dispute in writing ("Notice of Dispute") to the **Commissioner** within thirty (30) Days of receiving written notice of the determination or action that is the subject of the dispute. This notice requirement shall not be read to replace any other notice requirements contained in the **Contract**. The Notice of Dispute shall include all the facts, evidence, documents, or other basis upon which the **Contractor** relies in support of its position, as well as a detailed computation demonstrating how any amount of money claimed by the **Contractor** in the dispute was arrived at. Within thirty (30) Days after receipt of the detailed written submission comprising the complete Notice of Dispute, the **Engineer**, **Resident Engineer**, **Engineering Audit Officer**, or other designee of the **Commissioner** shall submit to the **Commissioner** all materials he or she deems pertinent to the dispute. Following initial submissions to the **Commissioner**, either party may demand of the other the production of any document or other material the demanding party believes may be relevant to the dispute. The requested party shall produce all relevant materials that are not otherwise

protected by a legal privilege recognized by the courts of New York State. Any question of relevancy shall be determined by the **Commissioner** whose decision shall be final. Willful failure of the **Contractor** to produce any requested material whose relevancy the **Contractor** has not disputed, or whose relevancy has been affirmatively determined, shall constitute a waiver by the **Contractor** of its claim.

27.4.1 **Commissioner** Inquiry. The **Commissioner** shall examine the material and may, in his or her discretion, convene an informal conference with the **Contractor**, the **ACCO**, and the **Engineer**, **Resident Engineer**, **Engineering Audit Officer**, or other designee of the **Commissioner** to resolve the issue by mutual consent prior to reaching a determination. The **Commissioner** may seek such technical or other expertise as he or she shall deem appropriate, including the use of neutral mediators, and require any such additional material from either or both parties as he or she deems fit. The **Commissioner's** ability to render, and the effect of, a decision hereunder shall not be impaired by any negotiations in connection with the dispute presented, whether or not the **Commissioner** participated therein. The **Commissioner** may or, at the request of any party to the dispute, shall compel the participation of any **Other Contractor** with a contract related to the **Work** of this **Contract**, and that **Contractor** shall be bound by the decision of the **Commissioner**. Any **Other Contractor** thus brought into the dispute resolution proceeding shall have the same rights and obligations under this Article 27 as the **Contractor** initiating the dispute.

27.4.2 **Commissioner** Determination. Within thirty (30) **Days** after the receipt of all materials and information, or such longer time as may be agreed to by the parties, the **Commissioner** shall make his or her determination and shall deliver or send a copy of such determination to the **Contractor**, the **ACCO,** and **Engineer**, **Resident Engineer**, **Engineering Audit Officer**, or other designee of the **Commissioner**, as applicable, together with a statement concerning how the decision may be appealed.

27.4.3 Finality of **Commissioner's** Decision. The **Commissioner's** decision shall be final and binding on all parties, unless presented to the Contract Dispute Resolution Board pursuant to this Article 27. The **City** may not take a petition to the Contract Dispute Resolution Board. However, should the **Contractor** take such a petition, the **City** may seek, and the Contract Dispute Resolution Board may render, a determination less favorable to the **Contractor** and more favorable to the **City** than the decision of the **Commissioner**.

27.5 Presentation of Dispute to the **Comptroller**. Before any dispute may be brought by the **Contractor** to the Contract Dispute Resolution Board, the **Contractor** must first present its claim to the **Comptroller** for his or her review, investigation, and possible adjustment.

27.5.1 Time, Form, and Content of Notice. Within thirty (30) **Days** of its receipt of a decision by the **Commissioner,** the **Contractor** shall submit to the **Comptroller** and to the **Commissioner** a Notice of Claim regarding its dispute with the **Agency**. The Notice of Claim shall consist of (i) a brief written statement of the substance of the dispute, the amount of money, if any, claimed and the reason(s) the **Contractor** contends the dispute was wrongly decided by the **Commissioner**; (ii) a copy of the written decision of the **Commissioner**; and (iii) a copy of all materials submitted by the **Contractor** to the **Agency**, including the Notice of Dispute. The **Contractor** may not present to the **Comptroller** any material not presented to the **Commissioner**, except at the request of the **Comptroller**.

27.5.2 Response. Within thirty (30) **Days** of receipt of the Notice of Claim, the **Agency** shall make available to the **Comptroller** a copy of all material submitted by the **Agency** to the **Commissioner** in connection with the dispute. The **Agency** may not present to the **Comptroller** any material not presented to the **Commissioner** except at the request of the **Comptroller**.

27.5.3 **Comptroller** Investigation. The **Comptroller** may investigate the claim in dispute and, in the course of such investigation, may exercise all powers provided in Sections 7-201 and 7-203 of the Administrative Code. In addition, the **Comptroller** may demand of either party, and such party shall provide, whatever additional material the **Comptroller** deems pertinent to the claim, including original business records of the **Contractor**. Willful failure of the **Contractor** to produce within fifteen (15) **Days** any material requested by the **Comptroller** shall constitute a waiver by the **Contractor** of its claim. The **Comptroller** may also schedule an informal conference to be attended by the **Contractor**, **Agency** representatives, and any other personnel desired by the **Comptroller**.

27.5.4 Opportunity of **Comptroller** to Compromise or Adjust Claim. The **Comptroller** shall have forty-five (45) **Days** from his or her receipt of all materials referred to in Article 27.5.3 to investigate the disputed claim. The period for investigation and compromise may be further extended by agreement between the **Contractor** and the **Comptroller**, to a maximum of ninety (90) **Days** from the **Comptroller's** receipt of all materials. The **Contractor** may not present its petition to the Contract Dispute Resolution Board until the period for investigation and compromise delineated in this Article 27.5.4 has expired. In compromising or adjusting any claim hereunder, the **Comptroller** may not revise or disregard the terms of the **Contract** between the parties.

27.6 Contract Dispute Resolution Board. There shall be a Contract Dispute Resolution Board composed of:

27.6.1 The chief administrative law judge of the Office of Administrative Trials and Hearings (OATH) or his/her designated OATH administrative law judge, who shall act as chairperson, and may adopt operational procedures and issue such orders consistent with this Article 27 as may be necessary in the execution of the Contract Dispute Resolution Board's functions, including, but not limited to, granting extensions of time to present or respond to submissions;

27.6.2 The **CCPO** or his/her designee; any designee shall have the requisite background to consider and resolve the merits of the dispute and shall not have participated personally and substantially in the particular matter that is the subject of the dispute or report to anyone who so participated; and

27.6.3 A person with appropriate expertise who is not an employee of the **City**. This person shall be selected by the presiding administrative law judge from a prequalified panel of individuals, established and administered by OATH with appropriate background to act as decision-makers in a dispute. Such individual may not have a contract or dispute with the **City** or be an officer or employee of any company or organization that does, or regularly represents persons, companies, or organizations having disputes with the **City**.

27.7 Petition to the Contract Dispute Resolution Board. In the event the claim has not been settled or adjusted by the **Comptroller** within the period provided in this Article 27, the **Contractor**,

within thirty (30) **Days** thereafter, may petition the Contract Dispute Resolution Board to review the **Commissioner's** determination.

27.7.1 Form and Content of Petition by **Contractor**. The **Contractor** shall present its dispute to the Contract Dispute Resolution Board in the form of a petition, which shall include (i) a brief written statement of the substance of the dispute, the amount of money, if any, claimed, and the reason(s) the **Contractor** contends the dispute was wrongly decided by the **Commissioner**; (ii) a copy of the written Decision of the **Commissioner,** (iii) copies of all materials submitted by the **Contractor** to the Agency; (iv) a copy of the written decision of the **Comptroller**, if any, and (v) copies of all correspondence with, or written material submitted by the **Contractor**, to the **Comptroller**. The **Contractor** shall concurrently submit four (4) complete sets of the Petition: one set to the **City** Corporation Counsel (Attn: Commercial and Real Estate Litigation Division) and three (3) sets to the Contract Dispute Resolution Board at OATH's offices with proof of service on the **City** Corporation Counsel. In addition, the **Contractor** shall submit a copy of the written statement of the substance of the dispute, cited in (i) above, to both the **Commissioner** and the **Comptroller**.

27.7.2 **Agency** Response. Within thirty (30) **Days** of its receipt of the Petition by the **City** Corporation Counsel, the **Agency** shall respond to the brief written statement of the **Contractor** and make available to the Contract Dispute Resolution Board all material it submitted to the **Commissioner** and **Comptroller**. Three (3) complete copies of the **Agency** response shall be provided to the Contract Dispute Resolution Board and one to the **Contractor**. Extensions of time for submittal of the **Agency** response shall be given as necessary upon a showing of good cause or, upon consent of the parties, for an initial period of up to thirty (30) Days.

27.7.3 Further Proceedings. The Contract Dispute Resolution Board shall permit the **Contractor** to present its case by submission of memoranda, briefs, and oral argument. The Contract Dispute Resolution Board shall also permit the **Agency** to present its case in response to the **Contractor** by submission of memoranda, briefs, and oral argument. If requested by the **City** Corporation Counsel, the **Comptroller** shall provide reasonable assistance in the preparation of the **Agency's** case. Neither the **Contractor** nor the **Agency** may support its case with any documentation or other material that was not considered by the **Comptroller**, unless requested by the Contract Dispute Resolution Board. The Contract Dispute Resolution Board, in its discretion, may seek such technical or other expert advice as it shall deem appropriate and may seek, on its own or upon application of a party, any such additional material from any party as it deems fit. The Contract Dispute Resolution Board, in its discretion, may combine more than one dispute between the parties for concurrent resolution.

27.7.4 Contract Dispute Resolution Board Determination. Within forty-five (45) **Days** of the conclusion of all written submissions and oral arguments, the Contract Dispute Resolution Board shall render a written decision resolving the dispute. In an unusually complex case, the Contract Dispute Resolution Board may render its decision in a longer period, not to exceed ninety (90) **Days**, and shall so advise the parties at the commencement of this period. The Contract Dispute Resolution Board's decision must be consistent with the terms of the **Contract**. Decisions of the Contract Dispute Resolution Board shall only resolve matters before the Contract Dispute Resolution Board and shall not have precedential effect with respect to matters not before the Contract Dispute Resolution Board.

27.7.5 Notification of Contract Dispute Resolution Board Decision. The Contract Dispute Resolution Board shall send a copy of its decision to the **Contractor**, the **ACCO**, the Engineer, the **Comptroller**, the **City** Corporation Counsel, the CCPO, and the **PPB**. A decision in favor of the **Contractor** shall be subject to the prompt payment provisions of the **PPB** Rules. The Required Payment Date shall be thirty (30) Days after the date the parties are formally notified of the Contract Dispute Resolution Board's decision.

27.7.6 Finality of Contract Dispute Resolution Board Decision. The Contract Dispute Resolution Board's decision shall be final and binding on all parties. Any party may seek review of the Contract Dispute Resolution Board's decision solely in the form of a challenge, filed within four (4) months of the date of the Contract Dispute Resolution Board's decision, in a court of competent jurisdiction of the State of New York, County of New York pursuant to Article 78 of the Civil Practice Law and Rules. Such review by the court shall be limited to the question of whether or not the Contract Dispute Resolution Board's decision was made in violation of lawful procedure, was affected by an error of **Law**, or was arbitrary and capricious or an abuse of discretion. No evidence or information shall be introduced or relied upon in such proceeding that was not presented to the Contract Dispute Resolution Board in accordance with this Article 27.

27.8 Any termination, cancellation, or alleged breach of the **Contract** prior to or during the pendency of any proceedings pursuant to this Article 27 shall not affect or impair the ability of the **Commissioner** or Contract Dispute Resolution Board to make a binding and final decision pursuant to this Article 27.

ARTICLE 28. RECORD KEEPING FOR EXTRA OR DISPUTED WORK OR WORK ON A TIME & MATERIALS BASIS

28.1 While the **Contractor** or any of its **Subcontractors** is performing **Work** on a time and material basis or **Extra Work** on a time and material basis ordered by the **Commissioner** under Article 25, or where the **Contractor** believes that it or any of its **Subcontractors** is performing **Extra Work** but a final determination by **Agency** has not been made, or the **Contractor** or any of its **Subcontractors** is performing disputed **Work** (whether on or off the **Site**), or complying with a determination or order under protest in accordance with Articles 11, 27, and 30, in each such case the **Contractor** shall furnish the **Resident Engineer** daily with three (3) copies of written statements signed by the **Contractor's** representative at the **Site** showing:

28.1.1 The name, trade, and number of each worker employed on such **Work** or engaged in complying with such determination or order, the number of hours employed, and the character of the **Work** each is doing; and

28.1.2 The nature and quantity of any materials, plant and equipment furnished or used in connection with the performance of such **Work** or compliance with such determination or order, and from whom purchased or rented.

28.2 A copy of such statement will be countersigned by the **Resident Engineer**, noting thereon any items not agreed to or questioned, and will be returned to the **Contractor** within two (2) **Days** after submission.

28.3 The **Contractor** and its **Subcontractors**, when required by the **Commissioner**, or the **Comptroller**, shall also produce for inspection, at the office of the **Contractor** or **Subcontractor**, any and all of its books, bid documents, financial statements, vouchers, records, daily job diaries and reports,

and cancelled checks, and any other documents relating to showing the nature and quantity of the labor, materials, plant and equipment actually used in the performance of such **Work**, or in complying with such determination or order, and the amounts expended therefor, and shall permit the **Commissioner** and the **Comptroller** to make such extracts therefrom, or copies thereof, as they or either of them may desire.

28.4 In connection with the examination provided for herein, the **Commissioner**, upon demand therefor, will produce for inspection by the **Contractor** such records as the **Agency** may have with respect to such **Extra Work** or disputed **Work** performed under protest pursuant to order of the **Commissioner**, except those records and reports which may have been prepared for the purpose of determining the accuracy and validity of the **Contractor's** claim.

28.5 Failure to comply strictly with these requirements shall constitute a waiver of any claim for extra compensation or damages on account of the performance of such **Work** or compliance with such determination or order.

ARTICLE 29. OMITTED WORK

29.1 If any **Contract Work** in a lump sum **Contract**, or if any part of a lump sum item in a unit price, lump sum, or percentage-bid **Contract** is omitted by the **Commissioner** pursuant to Article 33, the **Contract** price, subject to audit by the EAO, shall be reduced by a pro rata portion of the lump sum bid amount based upon the percent of **Work** omitted subject to Article 29.4. For the purpose of determining the pro rata portion of the lump sum bid amount, the bid breakdown submitted in accordance with Article 41 shall be considered, but shall not be the determining factor.

29.2 If the whole of a lump sum item or units of any other item is so omitted by the **Commissioner** in a unit price, lump sum, or percentage-bid **Contract**, then no payment will be made therefor except as provided in Article 29.4.

29.3 For units that have been ordered but are only partially completed, the unit price shall be reduced by a pro rata portion of the unit price bid based upon the percentage of **Work** omitted subject to Article 29.4.

29.4 In the event the **Contractor**, with respect to any omitted **Work**, has purchased any non-cancelable material and/or equipment that is not capable of use except in the performance of this **Contract** and has been specifically fabricated for the sole purpose of this **Contract**, but not yet incorporated into the **Work**, the **Contractor** shall be paid for such material and/or equipment in accordance with Article 64.2.1(b); provided, however, such payment is contingent upon the **Contractor's** delivery of such material and/or equipment in acceptable condition to a location designated by the **City**.

29.5 The **Contractor** agrees to make no claim for damages or for loss of overhead and profit with regard to any omitted **Work**.

ARTICLE 30. NOTICE AND DOCUMENTATION OF COSTS AND DAMAGES; PRODUCTION OF FINANCIAL RECORDS

30.1 If the **Contractor** shall claim to be sustaining damages by reason of any act or omission of the **City** or its agents, it shall submit to the **Commissioner** within forty-five (45) **Days** from the time such damages are first incurred, and every thirty (30) **Days** thereafter to the extent additional damages are being incurred for the same condition, verified statements of the details and the amounts of such

damages, together with documentary evidence of such damages. The **Contractor** may submit any of the above statements within such additional time as may be granted by the **Commissioner** in writing upon written request therefor. Failure of the **Commissioner** to respond in writing to a written request for additional time within thirty (30) **Days** shall be deemed a denial of the request. On failure of the **Contractor** to strictly comply with the foregoing provisions, such claims shall be deemed waived and no right to recover on such claims shall exist. Damages that the **Contractor** may claim in any action or dispute resolution procedure arising under or by reason of this **Contract** shall not be different from or in excess of the statements and documentation made pursuant to this Article 30. This Article 30.1 does not apply to claims submitted to the **Commissioner** pursuant to Article 11 or to claims disputing a determination under Article 27.

30.2 In addition to the foregoing statements, the **Contractor** shall, upon notice from the **Commissioner**, produce for examination at the **Contractor's** office, by the **Engineer**, **Architect** or **Project Manager**, all of its books of account, bills, invoices, payrolls, subcontracts, time books, daily reports, bank deposit books, bank statements, check books, and cancelled checks, showing all of its acts and transactions in connection with or relating to or arising by reason of this **Contract**, and submit itself and persons in its employment, for examination under oath by any person designated by the **Commissioner** or **Comptroller** to investigate claims made or disputes against the **City** under this **Contract**. At such examination, a duly authorized representative of the **Contractor** may be present.

30.3 In addition to the statements required under Article 28 and this Article 30, the **Contractor** and/or its **Subcontractor** shall, within thirty (30) **Days** upon notice from the **Commissioner** or **Comptroller**, produce for examination at the **Contractor's** and/or **Subcontractor's** office, by a representative of either the **Commissioner** or **Comptroller**, all of its books of account, bid documents, financial statements, accountant workpapers, bills, invoices, payrolls, subcontracts, time books, daily reports, bank deposit books, bank statements, check books, and cancelled checks, showing all of its acts and transactions in connection with or relating to or arising by reason of this **Contract**. Further, the **Contractor** and/or its **Subcontractor** shall submit any person in its employment, for examination under oath by any person designated by the **Commissioner** or **Comptroller** to investigate claims made or disputes against the **City** under this **Contract**. At such examination, a duly authorized representative of the **Contractor** may be present.

30.4 Unless the information and examination required under Article 30.3 is provided by the **Contractor** and/or its **Subcontractor** upon thirty (30) **Days'** notice from the **Commissioner** or **Comptroller**, or upon the **Commissioner's** or **Comptroller's** written authorization to extend the time to comply, the **City** shall be released from all claims arising under, relating to or by reason of this **Contract**, except for sums certified by the **Commissioner** to be due under the provisions of this **Contract**. It is further stipulated and agreed that no person has the power to waive any of the foregoing provisions and that in any action or dispute resolution procedure against the **City** to recover any sum in excess of the sums certified by the **Commissioner** to be due under or by reason of this **Contract**, the **Contractor** must allege in its complaint and prove, at trial or during such dispute resolution procedure, compliance with the provisions of this Article 30.

30.5 In addition, after the commencement of any action or dispute resolution procedure by the **Contractor** arising under or by reason of this **Contract**, the **City** shall have the right to require the **Contractor** to produce for examination under oath, up until the trial of the action or hearing before the Contract Dispute Resolution Board, the books and documents described in Article 30.3 and submit itself and all persons in its employ for examination under oath. If this Article 30 is not complied with as required, then the **Contractor** hereby consents to the dismissal of the action or dispute resolution procedure.

CHAPTER VII: POWERS OF THE RESIDENT ENGINEER,THE ENGINEER OR ARCHITECT AND THE COMMISSIONER

ARTICLE 31. THE RESIDENT ENGINEER

31.1 The **Resident Engineer** shall have the power to inspect, supervise, and control the performance of the **Work**, subject to review by the **Commissioner**. The **Resident Engineer** shall not, however, have the power to issue an **Extra Work** order, except as specifically designated in writing by the **Commissioner**.

ARTICLE 32. THE ENGINEER OR ARCHITECT OR PROJECT MANAGER

32.1 The **Engineer** or **Architect** or **Project Manager**, in addition to those matters elsewhere herein delegated to the **Engineer** and expressly made subject to his/her determination, direction or approval, shall have the power, subject to review by the **Commissioner**:

32.1.1 To determine the amount, quality, and location of the **Work** to be paid for hereunder; and

32.1.2 To determine all questions in relation to the **Work**, to interpret the **Contract Drawings**, **Specifications**, and **Addenda**, and to resolve all patent inconsistencies or ambiguities therein; and

32.1.3 To determine how the **Work** of this **Contract** shall be coordinated with **Work** of **Other Contractors** engaged simultaneously on this **Project**, including the power to suspend any part of the **Work**, but not the whole thereof; and

32.1.4 To make minor changes in the **Work** as he/she deems necessary, provided such changes do not result in a net change in the cost to the **City** or to the **Contractor** of the **Work** to be done under the **Contract**; and

32.1.5 To amplify the **Contract Drawings**, add explanatory information and furnish additional **Specifications** and drawings, consistent with this **Contract**.

32.2 The foregoing enumeration shall not imply any limitation upon the power of the **Engineer** or **Architect** or **Project Manager**, for it is the intent of this **Contract** that all of the **Work** shall generally be subject to his/her determination, direction, and approval, except where the determination, direction or approval of someone other than the **Engineer** or **Architect** or **Project Manager** is expressly called for herein.

32.3 The **Engineer** or **Architect** or **Project Manager** shall not, however, have the power to issue an **Extra Work** order, except as specifically designated in writing by the **Commissioner**.

ARTICLE 33. THE COMMISSIONER

33.1 The **Commissioner**, in addition to those matters elsewhere herein expressly made subject to his/her determination, direction or approval, shall have the power:

33.1.1 To review and make determinations on any and all questions in relation to this **Contract** and its performance; and

33.1.2 To modify or change this **Contract** so as to require the performance of **Extra Work** (subject, however, to the limitations specified in Article 25) or the omission of **Contract Work**; and

33.1.3 To suspend the whole or any part of the **Work** whenever in his/her judgment such suspension is required:

33.1.3(a) In the interest of the **City** generally; or

33.1.3(b) To coordinate the **Work** of the various contractors engaged on this **Project** pursuant to the provisions of Article 12; or

33.1.3(c) To expedite the completion of the entire **Project** even though the completion of this particular **Contract** may thereby be delayed.

ARTICLE 34. NO ESTOPPEL

34.1 Neither the **City** nor any **Agency**, official, agent or employee thereof, shall be bound, precluded or estopped by any determination, decision, approval, order, letter, payment or certificate made or given under or in connection with this **Contract** by the **City**, the **Commissioner**, the **Engineer**, the **Resident Engineer**, or any other official, agent or employee of the **City**, either before or after the final completion and acceptance of the **Work** and payment therefor:

34.1.1 From showing the true and correct classification, amount, quality or character of the **Work** actually done; or that any such determination, decision, order, letter, payment or certificate was untrue, incorrect or improperly made in any particular, or that the **Work**, or any part thereof, does not in fact conform to the requirements of this **Contract**; and

34.1.2 From demanding and recovering from the **Contractor** any overpayment made to it, or such damages as the **City** may sustain by reason of the **Contractor's** failure to perform each and every part of its **Contract**.

CHAPTER VIII: LABOR PROVISIONS

ARTICLE 35. EMPLOYEES

35.1 The **Contractor** and its **Subcontractors** shall not employ on the **Work**:

35.1.1 Anyone who is not competent, faithful and skilled in the **Work** for which he/she shall be employed; and whenever the **Commissioner** shall inform the **Contractor**, in writing, that any employee is, in his/her opinion, incompetent, unfaithful or disobedient, that employee shall be discharged from the **Work** forthwith, and shall not again be employed upon it; or

35.1.2 Any labor, materials or means whose employment, or utilization during the course of this **Contract**, may tend to or in any way cause or result in strikes, work stoppages, delays, suspension of **Work** or similar troubles by workers employed by the **Contractor** or its **Subcontractors**, or by any of the trades working in or about the buildings and premises where **Work** is being performed under this **Contract**, or by **Other Contractors** or their **Subcontractors** pursuant to other contracts, or on any other building or premises owned or operated by the **City**, its **Agencies**, departments, boards or authorities. Any violation by the **Contractor** of this requirement may, upon certification of the **Commissioner**, be considered as proper and sufficient cause for declaring the **Contractor** to be in default, and for the **City** to take action against it as set forth in Chapter X of this **Contract**, or such other article of this **Contract** as the Commissioner may deem proper; or

35.1.3 In accordance with Section 220.3-e of the Labor Law of the State of New York (hereinafter "Labor Law"), the **Contractor** and its **Subcontractors** shall not employ on the **Work** any apprentice, unless he/she is a registered individual, under a bona fide program registered with the New York State Department of Labor. The allowable ratio of apprentices to journey-level workers in any craft classification shall not be greater than the ratio permitted to the **Contractor** as to its work force on any job under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered as above, shall be paid the wage rate determined by the **Comptroller** of the **City** for the classification of **Work** actually performed. The **Contractor** or **Subcontractor** will be required to furnish written evidence of the registration of its program and apprentices as well as all the appropriate ratios and wage rates, for the area of the construction prior to using any apprentices on the **Contract Work**.

35.2 If the total cost of the **Work** under this **Contract** is at least two hundred fifty thousand ($250,000) dollars, all laborers, workers, and mechanics employed in the performance of the **Contract** on the public work site, either by the **Contractor**, **Subcontractor** or other person doing or contracting to do the whole or a part of the **Work** contemplated by the **Contract**, shall be certified prior to performing any **Work** as having successfully completed a course in construction safety and health approved by the United States Department of Labor's Occupational Safety and Health Administration that is at least ten (10) hours in duration.

35.3 In accordance with Local Law Nos. 30-2012 and 33-2012, codified at sections 6-132 and 12-113 of the Administrative Code, respectively,

35.3.1 The **Contractor** shall not take an adverse personnel action with respect to an officer or employee in retaliation for such officer or employee making a report of information concerning conduct which such officer or employee knows or reasonably believes to involve corruption, criminal activity, conflict of interest, gross mismanagement or abuse of authority by any officer or employee relating to this **Contract** to (a) the Commissioner of the Department of Investigation, (b) a member of the New York City Council, the Public Advocate, or the **Comptroller**, or (c) the **CCPO**, **ACCO**, **Agency** head, or **Commissioner**.

35.3.2 If any of the **Contractor**'s officers or employees believes that he or she has been the subject of an adverse personnel action in violation of Article 35.3.1, he or she shall be entitled to bring a cause of action against the **Contractor** to recover all relief necessary to make him or her whole. Such relief may include but is not limited to: (a) an injunction to restrain continued retaliation, (b) reinstatement to the position such employee would have had but for the retaliation or to an equivalent position, (c) reinstatement of full fringe benefits and seniority rights, (d) payment of two times back

pay, plus interest, and (e) compensation for any special damages sustained as a result of the retaliation, including litigation costs and reasonable attorney's fees.

35.3.3 The **Contractor** shall post a notice provided by the **City** in a prominent and accessible place on any site where work pursuant to the **Contract** is performed that contains information about:

35.3.3(a) how its employees can report to the New York City Department of Investigation allegations of fraud, false claims, criminality or corruption arising out of or in connection with the **Contract**; and

35.3.3(b) the rights and remedies afforded to its employees under Administrative Code sections 7-805 (the New York City False Claims Act) and 12-113 (the Whistleblower Protection Expansion Act) for lawful acts taken in connection with the reporting of allegations of fraud, false claims, criminality or corruption in connection with the **Contract**.

35.3.4 For the purposes of this Article 35.3, "adverse personnel action" includes dismissal, demotion, suspension, disciplinary action, negative performance evaluation, any action resulting in loss of staff, office space, equipment or other benefit, failure to appoint, failure to promote, or any transfer or assignment or failure to transfer or assign against the wishes of the affected officer or employee.

35.3.5 This Article 35.3 is applicable to all of the **Contractor**'s **Subcontractors** having subcontracts with a value in excess of $100,000; accordingly, the **Contractor** shall include this rider in all subcontracts with a value a value in excess of $100,000.

35.4 Article 35.3 is not applicable to this **Contract** if it is valued at $100,000 or less. Articles 35.3.1, 35.3.2, 35.3.4, and 35.3.5 are not applicable to this **Contract** if it was solicited pursuant to a finding of an emergency.

35.5 Paid Sick Leave Law.

35.5.1 Introduction and General Provisions.

35.5.1(a) The Earned Sick Time Act, also known as the Paid Sick Leave Law ("PSLL"), requires covered employees who annually perform more than 80 hours of work in New York City to be provided with paid sick time.[2] Contractors of the **City** or of other governmental entities may be required to provide sick time pursuant to the PSLL.

35.5.1(b) The PSLL became effective on April 1, 2014, and is codified at Title 20, Chapter 8, of the New York City Administrative Code. It is administered by the City's Department of Consumer Affairs ("DCA"); DCA's rules promulgated under the PSLL are codified at Chapter 7 of Title 6 of the Rules of the City of New York ("Rules").

[2] Pursuant to the PSLL, if fewer than five employees work for the same employer, as determined pursuant to New York City Administrative Code § 20-912(g), such employer has the option of providing such employees uncompensated sick time.

35.5.1(c) The **Contractor** agrees to comply in all respects with the PSLL and the Rules, and as amended, if applicable, in the performance of this **Contract**. The **Contractor** further acknowledges that such compliance is a material term of this **Contract** and that failure to comply with the PSLL in performance of this **Contract** may result in its termination.

35.5.1(d) The **Contractor** must notify the **Agency Chief Contracting Officer** of the **Agency** with whom it is contracting in writing within ten (10) days of receipt of a complaint (whether oral or written) regarding the PSLL involving the performance of this **Contract**. Additionally, the **Contractor** must cooperate with DCA's education efforts and must comply with DCA's subpoenas and other document demands as set forth in the PSLL and Rules.

35.5.1(e) The PSLL is summarized below for the convenience of the **Contractor**. The **Contractor** is advised to review the PSLL and Rules in their entirety. On the website www.nyc.gov/PaidSickLeave there are links to the PSLL and the associated Rules as well as additional resources for employers, such as Frequently Asked Questions, timekeeping tools and model forms, and an event calendar of upcoming presentations and webinars at which the **Contractor** can get more information about how to comply with the PSLL. The **Contractor** acknowledges that it is responsible for compliance with the PSLL notwithstanding any inconsistent language contained herein.

35.5.2 Pursuant to the PSLL and the Rules: Applicability, Accrual, and Use.

35.5.2(a) An employee who works within the City of New York for more than eighty hours in any consecutive 12-month period designated by the employer as its "calendar year" pursuant to the PSLL ("Year") must be provided sick time. Employers must provide a minimum of one hour of sick time for every 30 hours worked by an employee and compensation for such sick time must be provided at the greater of the employee's regular hourly rate or the minimum wage. Employers are not required to provide more than 40 hours of sick time to an employee in any Year.

35.5.2(b) An employee has the right to determine how much sick time he or she will use, provided that employers may set a reasonable minimum increment for the use of sick time not to exceed four hours per **Day**. In addition, an employee may carry over up to 40 hours of unused sick time to the following Year, provided that no employer is required to allow the use of more than forty hours of sick time in a Year or carry over unused paid sick time if the employee is paid for such unused sick time and the employer provides the employee with at least the legally required amount of paid sick time for such employee for the immediately subsequent Year on the first **Day** of such Year.

35.5.2(c) An employee entitled to sick time pursuant to the PSLL may use sick time for any of the following:

i. such employee's mental illness, physical illness, injury, or health condition or the care of such illness, injury, or condition or such employee's need for medical diagnosis or preventive medical care;
ii. such employee's care of a family member (an employee's child, spouse, domestic partner, parent, sibling, grandchild or grandparent, or the child or parent of an employee's spouse or domestic partner) who has a mental

illness, physical illness, injury or health condition or who has a need for medical diagnosis or preventive medical care;

iii. closure of such employee's place of business by order of a public official due to a public health emergency; or

iv. such employee's need to care for a child whose school or childcare provider has been closed due to a public health emergency.

35.5.2(d) An employer must not require an employee, as a condition of taking sick time, to search for a replacement. However, an employer may require an employee to provide: reasonable notice of the need to use sick time; reasonable documentation that the use of sick time was needed for a reason above if for an absence of more than three consecutive work days; and/or written confirmation that an employee used sick time pursuant to the PSLL. However, an employer may not require documentation specifying the nature of a medical condition or otherwise require disclosure of the details of a medical condition as a condition of providing sick time and health information obtained solely due to an employee's use of sick time pursuant to the PSLL must be treated by the employer as confidential.

35.5.2(e) If an employer chooses to impose any permissible discretionary requirement as a condition of using sick time, it must provide to all employees a written policy containing those requirements, using a delivery method that reasonably ensures that employees receive the policy. If such employer has not provided its written policy, it may not deny sick time to an employee because of non-compliance with such a policy.

35.5.2(f) Sick time to which an employee is entitled must be paid no later than the payday for the next regular payroll period beginning after the sick time was used.

35.5.3 Exemptions and Exceptions. Notwithstanding the above, the PSLL does not apply to any of the following:

35.5.3(a) an independent contractor who does not meet the definition of employee under section 190(2) of the New York State Labor Law;

35.5.3(b) an employee covered by a valid collective bargaining agreement in effect on April 1, 2014, until the termination of such agreement;

35.5.3(c) an employee in the construction or grocery industry covered by a valid collective bargaining agreement if the provisions of the PSLL are expressly waived in such collective bargaining agreement;

35.5.3(d) an employee covered by another valid collective bargaining agreement if such provisions are expressly waived in such agreement and such agreement provides a benefit comparable to that provided by the PSLL for such employee;

35.5.3(e) an audiologist, occupational therapist, physical therapist, or speech language pathologist who is licensed by the New York State Department of Education and who calls in for work assignments at will, determines his or her own schedule, has the ability to reject or accept any assignment referred to him or her, and is paid an average hourly wage that is at least four times the federal minimum wage;

35.5.3(f) an employee in a work study program under Section 2753 of Chapter 42 of the United States Code;

35.5.3(g) an employee whose work is compensated by a qualified scholarship program as that term is defined in the Internal Revenue Code, Section 117 of Chapter 20 of the United States Code; or

35.5.3(h) a participant in a Work Experience Program (WEP) under section 336-c of the New York State Social Services Law.

35.5.4 Retaliation Prohibited. An employer may not threaten or engage in retaliation against an employee for exercising or attempting in good faith to exercise any right provided by the PSLL. In addition, an employer may not interfere with any investigation, proceeding, or hearing pursuant to the PSLL.

35.5.5 Notice of Rights.

35.5.5(a) An employer must provide its employees with written notice of their rights pursuant to the PSLL. Such notice must be in English and the primary language spoken by an employee, provided that DCA has made available a translation into such language. Downloadable notices are available on DCA's website at http://www.nyc.gov/html/dca/html/law/PaidSickLeave.shtml.

35.5.5(b) Any person or entity that willfully violates these notice requirements is subject to a civil penalty in an amount not to exceed fifty dollars for each employee who was not given appropriate notice.

35.5.6 Records. An employer must retain records documenting its compliance with the PSLL for a period of at least three years, and must allow DCA to access such records in furtherance of an investigation related to an alleged violation of the PSLL.

35.5.7 Enforcement and Penalties.

35.5.7(a) Upon receiving a complaint alleging a violation of the PSLL, DCA has the right to investigate such complaint and attempt to resolve it through mediation. Within 30 **Days** of written notification of a complaint by DCA, or sooner in certain circumstances, the employer must provide DCA with a written response and such other information as DCA may request. If DCA believes that a violation of the PSLL has occurred, it has the right to issue a notice of violation to the employer.

35.5.7(b) DCA has the power to grant an employee or former employee all appropriate relief as set forth in New York City Administrative Code § 20-924(d). Such relief may include, among other remedies, treble damages for the wages that should have been paid, damages for unlawful retaliation, and damages and reinstatement for unlawful discharge. In addition, DCA may impose on an employer found to have violated the PSLL civil penalties not to exceed $500 for a first violation, $750 for a second violation within two years of the first violation, and $1,000 for each succeeding violation within two years of the previous violation.

35.5.8 More Generous Polices and Other Legal Requirements. Nothing in the PSLL is intended to discourage, prohibit, diminish, or impair the adoption or retention of a more generous sick time policy, or the obligation of an employer to comply with any contract,

collective bargaining agreement, employment benefit plan or other agreement providing more generous sick time. The PSLL provides minimum requirements pertaining to sick time and does not preempt, limit or otherwise affect the applicability of any other law, regulation, rule, requirement, policy or standard that provides for greater accrual or use by employees of sick leave or time, whether paid or unpaid, or that extends other protections to employees. The PSLL may not be construed as creating or imposing any requirement in conflict with any federal or state law, rule or regulation.

35.6 HireNYC: Hiring and Reporting Requirements. This Article 35.6 applies to construction contracts of $1,000,000 or more. The **Contractor** shall comply with the requirements of Articles 35.6.1-35.6.5 for all non-trades jobs (e.g., for an administrative position arising out of **Work** ant located in New York City). The **Contractor** shall reasonably cooperate with SBS and the **City** on specific outreach events, including "Hire-on-the-Spot" events, for the hiring of trades workers in connection with the **Work**. If provided elsewhere in this **Contract**, this **Contract** is subject to a project labor agreement.

35.6.1 Enrollment. The **Contractor** shall enroll with the HireNYC system, found at www.nyc.gov/sbs, within thirty (30) days after the registration of this **Contract** pursuant to Section 328 of the New York City Charter. The **Contractor** shall provide information about the business, designate a primary contact and say whether it intends to hire for any entry to mid-level job opportunities arising from this **Contract** and located in New York City, and, if so, the approximate start date of the first hire.

35.6.2 Job Posting Requirements.

35.6.2(a) Once enrolled in HireNYC, the **Contractor** agrees to update the HireNYC portal with all entry to mid-level job opportunities arising from this **Contract** and located in New York City, if any, which shall be defined as jobs requiring no more than an associate degree, as provided by the New York State Department of Labor (see Column F of https://labor.ny.gov/stats/2012-2022- NYS-Employment-Prospects.xls). The information to be updated includes the types of entry and mid-level positions made available from the work arising from the **Contract** and located in New York City, the number of positions, the anticipated schedule of initiating the hiring process for these positions, and the contact information for the **Contractor's** representative charged with overseeing hiring. The **Contractor** must update the HireNYC portal with any hiring needs arising from the contract and located in New York City, and the requirements of the jobs to be filled, no less than three weeks prior to the intended first day of employment for each new position, except with the permission of SBS, not to be unreasonably withheld, and must also update the HireNYC portal as set forth below.

35.6.2(b) After enrollment through HireNYC and submission of relevant information, SBS will work with the **Contractor** to develop a recruitment plan which will outline the candidate screening process, and will provide clear instructions as to when, where, and how interviews will take place. HireNYC will screen applicants based on employer requirements and refer applicants whom it believes are qualified to the **Contractor** for interviews. The **Contractor** must interview referred applicants whom it believes are qualified.

35.6.2(c) After completing an interview of a candidate referred by HireNYC, the **Contractor** must provide feedback via the portal within twenty (20) business days to indicate which candidates were interviewed and hired, if any. In addition, the **Contractor** shall provide the start date of new hires, and additional information

reasonably related to such hires, within twenty (20) business days after the start date. In the event the **Contractor** does not have any job openings covered by this Rider in any given year, the **Contractor** shall be required to provide an annual update to HireNYC to that effect. For this purpose, the reporting year shall run from the date of the registration of the **Contract** pursuant to Charter section 328 and each anniversary date.

35.6.2(d) These requirements do not limit the **Contractor's** ability to assess the qualifications of prospective workers, and to make final hiring and retention decisions. No provision of this Article 35.6 shall be interpreted so as to require the **Contractor** to employ any particular worker.

35.6.2(e) In addition, the provisions of this Article 35.6 shall not apply to positions that the **Contractor** intends to fill with employees employed pursuant to the job retention provision of Section 22-505 of the Administrative Code of the City of New York. The **Contractor** shall not be required to report such openings with HireNYC. However, the **Contractor** shall enroll with the HireNYC system pursuant to Article 35.6.1, above, and, if such positions subsequently become open, then the remaining provisions of this Article 35.6 will apply.

35.6.3 Breach and Liquidated Damages. If the **Contractor** fails to comply with the terms of the **ContrSact** and this Article 35.6 (l) by not enrolling its business with HireNYC; (2) by not informing HireNYC, as required, of open positions; or (3) by failing to interview a qualified candidate, the **Agency** may assess liquidated damages in the amount of two-thousand five hundred dollars ($2,500) per breach. For all other events of noncompliance with the terms of this Article 35.6, the **Agency** may assess liquidated damages in the amount of five hundred dollars ($500) per breach. Furthermore, in the event the **Contractor** breaches the requirements of this Article 35.6 during the term of the **Contract**, the **City** may hold the **Contractor** in default of this **Contract**.

35.6.4 Audit Compliance. In addition to the auditing requirements set forth in other parts of the **Contract**, the **Contractor** shall permit SBS and the **City** to inspect any and all records concerning or relating to job openings or the hiring of individuals for work arising from the **Contract** and located in New York City. The **Contractor** shall permit an inspection within seven (7) business days of the request.

35.6.5 Other Reporting Requirements. The **Contractor** shall report to the **City**, on a monthly basis, all information reasonably requested by the **City** that is necessary for the **City** to comply with any reporting requirements imposed by **Law**, including any requirement that the **City** maintain a publicly accessible database. In addition, the **Contractor** agrees to comply with all reporting requirements imposed by **Law**, or as otherwise requested by the **City**.

35.6.6 Federal Hiring Requirements. If this **Contract** is federally funded (as indicated elsewhere in this Contract), the **Contractor** shall comply with all federal hiring requirements as may be set forth in this **Contract**, including, as applicable: (a) Section 3 of the HUD Act of 1968, which requires, to the greatest extent feasible, economic opportunities for 30 percent of new hires be given to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing and Executive Order 11246, which prohibits discrimination in employment due to race, color, religion, sex or national origin, and requires the implementation of goals for minority and female participation for work involving any construction trade.

ARTICLE 36. NO DISCRIMINATION

36.1 The **Contractor** specifically agrees, as required by Labor Law Section 220-e, as amended, that:

36.1.1 In the hiring of employees for the performance of **Work** under this **Contract** or any subcontract hereunder, neither the **Contractor**, **Subcontractor**, nor any person acting on behalf of such **Contractor** or **Subcontractor**, shall by reason of race, creed, color or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the **Work** to which the employment relates;

36.1.2 Neither the **Contractor**, **Subcontractor**, nor any person on its behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of **Work** under this **Contract** on account of race, creed, color or national origin;

36.1.3 There may be deducted from the amount payable to the **Contractor** by the **City** under this **Contract** a penalty of fifty ($50.00) dollars for each person for each **Day** during which such person was discriminated against or intimidated in violation of the provisions of this **Contract**; and

36.1.4 This **Contract** may be cancelled or terminated by the **City** and all moneys due or to become due hereunder may be forfeited, for a second or any subsequent violation of the terms or conditions of this Article 36.

36.1.5 This Article 36 covers all construction, alteration and repair of any public building or public work occurring in the State of New York and the manufacture, sale, and distribution of materials, equipment, and supplies to the extent that such operations are performed within the State of New York pursuant to this **Contract**.

36.2 The **Contractor** specifically agrees, as required by Section 6-108 of the Administrative Code, as amended, that:

36.2.1 It shall be unlawful for any person engaged in the construction, alteration or repair of buildings or engaged in the construction or repair of streets or highways pursuant to a **Contract** with the **City** or engaged in the manufacture, sale or distribution of materials, equipment or supplies pursuant to a **Contract** with the **City** to refuse to employ or to refuse to continue in any employment any person on account of the race, color or creed of such person.

36.2.2 It shall be unlawful for any person or any servant, agent or employee of any person, described in Article 36.1.2, to ask, indicate or transmit, orally or in writing, directly or indirectly, the race, color or creed or religious affiliation of any person employed or seeking employment from such person, firm or corporation.

36.2.3 Breach of the foregoing provisions shall be deemed a violation of a material provision of this **Contract**.

36.2.4 Any person, or the employee, manager or owner of or officer of such firm or corporation who shall violate any of the provisions of this Article 36.2 shall, upon

conviction thereof, be punished by a fine of not more than one hundred ($100.00) dollars or by imprisonment for not more than thirty (30) **Days**, or both.

36.3 This **Contract** is subject to the requirements of Executive Order No. 50 (1980) ("E.O. 50"), as revised, and the rules and regulations promulgated thereunder. No contract will be awarded unless and until these requirements have been complied with in their entirety. By signing this **Contract**, the **Contractor** agrees that it:

36.3.1 Will not engage in any unlawful discrimination against any employee or applicant for employment because of race, creed, color, national origin, sex, age, disability, marital status or sexual orientation with respect to all employment decisions including, but not limited to, recruitment, hiring, upgrading, demotion, downgrading, transfer, training, rates of pay or other forms of compensation, layoff, termination, and all other terms and conditions of employment; and

36.3.2 Will not engage in any unlawful discrimination in the selection of **Subcontractors** on the basis of the owner's race, color, creed, national origin, sex, age, disability, marital status or sexual orientation; and

36.3.3 Will state in all solicitations or advertisements for employees placed by or on behalf of the **Contractor** that all qualified applicants will receive consideration for employment without unlawful discrimination based on race, creed, color, national origin, sex, age, citizens status, disability, marital status, sexual orientation, or that it is an equal employment opportunity employer; and

36.3.4 Will send to each labor organization or representative of workers with which it has a collective bargaining agreement or other contract or memorandum of understanding, written notification of its equal employment opportunity commitments under E.O. 50 and the rules and regulations promulgated thereunder; and

36.3.5 Will furnish, before the award of the **Contract**, all information and reports, including an employment report, that are required by E.O. 50, the rules and regulations promulgated thereunder, and orders of the **City** Department of Business Services, Division of Labor Services (**DLS**) and will permit access to its books, records, and accounts by the **DLS** for the purposes of investigation to ascertain compliance with such rules, regulations, and orders.

36.4 The **Contractor** understands that in the event of its noncompliance with the nondiscrimination clauses of this **Contract** or with any of such rules, regulations, or orders, such noncompliance shall constitute a material breach of this **Contract** and noncompliance with E.O. 50 and the rules and regulations promulgated thereunder. After a hearing held pursuant to the rules of the **DLS**, the Director of the **DLS** may direct the **Commissioner** to impose any or all of the following sanctions:

36.4.1 Disapproval of the **Contractor**; and/or

36.4.2 Suspension or termination of the **Contract**; and/or

36.4.3 Declaring the **Contractor** in default; and/or

36.4.4 In lieu of any of the foregoing sanctions, the Director of the **DLS** may impose an employment program.

In addition to any actions taken under this **Contract**, failure to comply with E.O. 50 and the rules and regulations promulgated thereunder, in one or more instances, may result in a **City Agency** declaring the **Contractor** to be non-responsible in future procurements. The **Contractor** further agrees that it will refrain from entering into any **Contract** or **Contract** modification subject to E.O. 50 and the rules and regulations promulgated thereunder with a **Subcontractor** who is not in compliance with the requirements of E.O. 50 and the rules and regulations promulgated thereunder.

36.5 The **Contractor** specifically agrees, as required by Section 6-123 of the Administrative Code, that:

36.5.1 The **Contractor** will not engage in any unlawful discriminatory practice in violation of Title 8 of the Administrative Code; and

36.5.2 Any failure to comply with this Article 36.5 may subject the **Contractor** to the remedies set forth in Section 6-123 of the Administrative Code, including, where appropriate, sanctions such as withholding of payment, imposition of an employment program, finding the **Contractor** to be in default, cancellation of the **Contract**, or any other sanction or remedy provided by **Law** or **Contract**.

ARTICLE 37. LABOR LAW REQUIREMENTS

37.1 The **Contractor** shall strictly comply with all applicable provisions of the Labor Law, as amended. Such compliance is a material term of this **Contract**.

37.2 The **Contractor** specifically agrees, as required by Labor Law Sections 220 and 220-d, as amended, that:

37.2.1 Hours of **Work**: No laborer, worker, or mechanic in the employ of the **Contractor**, **Subcontractor** or other person doing or contracting to do the whole or a part of the **Work** contemplated by this **Contract** shall be permitted or required to work more than eight (8) hours in any one (1) **Day**, or more than five (5) **Days** in any one (1) week, except as provided in the Labor Law and in cases of extraordinary emergency including fire, flood, or danger to life or property, or in the case of national emergency when so proclaimed by the President of the United States of America.

37.2.2 In situations in which there are not sufficient laborers, workers, and mechanics who may be employed to carry on expeditiously the **Work** contemplated by this **Contract** as a result of such restrictions upon the number of hours and **Days** of labor, and the immediate commencement or prosecution or completion without undue delay of the **Work** is necessary for the preservation of the **Site** and/or for the protection of the life and limb of the persons using the same, such laborers, workers, and mechanics shall be permitted or required to work more than eight (8) hours in any one (1) **Day**; or five (5) **Days** in any one (1) week; provided, however, that upon application of any **Contractor**, the **Commissioner** shall have first certified to the Commissioner of Labor of the State of New York (hereinafter "Commissioner of Labor") that such public **Work** is of an important nature and that a delay in carrying it to completion would result in serious disadvantage to the public; and provided, further, that such Commissioner of Labor shall have determined that such an emergency does in fact exist as provided in Labor Law Section 220.2.

37.2.3 Failure of the **Commissioner** to make such a certification to the Commissioner of Labor shall not entitle the **Contractor** to damages for delay or for any cause whatsoever.

37.2.4 Prevailing Rate of Wages: The wages to be paid for a legal day's **Work** to laborers, workers, or mechanics employed upon the **Work** contemplated by this **Contract** or upon any materials to be used thereon shall not be less than the "prevailing rate of wage" as defined in Labor Law Section 220, and as fixed by the **Comptroller** in the attached Schedule of Wage Rates and in updated schedules thereof. The prevailing wage rates and supplemental benefits to be paid are those in effect at the time the **Work** is being performed.

37.2.5 Requests for interpretation or correction in the Information for Bidders includes all requests for clarification of the classification of trades to be employed in the performance of the **Work** under this **Contract**. In the event that a trade not listed in the **Contract** is in fact employed during the performance of this **Contract**, the **Contractor** shall be required to obtain from the **Agency** the prevailing wage rates and supplementary benefits for the trades used and to complete the performance of this **Contract** at the price at which the **Contract** was awarded.

37.2.6 Minimum Wages: Except for employees whose wage is required to be fixed pursuant to Labor Law Section 220, all persons employed by the **Contractor** and any **Subcontractor** in the manufacture or furnishing of the supplies, materials, or equipment, or the furnishing of work, labor, or services, used in the performance of this **Contract**, shall be paid, without subsequent deduction or rebate unless expressly authorized by **Law**, not less than the sum mandated by **Law**.

37.3 Working Conditions: No part of the **Work**, labor or services shall be performed or rendered by the **Contractor** in any plants, factories, buildings or surroundings or under working conditions which are unsanitary or hazardous or dangerous to the health and safety of employees engaged in the performance of this **Contract**. Compliance with the safety, sanitary, and factory inspection **Laws** of the state in which the **Work** is to be performed shall be prima facie evidence of compliance with this Article 37.3.

37.4 Prevailing Wage Enforcement: The **Contractor** agrees to pay for all costs incurred by the **City** in enforcing prevailing wage requirements, including the cost of any investigation conducted by or on behalf of the **Agency** or the **Comptroller,** where the **City** discovers a failure to comply with any of the requirements of this Article 37 by the **Contractor** or its **Subcontractor(s)**. The **Contractor** also agrees that, should it fail or refuse to pay for any such investigation, the **Agency** is hereby authorized to deduct from a **Contractor's** account an amount equal to the cost of such investigation.

37.4.1 The Labor Law Section 220 and Section 220-d, as amended, provide that this **Contract** shall be forfeited and no sum paid for any **Work** done hereunder on a second conviction for willfully paying less than:

37.4.1(a) The stipulated prevailing wage scale as provided in Labor Law section 220, as amended, or

37.4.1(b) The stipulated minimum hourly wage scale as provided in Labor Law section 220-d, as amended.

37.4.2 For any breach or violation of either working conditions (Article 37.3) or minimum wages (Article 37.2.6) provisions, the party responsible therefor shall be liable to the **City** for liquidated damages, which may be withheld from any amounts due on any contracts with the **City** of such party responsible, or may be recovered in actions brought by the **City**

Corporation Counsel in the name of the **City**, in addition to damages for any other breach of this **Contract**, for a sum equal to the amount of any underpayment of wages due to any employee engaged in the performance of this **Contract**. In addition, the **Commissioner** shall have the right to cancel contracts and enter into other contracts for the completion of the original contract, with or without public letting, and the original **Contractor** shall be liable for any additional cost. All sums withheld or recovered as deductions, rebates, refunds, or underpayment of wages hereunder, shall be held in a special deposit account and shall be paid without interest, on order of the **Comptroller**, directly to the employees who have been paid less than minimum rates of pay as set forth herein and on whose account such sums were withheld or recovered, provided that no claims by employees for such payments shall be entertained unless made within two (2) years from the date of actual notice to the **Contractor** of the withholding or recovery of such sums by the **City**.

37.4.3 A determination by the **Comptroller** that a **Contractor** and/or its **Subcontractor** willfully violated Labor Law Section 220 will be forwarded to the **City's** five District Attorneys for review.

37.4.4 The **Contractor's** or **Subcontractor's** noncompliance with this Article 37.4 and Labor Law Section 220 may result in an unsatisfactory performance evaluation and the **Comptroller** may also find and determine that the **Contractor** or **Subcontractor** willfully violated the New York Labor **Law**.

37.4.4(a) An unsatisfactory performance evaluation for noncompliance with this Article 37.4 may result in a determination that the **Contractor** is a non-responsible bidder on subsequent procurements with the **City** and thus a rejection of a future award of a contract with the **City**, as well as any other sanctions provided for by **Law**.

37.4.4(b) Labor Law Section 220-b, as amended, provides that when two (2) final determinations have been rendered against a **Contractor** or **Subcontractor** within any consecutive six (6) year period determining that such **Contractor** or **Subcontractor** has willfully failed to pay the prevailing rate of wages or to provide supplements in accordance with the Labor Law and this Article 37.4, whether such failures were concurrent or consecutive and whether or not such final determinations concerning separate public works projects are rendered simultaneously, such **Contractor** or **Subcontractor** shall be ineligible to submit a bid on or be awarded any public works contract with the **City** for a period of five (5) years from the second final determination. If the final determination involves the falsification of payroll records or the kickback of wages or supplements, the **Contractor** or **Subcontractor** shall be ineligible to submit a bid on or be awarded any public works contract with the **City** for a period of five (5) years from the first final determination.

37.4.4(c) Labor Law Section 220, as amended, provides that the **Contractor** or **Subcontractor** found to have violated this Article 37.4 may be directed to make payment of wages or supplements including interest found to be due, and the **Contractor** or **Subcontractor** may be directed to make payment of a further sum as a civil penalty in an amount not exceeding twenty-five (25%) percent of the total amount found to be due.

37.5 The **Contractor** and its **Subcontractors** shall within ten (10) **Days** after mailing of a Notice of Award or written order, post in prominent and conspicuous places in each and every plant, factory, building, and structure where employees of the **Contractor** and its **Subcontractors** engaged in the

performance of this **Contract** are employed, notices furnished by the **City**, in relation to prevailing wages and supplements, minimum wages, and other stipulations contained in Sections 220 and 220-h of the Labor Law, and the **Contractor** and its **Subcontractors** shall continue to keep such notices posted in such prominent and conspicuous places until **Final Acceptance** of the supplies, materials, equipment, or **Work**, labor, or services required to be furnished or rendered under this **Contract**.

37.6 The **Contractor** shall strictly comply with all of the provisions of Articles 37.6.1 through 37.6.5, and provide for all workers, laborers or mechanics in its employ, the following:

37.6.1 Notices Posted At **Site**: Post, in a location designated by the **City**, schedules of prevailing wages and supplements for this **Project**, a copy of all re-determinations of such schedules for the **Project**, the Workers' Compensation **Law** Section 51 notice, all other notices required by **Law** to be posted at the **Site**, the **City** notice that this **Project** is a public works project on which each worker is entitled to receive the prevailing wages and supplements for the occupation at which he or she is working, and all other notices which the **City** directs the **Contractor** to post. The **Contractor** shall provide a surface for such notices which is satisfactory to the **City**. The **Contractor** shall maintain and keep current such notices in a legible manner and shall replace any notice or schedule which is damaged, defaced, illegible or removed for any reason. The **Contractor** shall post such notices before commencing any **Work** on the **Site** and shall maintain such notices until all **Work** on the **Site** is complete; and

37.6.2 Daily **Site** Sign-in Sheets: Maintain daily **Site** sign-in sheets, and require that **Subcontractors** maintain daily **Site** sign-in sheets for its employees, which include blank spaces for an employee's name to be both printed and signed, job title, date started and Social Security number, the time the employee began work and the time the employee left work, until **Final Acceptance** of the supplies, materials, equipment, or **Work**, labor, or services to be furnished or rendered under this **Contract** unless exception is granted by the **Comptroller** upon application by the **Agency**. In the alternative, subject to the approval of the **CCPO**, the **Contractor** and **Subcontractor** may maintain an electronic or biometric sign-in system, which provides the information required by this Article 37.6.2; and

37.6.3 Individual Employee Information Notices: Distribute a notice to each worker, laborer or mechanic employed under this **Contract**, in a form provided by the **Agency**, that this **Project** is a public works project on which each worker, laborer or mechanic is entitled to receive the prevailing rate of wages and supplements for the occupation at which he or she is working. If the total cost of the **Work** under this **Contract** is at least two hundred fifty thousand ($250,000) dollars, such notice shall also include a statement that each worker, laborer or mechanic must be certified prior to performing any **Work** as having successfully completed a course in construction safety and health approved by the United States Department of Labor's Occupational Safety and Health Administration that is at least ten (10) hours in duration. Such notice shall be distributed to each worker before he or she starts performing any **Work** of this **Contract** and with the first paycheck after July first of each year. "Worker, laborer or mechanic" includes employees of the **Contractor** and all **Subcontractors** and all employees of suppliers entering the **Site**. At the time of distribution, the **Contractor** shall have each worker, laborer or mechanic sign a statement, in a form provided by the **Agency**, certifying that the worker has received the notice required by this Article 37.6.3, which signed statement shall be maintained with the payroll records required by this **Contract**; and

37.6.3(a) The **Contractor** and each **Subcontractor** shall notify each worker, laborer or mechanic employed under this **Contract** in writing of the prevailing rate of

wages for their particular job classification. Such notification shall be given to every worker, laborer, and mechanic on their first pay stub and with every pay stub thereafter; and

37.6.4 **Site** Laminated Identification Badges: The **Contractor** shall provide laminated identification badges which include a photograph of the worker's, laborer's or mechanic's face and indicate the worker's, laborer's or mechanic's name, trade, employer's name, and employment starting date (month/day/year). Further, the **Contractor** shall require as a condition of employment on the **Site**, that each and every worker, laborer or mechanic wear the laminated identification badge at all times and that it may be seen by any representative of the **City**. The **Commissioner** may grant a written waiver from the requirement that the laminated identification badge include a photograph if the **Contractor** demonstrates that the identity of an individual wearing a laminated identification badge can be easily verified by another method; and

37.6.5 Language Other Than English Used On **Site**: Provide the **ACCO** notice when three (3) or more employees (worker and/or laborer and/or mechanic) on the **Site**, at any time, speak a language other than English. The **ACCO** will then provide the **Contractor** the notices described in Article 37.6.1 in that language or languages as may be required. The **Contractor** is responsible for all distributions under this Article 37; and

37.6.6 Provision of Records: The **Contractor** and **Subcontractor(s)** shall produce within five (5) **Days** on the **Site** of the **Work** and upon a written order of the **Engineer**, the **Commissioner**, the **ACCO**, the **Agency EAO**, or the **Comptroller,** such records as are required to be kept by this Article 37.6; and

37.6.7 The **Contractor** and **Subcontractor(s)** shall pay employees by check or direct deposit. If this **Contract** is for an amount greater than one million ($1,000,000) dollars, checks issued by the **Contractor** to covered employees shall be generated by a payroll service or automated payroll system (an in-house system may be used if approved by the **Agency**). For any subcontract for an amount greater than seven hundred fifty thousand ($750,000) dollars, checks issued by a **Subcontractor** to covered employees shall be generated by a payroll service or automated payroll system (an in-house system may be used if approved by the **Agency**); and

37.6.8 The failure of the **Contractor** or **Subcontractor(s)** to comply with the provisions of Articles 37.6.1 through 37.6.7 may result in the **Commissioner** declaring the **Contractor** in default and/or the withholding of payments otherwise due under the **Contract**.

37.7 The **Contractor** and its **Subcontractors** shall keep such employment and payroll records as are required by Section 220 of the Labor Law. The failure of the **Contractor** or **Subcontractor(s)** to comply with the provisions of this Article 37.7 may result in the **Commissioner** declaring the **Contractor** in default and/or the withholding of payments otherwise due under the **Contract.**

37.8 At the time the **Contractor** makes application for each partial payment and for final payment, the **Contractor** shall submit to the **Commissioner** a written payroll certification, in the form provided by this **Contract**, of compliance with the prevailing wage, minimum wage, and other provisions and stipulations required by Labor Law Section 220 and of compliance with the training requirements of Labor Law Section 220-h set forth in Article 35.2. This certification of compliance shall be a condition precedent to payment and no payment shall be made to the **Contractor** unless and until each such certification shall have been submitted to and received by the **Commissioner**.

37.9 This **Contract** is executed by the **Contractor** with the express warranty and representation that the **Contractor** is not disqualified under the provisions of Section 220 of the Labor Law from the award of the **Contract**.

37.10 Any breach or violation of any of the foregoing shall be deemed a breach or violation of a material provision of this **Contract**, and grounds for cancellation thereof by the **City**.

ARTICLE 38. PAYROLL REPORTS

38.1 The **Contractor** and its **Subcontractor(s)** shall maintain on the **Site** during the performance of the **Work** the original payrolls or transcripts thereof which the **Contractor** and its **Subcontractor(s)** are required to maintain and shall submit such original payrolls or transcripts, subscribed and affirmed by it as true, within thirty (30) **Days** after issuance of its first payroll, and every thirty (30) **Days** thereafter, pursuant to Labor Law Section 220(3-a)(a)(iii). The **Contractor** and **Subcontractor(s)** shall submit such original payrolls or transcripts along with each and every payment requisition. If payment requisitions are not submitted at least once a month, the **Contractor** and its **Subcontractor(s)** shall submit original payrolls and transcripts both along with its payment requisitions and independently of its payment requisitions.

38.2 The **Contractor** shall maintain payrolls or transcripts thereof for six (6) years from the date of completion of the **Work** on this **Contract**. If such payrolls and transcripts are maintained outside of New York City after the completion of the **Work** and their production is required pursuant to this Article 38, the **Contractor** shall produce such records in New York City upon request by the City.

38.3 The **Contractor** and **Subcontractor(s)** shall comply with any written order, direction, or request made by the **Engineer**, the **Commissioner**, the **ACCO**, the **Agency EAO**, the **Agency Labor Law Investigator(s)**, or the **Comptroller**, to provide to the requesting party any of the following information and/or records within five (5) **Days** of such written order, direction, or request:

38.3.1 Such original payrolls or transcripts thereof subscribed and affirmed by it as true and the statements signed by each worker pursuant to this Chapter VIII; and/or

38.3.2 Attendance sheets for each **Day** on which any employee of the **Contractor** and/or any of the **Subcontractor(s)** performed **Work** on the **Site**, which attendance sheet shall be in a form acceptable to the **Agency** and shall provide information acceptable to the **Agency** to identify each such employee; and/or

38.3.3 Any other information to satisfy the **Engineer**, the **Commissioner**, the **ACCO**, the **Agency EAO**, the **Agency Labor Law Investigator(s)** or the **Comptroller**, that this Chapter VIII and the Labor Law, as to the hours of employment and prevailing rates of wages and/or supplemental benefits, are being observed.

38.4 The failure of the **Contractor** or **Subcontractor(s)** to comply with the provisions of Articles 38.1 and/or 38.2 may result in the **Commissioner** declaring the **Contractor** in default and/or the withholding of payments otherwise due under the **Contract**.

ARTICLE 39. DUST HAZARDS

39.1 Should a harmful dust hazard be created in performing the **Work** of this **Contract**, for the elimination of which appliances or methods have been approved by the Board of Standards and Appeals

of the City of New York, such appliances and methods shall be installed, maintained, and effectively operated during the continuance of such harmful dust hazard. Failure to comply with this provision after notice shall make this **Contract** voidable at the sole discretion of the **City**.

CHAPTER IX: PARTIAL AND FINAL PAYMENTS

ARTICLE 40. CONTRACT PRICE

40.1 The **City** shall pay, and the **Contractor** agrees to accept, in full consideration for the **Contractor's** performance of the **Work** subject to the terms and conditions hereof, the lump sum price or unit prices for which this **Contract** was awarded, plus the amount required to be paid for any **Extra Work** ordered by the **Commissioner** under Article 25, less credit for any **Work** omitted pursuant to Article 29.

ARTICLE 41. BID BREAKDOWN ON LUMP SUM

41.1 Within fifteen (15) **Days** after the commencement date specified in the **Notice to Proceed** or **Order to Work**, unless otherwise directed by the **Resident Engineer**, the **Contractor** shall submit to the **Resident Engineer** a breakdown of its bid price, or of lump sums bid for items of the **Contract**, showing the various operations to be performed under the **Contract**, as directed in the progress schedule required under Article 9, and the value of each of such operations, the total of such items to equal the lump sum price bid. Said breakdown must be approved in writing by the **Resident Engineer**.

41.2 No partial payment will be approved until the **Contractor** submits a bid breakdown that is acceptable to the **Resident Engineer**.

41.3 The **Contractor** shall also submit such other information relating to the bid breakdown as directed by the **Resident Engineer**. Thereafter, the breakdown may be used only for checking the **Contractor's** applications for partial payments hereunder, but shall not be binding upon the **City**, the **Commissioner**, or the **Engineer** for any purpose whatsoever.

ARTICLE 42. PARTIAL PAYMENTS

42.1 From time to time as the **Work** progresses satisfactorily, but not more often than once each calendar month (except where the **Commissioner** approves in writing the submission of invoices on a more frequent basis and for invoices relating to **Work** performed pursuant to a change order), the **Contractor** may submit to the **Engineer** a requisition for a partial payment in the prescribed form, which shall contain an estimate of the quantity and the fair value of the **Work** done during the payment period.

42.2 Partial payments may be made for materials, fixtures, and equipment in advance of their actual incorporation in the **Work**, as the **Commissioner** may approve, and upon the terms and conditions set forth in the General Conditions.

42.3 The **Contractor** shall also submit to the **Commissioner** in connection with every application for partial payment a verified statement in the form prescribed by the **Comptroller** setting forth the information required under Labor Law Section 220-a.

42.4 Within thirty (30) **Days** after receipt of a satisfactory payment application, and within sixty (60) **Days** after receipt of a satisfactory payment application in relation to **Work** performed pursuant to a change order, the **Engineer** will prepare and certify, and the **Commissioner** will approve, a voucher for a partial payment in the amount of such approved estimate, less any and all deductions authorized to be made by the **Commissioner** under the terms of this **Contract** or by **Law**.

ARTICLE 43. PROMPT PAYMENT

43.1 The Prompt Payment provisions of the **PPB** Rules in effect at the time of the bid will be applicable to payments made under this **Contract**. The provisions require the payment to the **Contractor** of interest on payments made after the required payment date, except as set forth in the **PPB** Rules.

43.2 The **Contractor** shall submit a proper invoice to receive payment, except where the **Contract** provides that the **Contractor** will be paid at predetermined intervals without having to submit an invoice for each scheduled payment.

43.3 Determination of interest due will be made in accordance with the **PPB** Rules.

43.4 If the **Contractor** is paid interest, the proportionate share(s) of that interest shall be forwarded by the **Contractor** to its **Subcontractor(s)**.

43.5 The **Contractor** shall pay each **Subcontractor** or **Materialman** not later than seven (7) **Days** after receipt of payment out of amounts paid to the **Contractor** by the **City** for **Work** performed by the **Subcontractor** or **Materialman** under this **Contract**.

> 43.5.1 If **Contractor** fails to make any payment to any **Subcontractor** or **Materialman** within seven (7) **Days** after receipt of payment by the **City** pursuant to this Article 43.5, then the **Contractor** shall pay interest on amounts due to such **Subcontractor** or **Materialman** at the rate of interest in effect on the date such payment is made by the **Contractor** computed in accordance with Section 756-b (1)(b) of the New York General Business Law. Accrual of interest shall commence on the **Day** immediately following the expiration of the seventh **Day** following receipt of payment by the **Contractor** from the **City** and shall end on the date on which payment is made.

43.6 The **Contractor** shall include in each of its subcontracts a provision requiring each **Subcontractor** to make payment to each of its **Subcontractors** or **Materialmen** for **Work** performed under this **Contract** in the same manner and within the same time period set forth above.

ARTICLE 44. SUBSTANTIAL COMPLETION PAYMENT

44.1 The **Contractor** shall submit with the **Substantial Completion** requisition:

> 44.1.1 A final verified statement of any pending Article 27 disputes in accordance with the **PPB** Rules and this **Contract** and any and all alleged claims against the **City**, in any way connected with or arising out of this **Contract** (including those as to which details may have been furnished pursuant to Articles 11, 27, 28, and 30) setting forth with respect to each such claim the total amount thereof, the various items of labor and materials included therein, and the alleged value of each item; and if the alleged claim be one for delay, the alleged cause of each such delay, the period or periods of time, giving the dates when the

Contractor claims the performance of the **Work** or a particular part thereof was delayed, and an itemized statement and breakdown of the amount claimed for each such delay.

44.1.1(a) With respect to each such claim, the **Commissioner**, the **Comptroller** and, in the event of litigation, the **City** Corporation Counsel shall have the same right to inspect, and to make extracts or copies of, the **Contractor's** books, vouchers, records, etc., as is referred to in Articles 11, 27, 28, and 30. Nothing contained in this Article 44.1.1(a) is intended to or shall relieve the **Contractor** from the obligation of complying strictly with Articles 11, 27, 28, and 30. The **Contractor** is warned that unless such claims are completely set forth as herein required, the **Contractor** upon acceptance of the **Substantial Completion** payment pursuant to this Article 44, will have waived any such claims.

44.1.2 A **Final Approved Punch List**.

44.1.3 Where required, a request for an extension of time to achieve **Substantial Completion** or final extension of time.

44.2 The **Commissioner** shall issue a voucher calling for payment of any part or all of the balance due for **Work** performed under the **Contract**, including monies retained under Article 21, less any and all deductions authorized to be made by the **Commissioner**, under this **Contract** or by **Law**, and less twice the amount the **Commissioner** considers necessary to ensure the completion of the balance of the **Work** by the **Contractor**. Such a payment shall be considered a partial and not a final payment. No **Substantial Completion** payment shall be made under this Article 44 where the **Contractor** failed to complete the **Work** within the time fixed for such completion in the Schedule A of the General Conditions, or within the time to which completion may have been extended, until an extension or extensions of time for the completion of **Work** have been acted upon pursuant to Article 13.

44.3 No further partial payments shall be made to the **Contractor** after **Substantial Completion**, except the **Substantial Completion** payment and payment pursuant to any **Contractor's** requisition that were properly filed with the **Commissioner** prior to the date of **Substantial Completion**; however, the **Commissioner** may grant a waiver for further partial payments after the date of **Substantial Completion** to permit payments for change order **Work** and/or release of retainage and deposits pursuant to Articles 21 and 24. Such waiver shall be in writing.

44.4 The **Contractor** acknowledges that nothing contained in this Article 44 is intended to or shall in any way diminish the force and effect of Article 13.

ARTICLE 45. FINAL PAYMENT

45.1 After completion and **Final Acceptance** of the **Work**, the **Contractor** shall submit all required certificates and documents, together with a requisition for the balance claimed to be due under the **Contract**, less the amount authorized to be retained for maintenance under Article 24. Such submission shall be within 90 days of the date of the **Commissioner's** written determination of **Final Acceptance**, or within such additional time as may be granted by the **Commissioner** in writing. If the **Contractor** fails to submit all required certificates and documents within the time allowed, no payment of the balance claimed shall be made to the **Contractor** and the **Contractor** shall be deemed to have forfeited its right to payment of any balance claimed. A verified statement similar to that required in connection with applications for partial payments shall also be submitted to the **Commissioner**.

45.2 Amended Verified Statement of Claims: The **Contractor** shall also submit with the final requisition any amendments to the final verified statement of any pending dispute resolution procedures in accordance with the **PPB** Rules and this **Contract** and any and all alleged claims against the **City**, in any way connected with or arising out of this **Contract** (including those as to which details may have been furnished pursuant to Articles 11, 27, 28, and 30) that have occurred subsequent to **Substantial Completion**, setting forth with respect to each such claim the total amount thereof, the various items of labor and materials included therein, and the alleged value of each such item; and if the alleged claim be one for delay, the alleged cause of each such delay, the period or periods of time, giving the dates when the **Contractor** claims the performance of the **Work** or a particular part thereof was delayed, and an itemized statement and breakdown of the amount claimed for each such delay. With reference to each such claim, the **Commissioner**, the **Comptroller** and, in the event of litigation, the **City** Corporation Counsel shall have the same right to inspect, and to make extracts or copies of, the **Contractor's** books, vouchers, records, etc., as is referred to in Articles 11, 27, 28, and 30. Nothing contained in this Article 45.2, is intended to or shall relieve the **Contractor** from the obligation of complying strictly with Articles 11, 27, 28, and 30. The **Contractor** is warned that unless such claims are completely set forth as herein required, the **Contractor**, upon acceptance of the Final Payment pursuant to Article 46, will have waived any such claims.

45.3 Preparation of Final Voucher: Upon determining the balance due hereunder other than on account of claims, the **Engineer** will prepare and certify, for the Commissioner's approval, a voucher for final payment in that amount less any and all deductions authorized to be made by the **Commissioner** under this **Contract** or by **Law**. In the case of a lump sum **Contract**, the **Commissioner** shall certify the voucher for final payment within thirty (30) **Days** from the date of completion and acceptance of the **Work**, provided all requests for extensions of time have been acted upon.

45.3.1 All prior certificates and vouchers upon which partial payments were made, being merely estimates made to enable the **Contractor** to prosecute the **Work** more advantageously, shall be subject to correction in the final voucher, and the certification of the **Engineer** thereon and the approval of the **Commissioner** thereof, shall be conditions precedent to the right of the **Contractor** to receive any money hereunder. Such final voucher shall be binding and conclusive upon the **Contractor**.

45.3.2 Payment pursuant to such final voucher, less any deductions authorized to be made by the **Commissioner** under this **Contract** or by **Law**, shall constitute the final payment, and shall be made by the **Comptroller** within thirty (30) **Days** after the filing of such voucher in his/her office.

45.4 The **Contractor** acknowledges that nothing contained in this Article 45 is intended to or shall in any way diminish the force and effect of Article 13.

ARTICLE 46. ACCEPTANCE OF FINAL PAYMENT

46.1 The acceptance by the **Contractor**, or by anyone claiming by or through it, of the final payment, whether such payment be made pursuant to any judgment of any court, or otherwise, shall constitute and operate as a release of the **City** from any and all claims of and liability to the **Contractor** for anything heretofore done or furnished for the **Contractor** relating to or arising out of this **Contract** and the **Work** done hereunder, and for any prior act, neglect or default on the part of the **City** or any of its officials, agents or employees, excepting only a claim against the **City** for the amounts deducted or retained in accordance with the terms and provisions of this **Contract** or by **Law**, and excepting any claims, not otherwise waived, or any pending dispute resolution procedures which are contained in the

verified statement filed with the **Contractor's** substantial and final requisitions pursuant to Articles 44 and 45.

46.2 The **Contractor** is warned that the execution by it of a release, in connection with the acceptance of the final payment, containing language purporting to reserve claims other than those herein specifically excepted from the operation of this Article 46, or those for amounts deducted by the **Commissioner** from the final requisition or from the final payment as certified by the **Engineer** and approved by the **Commissioner**, shall not be effective to reserve such claims, anything stated to the **Contractor** orally or in writing by any official, agent or employee of the **City** to the contrary notwithstanding.

46.3 Should the **Contractor** refuse to accept the final payment as tendered by the **Comptroller**, it shall constitute a waiver of any right to interest thereon.

46.4 The **Contractor**, however, shall not be barred by this Article 46 from commencing an action for breach of **Contract** to the extent permitted by **Law** and by the terms of the **Contract** for any claims that are contained in the verified statement filed with the **Contractor's** substantial and final requisitions pursuant to Articles 44 and 45 or that arose after submission of the final payment requisition, provided that a detailed and verified statement of claim is served upon the contracting **Agency** and **Comptroller** not later than forty (40) **Days** after the making of such final payment by electronic funds transfer (EFT) or the mailing of such final payment. The statement shall specify the items upon which the claim will be based and any such claim shall be limited to such items.

ARTICLE 47. APPROVAL BY PUBLIC DESIGN COMMISSION

47.1 All works of art, including paintings, mural decorations, stained glass, statues, bas-reliefs, and other sculptures, monuments, fountains, arches, and other structures of a permanent character intended for ornament or commemoration, and every design of the same to be used in the performance of this **Contract**, and the design of all bridges, approaches, buildings, gates, fences, lamps, or structures to be erected, pursuant to the terms of this **Contract**, shall be submitted to the Art Commission, d/b/a the Public Design Commission of the City of New York, and shall be approved by the Public Design Commission prior to the erection or placing in position of the same. The final payment shall not become due or payable under this **Contract** unless and until the Public Design Commission shall certify that the design for the **Work** herein contracted for has been approved by the said Public Design Commission, and that the same has been executed in substantial accordance with the design so approved, pursuant to the provisions of Chapter 37, Section 854 of the **City** Charter, as amended.

CHAPTER X: CONTRACTOR'S DEFAULT

ARTICLE 48. COMMISSIONER'S RIGHT TO DECLARE CONTRACTOR IN DEFAULT

48.1 In addition to those instances specifically referred to in other Articles herein, the **Commissioner** shall have the right to declare the **Contractor** in default of this **Contract** if:

48.1.1 The **Contractor** fails to commence **Work** when notified to do so by the **Commissioner**; or if

48.1.2 The **Contractor** shall abandon the **Work**; or if

48.1.3 The **Contractor** shall refuse to proceed with the **Work** when and as directed by the **Commissioner**; or if

48.1.4 The **Contractor** shall, without just cause, reduce its working force to a number which, if maintained, would be insufficient, in the opinion of the **Commissioner**, to complete the **Work** in accordance with the progress schedule; or if

48.1.5 The **Contractor** shall fail or refuse to increase sufficiently such working force when ordered to do so by the **Commissioner**; or if

48.1.6 The **Contractor** shall sublet, assign, transfer, convert or otherwise dispose of this **Contract** other than as herein specified; or sell or assign a majority interest in the **Contractor**; or if

48.1.7 The **Contractor** fails to secure and maintain all required insurance; or if

48.1.8 A receiver or receivers are appointed to take charge of the **Contractor's** property or affairs; or if

48.1.9 The **Commissioner** shall be of the opinion that the **Contractor** is or has been unnecessarily or unreasonably or willfully delaying the performance and completion of the **Work**, or the award of necessary subcontracts, or the placing of necessary material and equipment orders; or if

48.1.10 The **Commissioner** shall be of the opinion that the **Contractor** is or has been willfully or in bad faith violating any of the provisions of this **Contract**; or if

48.1.11 The **Commissioner** shall be of the opinion that the **Work** cannot be completed within the time herein provided therefor or within the time to which such completion may have been extended; provided, however, that the impossibility of timely completion is, in the **Commissioner's** opinion, attributable to conditions within the **Contractor's** control; or if

48.1.12 The **Work** is not completed within the time herein provided therefor or within the time to which the **Contractor** may be entitled to have such completion extended; or if

48.1.13 Any statement or representation of the **Contractor** in the **Contract** or in any document submitted by the **Contractor** with respect to the **Work**, the **Project**, or the **Contract** (or for purposes of securing the **Contract**) was untrue or incorrect when made; or if

48.1.14 The **Contractor** or any of its officers, directors, partners, five (5%) percent shareholders, principals, or other persons substantially involved in its activities, commits any of the acts or omissions specified as the grounds for debarment in the **PPB** Rules.

48.2 Before the **Commissioner** shall exercise his/her right to declare the **Contractor** in default, the **Commissioner** shall give the **Contractor** an opportunity to be heard, upon not less than two (2) **Days**' notice.

ARTICLE 49. EXERCISE OF THE RIGHT TO DECLARE DEFAULT

49.1 The right to declare the **Contractor** in default for any of the grounds specified or referred to in Article 48 shall be exercised by sending the **Contractor** a notice, signed by the **Commissioner**, setting forth the ground or grounds upon which such default is declared (hereinafter referred to as a "Notice of Default").

49.2 The **Commissioner's** determination that the **Contractor** is in default shall be conclusive, final, and binding on the parties and such a finding shall preclude the **Contractor** from commencing a plenary action for any damages relating to the **Contract**. If the **Contractor** protests the determination of the **Commissioner**, the **Contractor** may commence an action in a court of competent jurisdiction of the State of New York under Article 78 of the New York Civil Practice Law and Rules.

ARTICLE 50. QUITTING THE SITE

50.1 Upon receipt of such notice the **Contractor** shall immediately discontinue all further operations under this **Contract** and shall immediately quit the **Site**, leaving untouched all plant, materials, equipment, tools, and supplies then on the **Site**.

ARTICLE 51. COMPLETION OF THE WORK

51.1 The **Commissioner**, after declaring the **Contractor** in default, may then have the **Work** completed by such means and in such manner, by contract with or without public letting, or otherwise, as he/she may deem advisable, utilizing for such purpose such of the **Contractor's** plant, materials, equipment, tools, and supplies remaining on the **Site**, and also such **Subcontractors**, as he/she may deem advisable.

51.2 After such completion, the **Commissioner** shall make a certificate stating the expense incurred in such completion, which shall include the cost of re-letting and also the total amount of liquidated damages (at the rate provided for in the **Contract**) from the date when the **Work** should have been completed by the **Contractor** in accordance with the terms hereof to the date of actual completion of the **Work**. Such certificate shall be binding and conclusive upon the **Contractor**, its sureties, and any person claiming under the **Contractor**, as to the amount thereof.

51.3 The expense of such completion, including any and all related and incidental costs, as so certified by the **Commissioner**, and any liquidated damages assessed against the **Contractor**, shall be charged against and deducted out of monies which are earned by the **Contractor** prior to the date of default. Should the expense of such completion, as certified by the **Commissioner**, exceed the total sum which would have been payable under the **Contract** if it had been completed by the **Contractor**, any excess shall be paid by the **Contractor**.

ARTICLE 52. PARTIAL DEFAULT

52.1 In case the **Commissioner** shall declare the **Contractor** in default as to a part of the **Work** only, the **Contractor** shall discontinue such part, shall continue performing the remainder of the **Work** in strict conformity with the terms of this **Contract**, and shall in no way hinder or interfere with any **Other Contractor(s)** or persons whom the **Commissioner** may engage to complete the **Work** as to which the **Contractor** was declared in default.

52.2 The provisions of this Chapter relating to declaring the **Contractor** in default as to the entire **Work** shall be equally applicable to a declaration of partial default, except that the **Commissioner** shall be entitled to utilize for completion of the part of the **Work** as to which the **Contractor** was declared in default only such plant, materials, equipment, tools, and supplies as had been previously used by the **Contractor** on such part.

ARTICLE 53. PERFORMANCE OF UNCOMPLETED WORK

53.1 In completing the whole or any part of the **Work** under the provisions of this Chapter X, the **Commissioner** shall have the power to depart from or change or vary the terms and provisions of this **Contract**, provided, however, that such departure, change or variation is made for the purpose of reducing the time or expense of such completion. Such departure, change or variation, even to the extent of accepting a lesser or different performance, shall not affect the conclusiveness of the **Commissioner's** certificate of the cost of completion referred to in Article 51, nor shall it constitute a defense to an action to recover the amount by which such certificate exceeds the amount which would have been payable to the **Contractor** hereunder but for its default.

ARTICLE 54. OTHER REMEDIES

54.1 In addition to the right to declare the **Contractor** in default pursuant to this Chapter X, the **Commissioner** shall have the absolute right, in his/her sole discretion and without a hearing, to complete or cause to be completed in the same manner as described in Articles 51 and 53, any or all unsatisfactory or uncompleted punch list **Work** that remains after the completion date specified in the **Final Approved Punch List**. A written notice of the exercise of this right shall be sent to the **Contractor** who shall immediately quit the **Site** in accordance with the provisions of Article 50.

54.2 The expense of completion permitted under Article 54.1, including any and all related and incidental costs, as so certified by the **Commissioner**, shall be charged against and deducted out of monies which have been earned by the **Contractor** prior to the date of the exercise of the right set forth in Article 54.1; the balance of such monies, if any, subject to the other provisions of this **Contract**, to be paid to the **Contractor** without interest after such completion. Should the expense of such completion, as certified by the **Commissioner**, exceed the total sum which would have been payable under the **Contract** if it had been completed by the **Contractor**, any excess shall be paid by the **Contractor**.

54.3 The previous provisions of this Chapter X shall be in addition to any and all other remedies available under **Law** or in equity.

54.4 The exercise by the **City** of any remedy set forth herein shall not be deemed a waiver by the **City** of any other legal or equitable remedy contained in this **Contract** or provided under **Law**.

CHAPTER XI: MISCELLANEOUS PROVISIONS

ARTICLE 55. CONTRACTOR'S WARRANTIES

55.1 In consideration of, and to induce, the award of this **Contract** to the **Contractor**, the **Contractor** represents and warrants:

55.1.1 That it is financially solvent, sufficiently experienced and competent to perform the **Work**; and

55.1.2 That the facts stated in its bid and the information given by it pursuant to the Information for Bidders is true and correct in all respects; and

55.1.3 That it has read and complied with all requirements set forth in the **Contract**.

ARTICLE 56. CLAIMS AND ACTIONS THEREON

56.1 Any claim, that is not subject to dispute resolution under the **PPB** Rules or this **Contract**, against the **City** for damages for breach of **Contract** shall not be made or asserted in any action, unless the **Contractor** shall have strictly complied with all requirements relating to the giving of notice and of information with respect to such claims, as herein before provided.

56.2 Nor shall any action be instituted or maintained on any such claims unless such action is commenced within six (6) months after **Substantial Completion**; except that:

56.2.1 Any claims arising out of events occurring after **Substantial Completion** and before **Final Acceptance** of the **Work** shall be asserted within six (6) months of **Final Acceptance** of the **Work**;

56.2.2 If the **Commissioner** exercises his/her right to complete or cause to complete any or all unsatisfactory or uncompleted punch list **Work** that remains after the completion date specified in the **Final Approved Punch List** pursuant to Article 54, any such action shall be commenced within six (6) months from the date the **Commissioner** notifies the **Contractor** in writing that he/she has exercised such right. Any claims for monies deducted, retained or withheld under the provisions of this **Contract** shall be asserted within six (6) months after the date when such monies otherwise become due and payable hereunder; and

56.2.3 If the **Commissioner** exercises his/her right to terminate the **Contract** pursuant to Article 64, any such action shall be commenced within six (6) months of the date the **Commissioner** exercises said right.

ARTICLE 57. INFRINGEMENT

57.1 The **Contractor** shall be solely responsible for and shall defend, indemnify, and hold the **City** harmless from any and all claims (even if the allegations of the lawsuit are without merit) and judgments for damages and from costs and expenses to which the **City** may be subject to or which it may suffer or incur allegedly arising out of or in connection with any infringement by the **Contractor** of any copyright, trade secrets, trademark or patent rights or any other property or personal right of any third party by the **Contractor** and/or its **Subcontractors** in the performance or completion of the **Work**. Insofar as the facts or **Law** relating to any claim would preclude the **City** from being completely indemnified by the **Contractor**, the **City** shall be partially indemnified by the **Contractor** to the fullest extent permitted by **Law**.

ARTICLE 58. NO CLAIM AGAINST OFFICIALS, AGENTS OR EMPLOYEES

58.1 No claim whatsoever shall be made by the **Contractor** against any official, agent or employee of the **City** for, or on account of, anything done or omitted to be done in connection with this **Contract**.

ARTICLE 59. SERVICE OF NOTICES

59.1 The **Contractor** hereby designates the business address, fax number, and email address specified in its bid, as the place where all notices, directions or other communications to the **Contractor** may be delivered, or to which they may be mailed. Any notice, direction, or communication from either party to the other shall be in writing and shall be deemed to have been given when (i) delivered personally; (ii) sent by certified mail, return receipt requested; (iii) delivered by overnight or same day courier service in a properly addressed envelope with confirmation; or (iv) sent by fax or email and, unless receipt of the fax or e-mail is acknowledged by the recipient by fax or e-mail, deposited in a post office box regularly maintained by the United States Postal Service in a properly addressed, postage pre-paid envelope.

59.2 **Contractor's** notice address, email address, or fax number may be changed at any time by an instrument in writing, executed and acknowledged by the **Contractor**, and delivered to the **Commissioner**.

59.3 Nothing herein contained shall, however, be deemed to preclude or render inoperative the service of any notice, direction or other communication upon the **Contractor** personally, or, if the **Contractor** is a corporation, upon any officer thereof.

ARTICLE 60. UNLAWFUL PROVISIONS DEEMED STRICKEN FROM CONTRACT

60.1 If this **Contract** contains any unlawful provision not an essential part of the **Contract** and which shall not appear to have been a controlling or material inducement to the making thereof, the same shall be deemed of no effect and shall, upon notice by either party, be deemed stricken from the **Contract** without affecting the binding force of the remainder.

ARTICLE 61. ALL LEGAL PROVISIONS DEEMED INCLUDED

61.1 It is the intent and understanding of the parties to this **Contract** that each and every provision of **Law** required to be inserted in this **Contract** shall be and is inserted herein. Furthermore, it is hereby stipulated that every such provision is to be deemed to be inserted herein, and if, through mistake or otherwise, any such provision is not inserted, or is not inserted in correct form, then this **Contract** shall forthwith upon the application of either party be amended by such insertion so as to comply strictly with the **Law** and without prejudice to the rights of either party hereunder.

ARTICLE 62. TAX EXEMPTION

62.1 The **City** is exempt from payment of Federal, State, and local taxes, including sales and compensating use taxes of the State of New York and its cities and counties on all tangible personal property sold to the **City** pursuant to the provisions of this **Contract**. These taxes are not to be included in bids. However, this exemption does not apply to tools, machinery, equipment or other property leased by or to the **Contractor**, **Subcontractor** or **Materialman** or to tangible personal property which, even

though it is consumed, is not incorporated into the completed **Work** (consumable supplies) and tangible personal property that the **Contractor** is required to remove from the **Site** during or upon completion of the **Work**. The **Contractor** and its **Subcontractors** and **Materialmen** shall be responsible for and pay any and all applicable taxes, including sales and compensating use taxes, on such leased tools, machinery, equipment or other property and upon all such consumable supplies and tangible personal property that the **Contractor** is required to remove from the **Site** during or upon completion of the **Work**.

62.2 The **Contractor** agrees to sell and the **City** agrees to purchase all tangible personal property, other than consumable supplies and other tangible personal property that the **Contractor** is required to remove from the **Site** during or upon completion of the **Work**, that is required, necessary or proper for or incidental to the construction of the **Project** covered by this **Contract**. The sum paid under this **Contract** for such tangible personal property shall be in full payment and consideration for the sale of such tangible personal property.

62.2.1 The **Contractor** agrees to construct the **Project** and to perform all **Work**, labor and services rendered, necessary, proper or incidental thereto for the sum shown in the bid for the performance of such **Work**, labor, and services, and the sum so paid pursuant to this **Contract** for such **Work**, labor, and services, shall be in full consideration for the performance by the **Contractor** of all its duties and obligations under this **Contract** in connection with said **Work,** labor, and services.

62.3 20 NYCRR Section 541.3(d) provides that a **Contractor**'s purchases of tangible personal property that is either incorporated into real property owned by a governmental entity or purchased for and sold to a governmental entity are exempt from sales and use tax. The **City** shall not pay sales tax for any such tangible personal property that it purchases from the **Contractor** pursuant to the **Contract.** With respect to such tangible personal property, the **Contractor**, at the request of the **City**, shall furnish to the **City** such bills of sale and other instruments as may be required by the **City**, properly executed, acknowledged and delivered assuring to the **City** title to such tangible personal property, free of liens and/or encumbrances, and the **Contractor** shall mark or otherwise identify all such tangible personal property as the property of the **City**.

62.4 Title to all tangible personal property to be sold by the **Contractor** to the **City** pursuant to the provisions of the **Contract** shall immediately vest in and become the sole property of the **City** upon delivery of such tangible personal property to the **Site**. Notwithstanding such transfer of title, the **Contractor** shall have the full and continuing responsibility to install such tangible personal property in accordance with the provisions of this **Contract**, protect it, maintain it in a proper condition and forthwith repair, replace and make good any damage thereto, theft or disappearance thereof, and furnish additional tangible personal property in place of any that may be lost, stolen or rendered unusable, without cost to the **City**, until such time as the **Work** covered by the **Contract** is fully accepted by the **City**. Such transfer of title shall in no way affect any of the **Contractor's** obligations hereunder. In the event that, after title has passed to the **City**, any of the tangible personal property is rejected as being defective or otherwise unsatisfactory, title to all such tangible personal property shall be deemed to have been transferred back to the **Contractor**.

62.5 The purchase by **Subcontractors** or **Materialmen** of tangible personal property to be sold hereunder shall be a purchase or procurement for resale to the **Contractor** (either directly or through other **Subcontractors**) and therefore not subject to the aforesaid sales and compensating use taxes, provided that the subcontracts and purchase agreements provide for the resale of such tangible personal property and that such subcontracts and purchase agreements are in a form similar to this **Contract** with respect to the separation of the sale of consumable supplies and tangible personal property that the

Contractor is required to remove from the **Site** during or upon completion of the **Work** from the **Work** and labor, services, and any other matters to be provided, and provided further that the subcontracts and purchase agreements provide separate prices for tangible personal property and all other services and matters. Such separation shall actually be followed in practice, including the separation of payments for tangible personal property from the payments for other **Work** and labor and other things to be provided.

62.6 The **Contractor** and its **Subcontractors** and **Materialmen** shall furnish a **Contractor** Exempt Purchase Certificate to all persons, firms or corporations from which they purchase tangible personal property for the performance of the **Work** covered by this **Contract**.

62.7 In the event any of the provisions of this Article 62 shall be deemed to be in conflict with any other provisions of this **Contract** or create any ambiguity, then the provisions of this Article 62 shall control.

ARTICLE 63. INVESTIGATION(S) CLAUSE

63.1 The parties to this **Contract** agree to cooperate fully and faithfully with any investigation, audit or inquiry conducted by a United States, a State of New York (State) or a **City** governmental agency or authority that is empowered directly or by designation to compel the attendance of witnesses and to examine witnesses under oath, or conducted by the Inspector General of a governmental agency that is a party in interest to the transaction, submitted bid, submitted proposal, contract, lease, permit or license that is the subject of the investigation, audit or inquiry.

63.2 If any person who has been advised that his/her statement, and any information from such statement, will not be used against him/her in any subsequent criminal proceeding refuses to testify before a grand jury or other governmental agency or authority empowered directly or by designation to compel the attendance of witnesses and to examine witnesses under oath concerning the award of or performance under any transaction, agreement, lease, permit, contract, or license entered into with the **City**, the State, or any political subdivision or public authority thereof, or the Port Authority of New York and New Jersey, or any local development corporation within the **City**, or any public benefit corporation organized under the **Laws** of the State of New York, or;

63.3 If any person refuses to testify for a reason other than the assertion of his/her privilege against self incrimination in an investigation, audit or inquiry conducted by a **City** or State governmental agency or authority empowered directly or by designation to compel the attendance of witnesses and to take testimony under oath, or by the Inspector General of the governmental agency that is a party in interest in, and is seeking testimony concerning the award of, or performance under any transaction, agreement, lease, permit, contract, or license entered into with the **City**, the State, or any political subdivision thereof or any local development corporation within the **City**, then;

63.4 The **Commissioner** whose **Agency** is a party in interest to the transaction, submitted bid, submitted proposal, contract, lease, permit, or license shall convene a hearing, upon not less than five (5) **Days**' written notice to the parties involved to determine if any penalties should attach for the failure of a person to testify.

63.5 If any non-governmental party to the hearing requests an adjournment, the **Commissioner** who convened the hearing may, upon granting the adjournment, suspend any contract, lease, permit, or license, pending the final determination pursuant to Article 63.7 without the **City** incurring any penalty or damages for delay or otherwise.

63.6 The penalties which may attach after a final determination by the **Commissioner** may include but shall not exceed:

63.6.1 The disqualification for a period not to exceed five (5) years from the date of an adverse determination for any person, or any entity of which such person was a member at the time the testimony was sought, from submitting bids for, or transacting business with, or entering into or obtaining any contract, lease, permit or license with or from the **City**; and/or

63.6.2 The cancellation or termination of any and all such existing **City** contracts, leases, permits or licenses that the refusal to testify concerns and that have not been assigned as permitted under this **Contract**, nor the proceeds of which pledged, to an unaffiliated and unrelated institutional lender for fair value prior to the issuance of the notice scheduling the hearing, without the **City** incurring any penalty or damages on account of such cancellation or termination; monies lawfully due for goods delivered, work done, rentals, or fees accrued prior to the cancellation or termination shall be paid by the **City**.

63.7 The **Commissioner** shall consider and address in reaching his/her determination and in assessing an appropriate penalty the factors in Articles 63.7.1 and 63.7.2. The **Commissioner** may also consider, if relevant and appropriate, the criteria established in Articles 63.7.3 and 63.7.4, in addition to any other information which may be relevant and appropriate:

63.7.1 The party's good faith endeavors or lack thereof to cooperate fully and faithfully with any governmental investigation or audit, including but not limited to the discipline, discharge, or disassociation of any person failing to testify, the production of accurate and complete books and records, and the forthcoming testimony of all other members, agents, assignees or fiduciaries whose testimony is sought.

63.7.2 The relationship of the person who refused to testify to any entity that is a party to the hearing, including but not limited to, whether the person whose testimony is sought has an ownership interest in the entity and/or the degree of authority and responsibility the person has within the entity.

63.7.3 The nexus of the testimony sought to the subject entity and its contracts, leases, permits or licenses with the **City**.

63.7.4 The effect a penalty may have on an unaffiliated and unrelated party or entity that has a significant interest in an entity subject to penalties under Article 63.6, provided that the party or entity has given actual notice to the **Commissioner** upon the acquisition of the interest, or at the hearing called for in Article 63.4, gives notice and proves that such interest was previously acquired. Under either circumstance the party or entity shall present evidence at the hearing demonstrating the potential adverse impact a penalty will have on such person or entity.

63.8 Definitions:

63.8.1 The term "license" or "permit" as used in this Article 63 shall be defined as a license, permit, franchise or concession not granted as a matter of right.

63.8.2 The term "person" as used in this Article 63 shall be defined as any natural person doing business alone or associated with another person or entity as a partner, director, officer, principal or employee.

63.8.3 The term "entity" as used in this Article 63 shall be defined as any firm, partnership, corporation, association, joint venture, or person that receives monies, benefits, licenses, leases, or permits from or through the **City** or otherwise transacts business with the **City**.

63.8.4 The term "member" as used in this Article 63 shall be defined as any person associated with another person or entity as a partner, director, officer, principal or employee.

63.9 In addition to and notwithstanding any other provision of this **Contract**, the **Commissioner** may in his/her sole discretion terminate this **Contract** upon not less than three (3) **Days'** written notice in the event the **Contractor** fails to promptly report in writing to the **Commissioner** of the Department of Investigations ("DOI") of the **City** any solicitation of money, goods, requests for future employment or other benefit or thing of value, by or on behalf of any employee of the **City** or other person, firm, corporation or entity for any purpose which may be related to the procurement or obtaining of this **Contract** by the **Contractor**, or affecting the performance of this **Contract**.

ARTICLE 64. TERMINATION BY THE CITY

64.1 In addition to termination pursuant to any other article of this **Contract**, the **Commissioner** may, at any time, terminate this **Contract** by written notice to the **Contractor**. In the event of termination, the **Contractor** shall, upon receipt of such notice, unless otherwise directed by the **Commissioner**:

64.1.1 Stop **Work** on the date specified in the notice;

64.1.2 Take such action as may be necessary for the protection and preservation of the **City's** materials and property;

64.1.3 Cancel all cancelable orders for material and equipment;

64.1.4 Assign to the **City** and deliver to the **Site** or another location designated by the **Commissioner**, any non-cancelable orders for material and equipment that is not capable of use except in the performance of this **Contract** and has been specifically fabricated for the sole purpose of this **Contract** and not incorporated in the **Work**;

64.1.5 Take no action which will increase the amounts payable by the **City** under this **Contract**.

64.2 In the event of termination by the **City** pursuant to this Article 64, payment to the **Contractor** shall be in accordance with Articles 64.2.1, 64.2.2 or 64.2.3, to the extent that each respective article applies.

64.2.1 Lump Sum Contracts or Items: On all lump sum **Contracts**, or on lump sum items in a **Contract**, the **City** will pay the **Contractor** the sum of the amounts described in Articles 64.2.1(a) and 64.2.1(b), less all payments previously made pursuant to this **Contract**. On lump sum **Contracts** only, the **City** will also pay the **Contractor** an additional sum as provided in Article 64.2.1(c).

64.2.1(a) For **Work** completed prior to the notice of termination, the **Contractor** shall be paid a pro rata portion of the lump sum bid amount, plus approved change orders, based upon the percent completion of the **Work**, as determined by the

Commissioner. For the purpose of determining the pro rata portion of the lump sum bid amount to which the **Contractor** is entitled, the bid breakdown submitted in accordance with Article 41 shall be considered, but shall not be dispositive. The **Commissioner's** determination hereunder shall be final, binding, and conclusive.

64.2.1(b) For non-cancelable material and equipment that is not capable of use except in the performance of this **Contract** and has been specifically fabricated for the sole purpose of this **Contract**, but not yet incorporated in the **Work**, the **Contractor** shall be paid the lesser of the following, less salvage value:

64.2.1(b)(i) The Direct Cost, as defined in Article 64.2.4; or

64.2.1(b)(ii) The fair and reasonable value, if less than Direct Cost, of such material and equipment, plus necessary and reasonable delivery costs.

64.2.1(b)(iii) In addition, the **Contractor** shall be paid five (5%) percent of the amount described in Article 64.2.1(b)(i) or Article 64.2.1(b)(ii), whichever applies.

64.2.1(c) Except as otherwise provided in Article 64.2.1(d), on all lump sum **Contracts**, the **Contractor** shall be paid the percentage indicated below applied to the difference between the total lump sum bid amount and the total of all payments made prior to the notice of termination plus all payments allowed pursuant to Articles 64.2.1(a) and 64.2.1(b):

64.2.1(c)(i) Five (5%) percent of the first five million ($5,000,000) dollars; and

64.2.1(c)(ii) Three (3%) percent of any amount between five million ($5,000,000) dollars and fifteen million ($15,000,000) dollars; plus

64.2.1(c)(iii) One (1%) percent of any amount over fifteen million ($15,000,000) dollars.

64.2.1(d) In the event the **City** terminates a lump sum **Contract** pursuant to this Article 64 within ninety (90) **Days** after registration of the **Contract** with the **Comptroller**, the **Contractor** shall be paid one (1%) percent of the difference between the lump sum bid amount and the total of all payments made pursuant to this Article 64.2.

64.2.2 Unit Price Contracts or Items: On all unit price **Contracts**, or on unit price items in a **Contract**, the **City** will pay the **Contractor** the sum of the amounts described in Articles 64.2.2(a) and 64.2.2(b), less all payments previously made pursuant to this **Contract**:

64.2.2(a) For all completed units, the unit price stated in the **Contract**, and

64.2.2(b) For units that have been ordered but are only partially completed, the **Contractor** will be paid:

64.2.2(b)(i) A pro rata portion of the unit price stated in the **Contract** based upon the percent completion of the unit and

64.2.2(b)(ii) For non-cancelable material and equipment, payment will be made pursuant to Article 64.2.1(b).

64.2.3 Time and Materials Contracts or Items Based on Time and Material Records: On all **Contracts** or items in a **Contract** where payment for the **Work** is based on time and material records, the **Contractor** shall be paid in accordance with Article 26, less all payments previously made pursuant to this **Contract**.

64.2.4 Direct Costs: Direct Costs as used in this Article 64.2 shall mean:

64.2.4(a) The actual purchase price of material and equipment, plus necessary and reasonable delivery costs,

64.2.4(b) The actual cost of labor involved in construction and installation at the **Site**, and

64.2.4(c) The actual cost of necessary bonds and insurance purchased pursuant to requirements of this **Contract** less any amounts that have been or should be refunded by the **Contractor's** sureties or insurance carriers.

64.2.4(d) Direct Costs shall not include overhead.

64.3 In no event shall any payments under this Article 64 exceed the **Contract** price for such items.

64.4 All payments pursuant to Article 64 shall be in the nature of liquidated damages and shall be accepted by the **Contractor** in full satisfaction of all claims against the **City**.

64.5 The **City** may deduct or set off against any sums due and payable pursuant to this Article 64, any deductions authorized by this **Contract** or by **Law** (including but not limited to liquidated damages) and any claims it may have against the **Contractor**. The **City's** exercise of the right to terminate the **Contract** pursuant to this Article 64 shall not impair or otherwise effect the **City's** right to assert any claims it may have against the **Contractor** in a plenary action.

64.6 Where the **Work** covered by the **Contract** has been substantially completed, as determined in writing by the **Commissioner**, termination of the **Work** shall be handled as an omission of **Work** pursuant to Articles 29 and 33, in which case a change order will be issued to reflect an appropriate reduction in the **Contract** sum, or if the amount is determined after final payment, such amount shall be paid by the **Contractor**.

ARTICLE 65. CHOICE OF LAW, CONSENT TO JURISDICTION AND VENUE

65.1 This **Contract** shall be deemed to be executed in the **City** regardless of the domicile of the **Contractor**, and shall be governed by and construed in accordance with the **Laws** of the State of New York and the **Laws** of the United States, where applicable.

65.2 The parties agree that any and all claims asserted against the **City** arising under this **Contract** or related thereto shall be heard and determined in the courts of the State of New York ("New York State Courts") located in the **City** and County of New York. To effect this **Contract** and intent, the **Contractor** agrees:

65.2.1 If the **City** initiates any action against the **Contractor** in Federal court or in a New York State Court, service of process may be made on the **Contractor** either in person, wherever such **Contractor** may be found, or by registered mail addressed to the **Contractor** at its address as set forth in this **Contract**, or to such other address as the **Contractor** may provide to the **City** in writing; and

65.2.2 With respect to any action between the **City** and the **Contractor** in a New York State Court, the **Contractor** hereby expressly waives and relinquishes any rights it might otherwise have:

65.2.2(a) To move to dismiss on grounds of forum non conveniens;

65.2.2(b) To remove to Federal Court; and

65.2.2(c) To move for a change of venue to a New York State Court outside New York County.

65.2.3 With respect to any action brought by the **City** against the **Contractor** in a Federal Court located in the **City**, the **Contractor** expressly waives and relinquishes any right it might otherwise have to move to transfer the action to a Federal Court outside the **City**.

65.2.4 If the **Contractor** commences any action against the **City** in a court located other than in the **City** and County of New York, upon request of the **City**, the **Contractor** shall either consent to a transfer of the action to a New York State Court of competent jurisdiction located in the **City** and County of New York or, if the Court where the action is initially brought will not or cannot transfer the action, the **Contractor** shall consent to dismiss such action without prejudice and may thereafter reinstate the action in a New York State Court of competent jurisdiction in New York County.

65.3 If any provision(s) of this Article 65 is held unenforceable for any reason, each and all other provision(s) shall nevertheless remain in full force and effect.

ARTICLE 66. PARTICIPATION IN AN INTERNATIONAL BOYCOTT

66.1 The **Contractor** agrees that neither the **Contractor** nor any substantially owned affiliated company is participating or shall participate in an international boycott in violation of the provisions of the Federal Export Administration Act of 1979, as amended, or the regulations of the United States Department of Commerce (Commerce Department) promulgated thereunder.

66.2 Upon the final determination by the Commerce Department or any other agency of the United States as to, or conviction of the **Contractor** or a substantially-owned affiliated company thereof for participation in an international boycott in violation of the provisions of the Export Administration Act of 1979, as amended, or the regulations promulgated thereunder, the **Comptroller** may, at his/her option, render forfeit and void this **Contract**.

66.3 The **Contractor** shall comply in all respects, with the provisions of Section 6-114 of the Administrative Code and the rules and regulations issued by the **Comptroller** thereunder.

ARTICLE 67. LOCALLY BASED ENTERPRISE PROGRAM

67.1 This **Contract** is subject to the requirements of Section 6-108.1 of the Administrative Code and regulations promulgated thereunder. No construction contract shall be awarded unless and until these requirements have been complied with in their entirety; however, compliance with this Article 67 is not required if the Agency sets Subcontractor Participation Goals for Minority- and Women-Owned Business Enterprises (M/WBEs).

67.2 Unless specifically waived by the **Commissioner** with the approval of the Division of Economic and Financial Opportunity of the **City** Department of Business Services, if any portion of the **Contract** is subcontracted, not less than ten (10%) percent of the total dollar amount of the **Contract** shall be awarded to locally based enterprises (LBEs); except that where less than ten (10%) percent of the total dollar amount of the **Contract** is subcontracted, such lesser percentage shall be so awarded.

67.3 The **Contractor** shall not require performance and payment bonds from LBE **Subcontractors**.

67.4 If the **Contractor** has indicated prior to award that no **Work** will be subcontracted, no **Work** shall be subcontracted without the prior approval of the **Commissioner**, which shall be granted only if the **Contractor** makes a good faith effort beginning at least six (6) weeks before the **Work** is to be performed to obtain LBE **Subcontractors** to perform the **Work**.

67.5 If the **Contractor** has not identified sufficient LBE **Subcontractors** prior to award, it shall sign a letter of compliance stating that it complies with Section 6-108.1 of the Administrative Code, recognizes that achieving the LBE requirement is a condition of its **Contract**, and shall submit documentation demonstrating its good faith efforts to obtain LBEs. After award, the **Contractor** shall begin to solicit LBE's to perform subcontracted **Work** at least six (6) weeks before the date such **Work** is to be performed and shall demonstrate that a good faith effort has been made to obtain LBEs on each subcontract until it meets the required percentage.

67.6 Failure of the **Contractor** to comply with the requirements of Section 6-108.1 of the Administrative Code and the regulations promulgated thereunder shall constitute a material breach of this **Contract**. Remedy for such breach may include the imposition of any or all of the following sanctions:

67.6.1 Reducing the **Contractor's** compensation by an amount equal to the dollar value of the percentage of the LBE subcontracting requirement not complied with;

67.6.2 Declaring the **Contractor** in default;

67.6.3 If the **Contractor** is an LBE, de-certifying and declaring the **Contractor** ineligible to participate in the LBE program for a period of up to three (3) years.

ARTICLE 68. ANTITRUST

68.1 The **Contractor** hereby assigns, sells, and transfers to the **City** all right, title, and interest in and to any claims and causes of action arising under the antitrust **Laws** of New York State or of the United States relating to the particular goods or services purchased or procured by the **City** under this **Contract**.

ARTICLE 69. MacBRIDE PRINCIPLES PROVISIONS

69.1 Notice To All Prospective **Contractors**:

69.1.1 Local Law No. 34 of 1991 became effective on September 10, 1991 and added Section 6-115.1 of the Administrative Code. The local **Law** provides for certain restrictions on **City Contracts** to express the opposition of the people of the **City** to employment discrimination practices in Northern Ireland to promote freedom of work-place opportunity.

69.1.2 Pursuant to Section 6-115.1, prospective **Contractors** for **Contracts** to provide goods or services involving an expenditure of an amount greater than ten thousand ($10,000.) dollars, or for construction involving an amount greater than fifteen thousand ($15,000.) dollars, are asked to sign a rider in which they covenant and represent, as a material condition of their **Contract**, that any business operations in Northern Ireland conducted by the **Contractor** and any individual or legal entity in which the **Contractor** holds a ten (10%) percent or greater ownership interest in the **Contractor** will be conducted in accordance with the MacBride Principles of nondiscrimination in employment.

69.1.3 Prospective **Contractors** are not required to agree to these conditions. However, in the case of **Contracts** let by competitive sealed bidding, whenever the lowest responsible bidder has not agreed to stipulate to the conditions set forth in this notice and another bidder who has agreed to stipulate to such conditions has submitted a bid within five (5%) percent of the lowest responsible bid for a **Contract** to supply goods, services or contraction of comparable quality, the **Agency** shall refer such bids to the Mayor, the Speaker or other officials, as appropriate, who may determine, in accordance with applicable **Law**, that it is in the best interest of the **City** that the **Contract** be awarded to other than the lowest responsible pursuant to Section 313(b)(2) of the **City** Charter.

69.1.4 In the case of **Contracts** let by other than competitive sealed bidding, if a prospective **Contractor** does not agree to these conditions, no **Agency**, elected official or the **City** Council shall award the **Contract** to that bidder unless the **Agency** seeking to use the goods, services or construction certifies in writing that the **Contract** is necessary for the **Agency** to perform its functions and there is no other responsible **Contractor** who will supply goods, services or construction of comparable quality at a comparable price.

69.2 In accordance with Section 6-115.1 of the Administrative Code, the **Contractor** stipulates that such **Contractor** and any individual or legal entity in which the **Contractor** holds a ten (10%) percent or greater ownership interest in the **Contractor** either:

69.2.1 Have no business operations in Northern Ireland, or

69.2.2 Shall take lawful steps in good faith to conduct any business operations they have in Northern Ireland in accordance with the MacBride Principles, and shall permit independent monitoring of their compliance with such principles.

69.3 For purposes of this Article, the following terms shall have the following meanings:

69.3.1 "MacBride Principles" shall mean those principles relating to nondiscrimination in employment and freedom of work-place opportunity which require employers doing business in Northern Ireland to:

69.3.1(a) increase the representation of individuals from under-represented religious groups in the workforce, including managerial, supervisory, administrative, clerical and technical jobs;

69.3.1(b) take steps to promote adequate security for the protection of employees from under-represented religious groups both at the work-place and while traveling to and from **Work**;

69.3.1(c) ban provocative religious or political emblems from the workplace;

69.3.1(d) publicly advertise all job openings and make special recruitment efforts to attract applicants from under-represented religious groups;

69.3.1(e) establish layoff, recall, and termination procedures which do not in practice favor a particular religious group;

69.3.1(f) abolish all job reservations, apprenticeship restrictions and different employment criteria which discriminate on the basis of religion;

69.3.1(g) develop training programs that will prepare substantial numbers of current employees from under-represented religious groups for skilled jobs, including the expansion of existing programs and the creation of new programs to train, upgrade, and improve the skills of workers from under-represented religious groups;

69.3.1(h) establish procedures to asses, identify, and actively recruit employees from under-represented religious groups with potential for further advancement; and

69.3.1(i) appoint a senior management staff member to oversee affirmative action efforts and develop a timetable to ensure their full implementation.

69.4 The **Contractor** agrees that the covenants and representations in Article 69.2 are material conditions to this **Contract**. In the event the **Agency** receives information that the **Contractor** who made the stipulation required by this Article 69 is in violation thereof, the **Agency** shall review such information and give the **Contractor** an opportunity to respond. If the **Agency** finds that a violation has occurred, the **Agency** shall have the right to declare the **Contractor** in default in default and/or terminate this **Contract** for cause and procure supplies, services or **Work** from another source in the manner the **Agency** deems proper. In the event of such termination, the **Contractor** shall pay to the **Agency**, or the **Agency** in its sole discretion may withhold from any amounts otherwise payable to the **Contractor**, the difference between the **Contract** price for the uncompleted portion of this **Contract** and the cost to the **Agency** of completing performance of this **Contract** either itself or by engaging another **Contractor** or **Contractors**. In the case of a requirement **Contract**, the **Contractor** shall be liable for such difference in price for the entire amount of supplies required by the **Agency** for the uncompleted term of **Contractor's Contract**. In the case of a construction **Contract**, the **Agency** shall also have the right to hold the **Contractor** in partial or total default in accordance with the default provisions of this **Contract**, and/or may seek debarment or suspension of the **Contractor**. The rights and remedies of the **Agency** hereunder shall be in addition to, and not in lieu of, any rights and remedies the **Agency** has pursuant to this **Contract** or by operation of **Law**.

ARTICLE 70. ELECTRONIC FILING/NYC DEVELOPMENT HUB

70.1 The **Contractor** shall electronically file all alteration type-2 and alteration type-3 applications via the New York City Development Hub Web site, except applications for the following types of minor alterations: enlargements, curb cuts, legalizations, fire alarms, builders pavement plans, and jobs filed on Landmark Preservation Commission calendared properties. All such filings must be professionally certified. Information about electronic filing via the New York City Development Hub is available on the **City** Department of Buildings Web site at www.nyc.gov/buildings.

ARTICLE 71. PROHIBITION OF TROPICAL HARDWOODS

71.1 Tropical hardwoods, as defined in Section 165 of the New York State Finance Law (Finance Law), shall not be utilized in the performance of this **Contract** except as expressly permitted by Section 165 of the Finance Law.

ARTICLE 72. CONFLICTS OF INTEREST

72.1 Section 2604 of the **City** Charter and other related provisions of the **City** Charter, the Administrative Code, and the Penal Law are applicable under the terms of this **Contract** in relation to conflicts of interest and shall be extended to **Subcontractors** authorized to perform **Work**, labor and services pursuant to this **Contract** and further, it shall be the duty and responsibility of the **Contractor** to so inform its respective **Subcontractors**. Notice is hereby given that, under certain circumstances, penalties may be invoked against the donor as well as the recipient of any form of valuable gift.

ARTICLE 73. MERGER CLAUSE

73.1 The written **Contract** herein, contains all the terms and conditions agreed upon by the parties hereto, and no other agreement, oral or otherwise, regarding the subject matter of this **Contract** shall be deemed to exist or to bind any of the parties hereto, or to vary any of the terms contained herein.

ARTICLE 74. STATEMENT OF WORK

74.1 The **Contractor** shall furnish all labor and materials and perform all **Work** in strict accordance with the **Specifications** and **Addenda** thereto, numbered as shown in Schedule A.

ARTICLE 75. COMPENSATION TO BE PAID TO CONTRACTOR

75.1 The **City** will pay and the **Contractor** will accept in full consideration for the performance of the **Contract**, subject to additions and deductions as provided herein, the total sum shown in Schedule A, this said sum being the amount at which the **Contract** was awarded to the **Contractor** at a public letting thereof, based upon the **Contractor's** bid for the **Contract**.

ARTICLE 76. ELECTRONIC FUNDS TRANSFER

76.1 In accordance with Section 6-107.1 of the Administrative Code, the **Contractor** agrees to accept payments under this **Contract** from the **City** by electronic funds transfer (EFT). An EFT is any

transfer of funds, other than a transaction originated by check, draft or similar paper instrument, which is initiated through an electronic terminal, telephonic instrument or computer or magnetic tape so as to order, instruct or authorize a financial institution to debit or credit an account. Prior to the first payment made under this **Contract**, the **Contractor** shall designate one financial institution or other authorized payment agent and shall complete the attached "EFT Vendor Payment Enrollment Form" in order to provide the Commissioner of the **City** Department of Finance with information necessary for the **Contractor** to receive electronic funds transfer payments through a designated financial institution or authorized payment agent. The crediting of the amount of a payment to the appropriate account on the books of a financial institution or other authorized payment agent designated by the **Contractor** shall constitute full satisfaction by the **City** for the amount of the payment under this **Contract**. The account information supplied by the **Contractor** to facilitate the electronic funds transfer shall remain confidential to the fullest extent provided by **Law**.

76.2 The **Commissioner** may waive the application of the requirements of this Article 76 to payments on contracts entered into pursuant to Section 315 of the **City** Charter. In addition, the Commissioner of the Department of Finance and the Comptroller may jointly issue standards pursuant to which the **Agency** may waive the requirements of this Article 76 for payments in the following circumstances: (i) for individuals or classes of individuals for whom compliance imposes a hardship; (ii) for classifications or types of checks; or (iii) in other circumstances as may be necessary in the interest of the **City**.

ARTICLE 77. RECORDS RETENTION

77.1 The **Contractor** agrees to retain all books, records, and other documents relevant to this **Contract** for six years after the final payment or termination of this **Contract**, whichever is later. **City**, state, and federal auditors and any other persons duly authorized by the **City** shall have full access to and the right to examine any such books, records, and other documents during the retention period.

ARTICLE 78. EXAMINATION AND VIEWING OF SITE, CONSIDERATION OF OTHER SOURCES OF INFORMATION AND CHANGED SITE CONDITIONS

78.1 Pre-Bidding (Investigation) Viewing of Site – Bidders must carefully view and examine the **Site** of the proposed **Work**, as well as its adjacent area, and seek other usual sources of information, for they will be conclusively presumed to have full knowledge of any and all conditions and hazards on, about or above the **Site** relating to or affecting in any way the performance of the **Work** to be done under the **Contract** that were or should have been known by a reasonably prudent bidder. To arrange a date for visiting the **Site**, bidders are to contact the **Agency** contact person specified in the bid documents.

78.2 Should the **Contractor** encounter during the progress of the Work site conditions or environmental hazards at the **Site** materially differing from any shown on the **Contract Drawings** or indicated in the **Specifications** or such conditions or environmental hazards as could not reasonably have been anticipated by the **Contractor**, which conditions or hazards will materially affect the cost of the **Work** to be done under the **Contract**, the attention of the **Commissioner** must be called immediately to such conditions or hazards before they are disturbed. The **Commissioner** shall thereupon promptly investigate the conditions or hazards. If the **Commissioner** finds that they do so materially differ, and that they could not have been reasonably anticipated by the **Contractor**, the **Contract** may be modified with the **Commissioner**'s written approval.

2017 Standard Construction Contract Riders:

- NYC Earned Safe and Sick Time Act Contract Rider
- Rider to New York City Standard Construction Contract (March 2017) Regarding Non-Compensable Delays and Grounds for Extension
- Rider to New York City Standard Construction Contract (March 2017) Regarding Certified Payrolls
- New York City Mayoral Executive Order No. 39 Rider City Fleet and Truck Safety Requirements for City Contractors (version: November 19, 2024)
- Community Hiring Rider for Construction Contracts (version: February 20, 2025)

NYC EARNED SAFE AND SICK TIME ACT CONTRACT RIDER

(To supersede Section 4.06 of the November 2018 Appendix A and Section 35.5 of the March 2017 Standard Construction Contract and to be attached to other City contracts and solicitations)

A. *Introduction and General Provisions.*

1. The Earned Safe and Sick Time Act ("ESSTA"), codified at Title 20, Chapter 8 of the New York City Administrative Code, also known as the "Paid Safe and Sick Leave Law," requires covered employees (as defined in Admin. Code § 20-912) in New York City ("City") to be provided with paid safe and sick time. Contractors of the City or of other governmental entities may be required to provide safe and sick time pursuant to the ESSTA. The ESSTA is enforced by the City's Department of Consumer and Worker Protection ("DCWP"), which has promulgated 6 RCNY §§ 7-101 and 201 *et seq*. ("DCWP Rules").

2. The Contractor agrees to comply in all respects with the ESSTA and the DCWP Rules, and as amended, if applicable, in the performance of this agreement. The Contractor further acknowledges that such compliance is a material term of this agreement and that failure to comply with the ESSTA in performance of this agreement may result in its termination.

3. The Contractor must notify (with a copy to DCWP at ComplianceMonitoring@dcwp.nyc.gov) the Agency Chief Contracting Officer of the City Agency or other entity with whom it is contracting in writing within 10 days of receipt of a complaint (whether oral or written) or notice of investigation regarding the ESSTA involving the performance of this agreement. Additionally, the Contractor must cooperate with DCWP's guidance and must comply with DCWP's subpoenas, requests for information, and other document demands as set forth in the ESSTA and the DCWP Rules. More information is available at https://www1.nyc.gov/site/dca/about/paid-sick-leave-what-employers-need-to-know.page.

4. Upon conclusion of a DCWP investigation, Contractor will receive a findings letter detailing any employee relief and civil penalties owed. Pursuant to the findings, Contractor will have the opportunity to settle any violations and cure the breach of this agreement caused by failure to comply with the ESSTA either i) without a trial by entering into a consent order or ii) appearing before an impartial judge at the City's administrative tribunal. In addition to and notwithstanding any other rights and remedies available to the City, non-payment of relief and penalties owed pursuant to a consent order or final adjudication within 30 days of such consent order or final adjudication may result in the termination of this agreement without further opportunity to settle or cure the violations.

5. The ESSTA is briefly summarized below for the convenience of the Contractor. The Contractor is advised to review the ESSTA and the DCWP Rules in their entirety. The Contractor may go to www.nyc.gov/PaidSickLeave for resources for employers, such as Frequently Asked Questions, timekeeping tools and model forms, and an event calendar of upcoming presentations and webinars at which the Contractor can get more information about how to comply with the ESSTA and the DCWP Rules. The Contractor acknowledges that it is responsible for compliance with the ESSTA and the DCWP Rules notwithstanding any inconsistent language contained herein.

B. *Pursuant to the ESSTA and DCWP Rules: Applicability, Accrual, and Use.*

1. An employee who works within the City must be provided paid safe and sick time.[1] Employers with one hundred or more employees are required to provide 56 hours of safe and sick time for an employee each calendar year. Employers with fewer than one hundred employees are required to provide 40 hours of sick leave each calendar year. Employers must provide a minimum of one hour of safe and sick time for every 30 hours worked by an employee and compensation for such safe and sick time must be provided at the greater of the employee's regular hourly rate or the minimum wage at the time the paid safe or sick time is taken. Employers are not discouraged or prohibited from providing more generous safe and sick time policies than what the ESSTA requires.

2. Employees have the right to determine how much safe and sick time they will use, provided that an employer may set a reasonable minimum increment for the use of safe and sick time not to exceed four hours per day. For the use of safe time or sick time beyond the set minimum increment, an employer may set fixed periods of up to thirty minutes beyond the minimum increment. In addition, an employee may carry over up to 40 or 56 hours of unused safe and sick time to the following calendar year, provided that no employer is required to carry over unused paid safe and sick time if the employee is paid for such unused safe and sick time and the employer provides the employee with at least the legally required amount of paid safe and sick time for such employee for the immediately subsequent calendar year on the first day of such calendar year.

3. An employee entitled to safe and sick time pursuant to the ESSTA may use safe and sick time for any of the following:

a. such employee's mental illness, physical illness, injury, or health condition or the care of such illness, injury, or condition or such employee's need for medical diagnosis or preventive medical care;

b. such employee's care of a family member (an employee's child, spouse, domestic partner, parent, sibling, grandchild, or grandparent, the child or parent of an employee's spouse or domestic partner, any other individual related by blood to the employee, and any other individual whose close association with the employee is the equivalent of a family relationship) who has a mental illness, physical illness, injury or health condition or who has a need for medical diagnosis or preventive medical care;

[1] Pursuant to the ESSTA, if fewer than five employees work for the same employer, and the employer had a net income of less than one million dollars during the previous tax year, such employer has the option of providing such employees uncompensated safe and sick time.

c. closure of such employee's place of business by order of a public official due to a public health emergency;

d. such employee's need to care for a child whose school or childcare provider has been closed due to a public health emergency; or

e. when the employee or a family member has been the victim of a family offense matter, sexual offense, stalking, or human trafficking:

1. to obtain services from a domestic violence shelter, rape crisis center, or other shelter or services program for relief from a family offense matter, sexual offense, stalking, or human trafficking;
2. to participate in safety planning, temporarily or permanently relocate, or take other actions to increase the safety of the employee or employee's family members from future family offense matters, sexual offenses, stalking, or human trafficking;
3. to meet with a civil attorney or other social service provider to obtain information and advice on, and prepare for or participate in any criminal or civil proceeding, including but not limited to, matters related to a family offense matter, sexual offense, stalking, human trafficking, custody, visitation, matrimonial issues, orders of protection, immigration, housing, discrimination in employment, housing or consumer credit;
4. to file a complaint or domestic incident report with law enforcement;
5. to meet with a district attorney's office;
6. to enroll children in a new school; or
7. to take other actions necessary to maintain, improve, or restore the physical, psychological, or economic, health or safety of the employee or the employee's family member or to protect those who associate or work with the employee.

4. An employer must not require an employee, as a condition of taking safe and sick time, to search for a replacement. However, where the employee's need for safe and sick time is foreseeable, an employer may require an employee to provide reasonable notice of the need to use safe and sick time. For an absence of more than three consecutive work days, an employer may require reasonable documentation that the use of safe and sick time was needed for a reason listed in Admin. Code § 20-914; and/or written confirmation that an employee used safe and sick time pursuant to the ESSTA. However, an employer may not require documentation specifying the nature of a medical condition, require disclosure of the details of a medical condition, or require disclosure of the details of a family offense matter, sexual offense, stalking, or human trafficking, as a condition of providing safe and sick time. Health information and information concerning family offenses, sexual offenses, stalking or human trafficking obtained solely due to an

employee's use of safe and sick time pursuant to the ESSTA must be treated by the employer as confidential. An employer must reimburse an employee for all reasonable costs or expenses incurred in obtaining such documentation for the employer.

5. An employer must provide to all employees a written policy explaining its method of calculating sick time, policies regarding the use of safe and sick time (including any permissible discretionary conditions on use), and policies regarding carry-over of unused time at the end of the year, among other topics. It must provide the policy to employees using a delivery method that reasonably ensures that employees receive the policy. If such employer has not provided its written policy, it may not deny safe and sick time to an employee because of non-compliance with such a policy.

6. An employer must provide a pay statement or other form of written documentation that informs the employee of the amount of safe/sick time accrued and used during the relevant pay period and the total balance of the employee's accrued safe/sick time available for use.

7. Safe and sick time to which an employee is entitled must be paid no later than the payday for the next regular payroll period beginning after the safe and sick time was used.

C. *Exemptions and Exceptions*. Notwithstanding the above, the ESSTA does not apply to any of the following:

1. an independent contractor who does not meet the definition of employee under N.Y. Labor Law § 190(2);

2. an employee covered by a valid collective bargaining agreement, if the provisions of the ESSTA are expressly waived in such agreement and such agreement provides a benefit comparable to that provided by the ESSTA for such employee;

3. an audiologist, occupational therapist, physical therapist, or speech language pathologist who is licensed by the New York State Department of Education and who calls in for work assignments at will, determines their own schedule, has the ability to reject or accept any assignment referred to them, and is paid an average hourly wage that is at least four times the federal minimum wage;

4. an employee in a work study program under Section 2753 of Chapter 42 of the United States Code;

5. an employee whose work is compensated by a qualified scholarship program as that term is defined in the Internal Revenue Code, Section 117 of Chapter 20 of the United States Code; or

6. a participant in a Work Experience Program (WEP) under N.Y. Social Services Law § 336-c.

D. *Retaliation Prohibited.* An employer shall not take any adverse action against an employee that penalizes the employee for, or is reasonably likely to deter the employee from or interfere with the employee exercising or attempting in good faith to exercise any right provided by the ESSTA. In addition, an employer shall not interfere with any investigation, proceeding, or hearing pursuant to the ESSTA.

E. *Notice of Rights.*

1. An employer must provide its employees with written notice of their rights pursuant to the ESSTA. Such notice must be in English and the primary language spoken by an employee, provided that DCWP has made available a translation into such language. Downloadable notices are available on DCWP's website at https://www1.nyc.gov/site/dca/about/Paid-Safe-Sick-Leave-Notice-of-Employee-Rights.page. The notice must be provided to the employees by a method that reasonably ensures personal receipt by the employee.

2. Any person or entity that willfully violates these notice requirements is subject to a civil penalty in an amount not to exceed $50.00 for each employee who was not given appropriate notice.

F. *Records*. An employer must retain records documenting its compliance with the ESSTA for a period of at least three years, and must allow DCWP to access such records in furtherance of an investigation related to an alleged violation of the ESSTA.

G. *Enforcement and Penalties.*

1. Upon receiving a complaint alleging a violation of the ESSTA, DCWP must investigate such complaint. DCWP may also open an investigation to determine compliance with the ESSTA on its own initiative. Upon notification of a complaint or an investigation by DCWP, the employer must provide DCWP with a written response and any such other information as DCWP may request. If DCWP believes that a violation of the ESSTA has occurred, it has the right to issue a notice of violation to the employer .

2. DCWP has the power to grant an employee or former employee all appropriate relief as set forth in Admin. Code § 20-924(d). Such relief may include, but is not limited to, treble damages for the wages that should have been paid; statutory damages for unlawful retaliation; and damages, including statutory damages, full compensation for wages and benefits lost, and reinstatement, for unlawful discharge. In addition, DCWP may impose on an employer found to have violated the ESSTA civil penalties not to exceed $500.00 for a first violation, $750.00 for a second violation within two years of the first violation, and $1,000.00 for each succeeding violation within two years of the previous violation. When an employer has a policy or practice of not providing or refusing to allow the use of safe and sick time to its employees, DCWP may seek penalties and relief on a per employee basis.

3. Pursuant to Admin. Code § 20-924.2, (a) where reasonable cause exists to believe that an employer is engaged in a pattern or practice of violations of the ESSTA, the Corporation Counsel may commence a civil action on behalf of the City in a court of competent jurisdiction by filing a complaint setting forth facts relating to such pattern or practice and requesting relief, which may include injunctive relief, civil penalties and any other appropriate relief. Nothing in § 20-924.2 prohibits DCWP from exercising its authority under section 20-924 or the Charter, provided that a civil action pursuant to § 20-924.2 shall not have previously been commenced.

H. *More Generous Polices and Other Legal Requirements.* Nothing in the ESSTA is intended to discourage, prohibit, diminish, or impair the adoption or retention of a more generous safe and sick time policy, or the obligation of an employer to comply with any contract, collective bargaining agreement, employment benefit plan or other agreement providing more generous safe and sick time. The ESSTA provides minimum requirements pertaining to safe and sick time and does not preempt, limit, or otherwise affect the applicability of any other law, regulation, rule, requirement, policy or standard that provides for greater accrual or use by employees of safe and sick leave or time, whether paid or unpaid, or that extends other protections to employees. The ESSTA may not be construed as creating or imposing any requirement in conflict with any federal or state law, rule or regulation.

RIDER TO NEW YORK CITY STANDARD CONSTRUCTION CONTRACT (MARCH 2017) REGARDING NON-COMPENSABLE DELAYS AND GROUNDS FOR EXTENSION

[Instructions to Agencies: Please attach this Rider to the March 2017 version of the New York City Standard Construction Contract]

The following provisions supersede the corresponding provisions in the March 2017 version of the New York City Standard Construction Contract:

1. Section **11.5.1** provides as follows:

   11.5.1 The acts or omissions of public or government bodies (other than **City** agencies) or of any third parties who are disclosed in the **Contract Documents,** or those third parties who are ordinarily encountered or who are generally recognized as related to the **Work**, including but not limited to, **Other Contractors**, utilities or private enterprises;

2. Section **11.5.6** provides as follows:

   11.5.6 Climatic conditions, storms, floods, droughts, tidal waves, fires, hurricanes, earthquakes, landslides or other catastrophes or acts of God; acts of war or of the public enemy or terrorist acts; disruption, outage or power failure caused by a utility's inability or failure to provide service, pandemics, epidemics, outbreaks of infectious disease or any other public health emergency; other states of emergency declared by the City, State or Federal government , quarantine restrictions, and freight embargoes; including the **City's** reasonable responses to any of the above; and

3. Section **13.3** provides as follows:

   13.3 Grounds for Extension: If such application is made, the **Contractor** shall be entitled to an extension of time for delay in completion of the **Work** caused solely:

   13.3.1 By any of the acts or omissions of the **City**, its officials, agents or employees set forth in Articles **11.4.1.1** through **11.4.1.9**; or

   13.3.2 By or attributable to any of the items set forth in Articles **11.5.1** through **11.5.7**.

   13.3.3 The **Contractor** shall, however, be entitled to an extension of time for such causes only for the number of **Days** of delay which the **ACCO** or the Board may determine to be due solely to such causes, and then only if the **Contractor** shall have strictly complied with all of the requirements of Articles 9 and 10

RIDER TO NEW YORK CITY STANDARD CONSTRUCTION CONTRACT (MARCH 2017) REGARDING CERTIFIED PAYROLLS

[Instructions to Agencies: Please attach this Rider to the March 2017 version of the New York City Standard Construction Contract]

The following provisions supersede the corresponding provisions in the March 2017 version of the New York City Standard Construction Contract. Article 38 provides as follows:

ARTICLE 38. PAYROLL REPORTS

38.1 The **Contractor** and its **Subcontractor(s)** shall maintain the original payrolls or transcripts thereof which the **Contractor** and its **Subcontractor(s)** are required to maintain and shall submit such original payrolls or transcripts, subscribed and affirmed by it as true, within thirty (30) **Days** after issuance of its first payroll, and every thirty (30) **Days** thereafter, pursuant to Labor Law Section 220(3-a)(a)(iii), as modified by Labor Law Section 220-j. The **Contractor** and **Subcontractor(s)** shall submit such original payrolls or transcripts into the Electronic Certified Payroll Database (as hereinafter defined). If payment requisitions are not submitted at least once a month, the **Contractor** and its **Subcontractor(s)** shall submit original payrolls and transcripts both at the same time payment requisitions are submitted and independently of its payment requisitions. For purposes of this Article 38, "Electronic Certified Payroll Record Database" means the City's publicly accessible online database of electronic certified payroll records through which contractors and subcontractors submit certified payroll reports in an electronic format. The database is accessible at the following link: https://nyc-oti.ecomply.us/

38.2 The **Contractor** shall maintain payrolls or transcripts thereof for six (6) years from the date of completion of the **Work** on this **Contract**. If such payrolls and transcripts are maintained outside of New York City after the completion of the **Work** and their production is required pursuant to this Article 38, the **Contractor** shall produce such records in New York City upon request by the City.

38.3 The **Contractor** and **Subcontractor(s)** shall comply with any written order, direction, or request made by the **Engineer**, the **Commissioner**, the **ACCO**, the **Agency EAO**, the **Agency Labor Law Investigator(s)**, or the **Comptroller**, to provide to the requesting party any of the following information and/or records within five (5) **Days** of such written order, direction, or request:

38.3.1 Such original payrolls or transcripts thereof subscribed and affirmed by it as true and the statements signed by each worker pursuant to this Chapter VIII; and/or

38.3.2 Attendance sheets for each **Day** on which any employee of the **Contractor** and/or any of the **Subcontractor(s)** performed **Work** on the **Site**, which attendance sheet shall be in a form acceptable to the **Agency** and shall provide information acceptable to the **Agency** to identify each such employee; and/or

38.3.3 Any other information to satisfy the **Engineer**, the **Commissioner**, the **ACCO**, the **Agency EAO**, the **Agency Labor Law Investigator(s)** or the **Comptroller**, that this Chapter VIII and the Labor Law, as to the hours of employment and prevailing rates of wages and/or supplemental benefits, are being observed.

New York City Mayoral Executive Order No. 39 Rider

City Fleet and Truck Safety Requirements for City Contractors

Version: 11/19/24

[Instruction to Agencies: Please attach this Rider to the following agreements: (1) Procurement Contracts that meet the criteria set forth in Executive Order 39 of February 1, 2024; and (2) to the March 2017 version of the New York City Standard Construction Contract.]

Section 1.01 Background

This rider is included in the Agreement and made a part thereof pursuant to the provisions of Mayoral Executive Order 39 of 2024.

Section 1.02 Definitions

A. Capitalized terms not otherwise defined in this rider shall have the meaning ascribed to them in the Agreement.

B. Agreement: The agreement between the City and the Contractor, to which this rider has been added and made a part.

C. City-contracted Vehicle means a Truck (as hereinafter defined) or any other motor vehicle that the Contractor anticipates providing in accordance with this Agreement or using in performing its obligations under this Agreement on a weekly or more frequent basis[1]. This includes those vehicles anticipated to be provided or used by subcontractors to fulfill the scope of a subcontract for work to be performed under a contract that is subject to the Executive Order, regardless of monetary value of the subcontract, if the vehicle is utilized on a weekly or more frequent basis.

D. Contracting Agency: the City agency or office through which the City of New York has entered into this Agreement.

[1] The following vehicles are not considered City-contracted vehicles and are thus not subject to Executive Order 39: any motor vehicle or truck that is utilized pursuant to (1) contracts registered prior to July 1, 2024, including the renewal, extension, or modification of such contracts; (2) an agency on-call emergency contract; (3) an emergency procurement made pursuant to section 3-06 of title 9 of the Rules of the City of New York or pursuant to an executive order of the Mayor or Governor issued under section 24 or section 29-A of the New York State Executive Law; (4) intergovernmental contracts; (5) government-to-government contracts between the City and any State or Federal government agency; and (6) a contract for utilities, as identified in subdivision (b) of section 825 of the New York City Charter.

E. Contractor: the entity providing services under this Agreement.

F. Executive Order: Mayoral Executive Order 39 of 2024, as it may be amended.

G. High Vision Truck: A Truck with a cab-over or cab-forward design wherein the driver sits in front of the front axle as opposed to conventional cab design wherein the engine and front axle are in front of the driver. The distance from the forward of the center of the vehicle bumper at which the driver can see the top of a 3-foot cone shall not exceed eight feet and the distance beyond the exterior of the passenger side door at which the driver can first see the top of the 4-foot cone shall not exceed six feet.

H. Registration: Registration of this Agreement pursuant to Section 328 of the New York City Charter.

I. Telematics: Automatic vehicle location systems that track vehicle location and speed and alert the driver and another designated person(s) to such location and speed in real time.

J. Truck: A City-contracted Vehicle with a manufacturer's gross vehicle weight rating exceeding 10,000 pounds. The term does not include off-road construction vehicles.

K. Truck Surround Cameras: A system of cameras, sensors, and alerts placed on a Truck that provides a Truck operator with a full view of all four sides of the Truck.

L. Vehicle Safety Plan: A plan with regard to City-contracted Vehicles, approved by the Contracting Agency, that includes the components listed in Section 2.03(A) through (F) of this rider.

Section 2.01 Vehicle Requirements

All City-contracted Vehicles shall conform to the following requirements:

A. Truck Surround Cameras: All Trucks, other than High Vision Trucks, shall be outfitted with truck surround cameras in accordance with the following schedule:
   a. Contracts involving 10 or fewer Trucks: No later than 12 months from Registration.
   b. Contracts involving more than 10 Trucks: No later than 18 months from Registration.
   c. New or replacement Truck acquired after work under this Agreement has begun: Truck must be outfitted with Truck Surround Cameras within 12 months from the date of first using such Truck.
   d. Contractor must submit to the Contracting Agency photographic and purchase order evidence, that is satisfactory to the Contracting Agency, of compliance with this Paragraph (A).

B. Truck Side-guards: Contractor shall provide side-guards for City-contracted Vehicles as applicable pursuant to Section 6-141 of the New York City Administrative Code.

C. Telematics: All City-contracted Vehicles must be installed with Telematics. Data gathered by Telematics must be made available in a manner that is satisfactory to the Contracting Agency.

Section 2.02 Safety Requirements

Contractor shall provide the following:

A. Licensing: Contractors shall ensure proper licensing for all drivers who operate City-contracted Vehicles. Contractors shall ensure that all drivers operating City-contracted Vehicles are enrolled in the New York State License Notification System (LENS) and that all out-of-state licenses are being monitored by Contractor. Contractor must notify the Contracting Agency of any license suspensions and/or arrests tied to unsafe or illegal vehicle operation by any drivers of City-contracted Vehicles.

B. Training: Contractor must provide the Contracting Agency documentation, satisfactory to the Contracting Agency, showing:
    a. That all drivers of City-contracted Vehicles have taken a New York State approved defensive driving class within six months after Registration; or
    b. That all drivers of City-contracted Vehicles have attended a New York State-approved defensive driving class within 3 years prior to Registration; or
    c. That all drivers of City-contracted Vehicles have received alternative safe driver training acceptable to the Contracting Agency that is documented to the satisfaction of the Contracting agency.

C. Crash tracking: Contractors must notify the Contracting Agency of any and all collisions that take place involving City-contracted Vehicles while performing services under this Agreement.

Section 2.03 Vehicle Safety Plan

Within one month after Registration, the Contractor must submit, for review and approval, to Contracting Agency, at the address set forth in the Agreement for notices to the City, and DCAS Fleet (C/O Chief Fleet Management Officer, 23rd Floor South, Municipal Building, 1 Centre Street, NY, NY 10007) a proposed vehicle safety plan that shall include at the minimum the components listed in Paragraphs (A) through (E) below. If directed by the Contracting Agency,

Contractor shall revise said proposed vehicle safety plan in accordance with the directions of the Contracting Agency, and until the Contracting Agency issues its approval thereof, Contractor shall submit a revised proposed vehicle safety plan to the Contracting Agency in each case, within 15 days after receipt by Contractor of directions to that effect from the Contracting Agency. Upon approval of the proposed vehicle safety plan, said proposed plan shall be considered the Vehicle Safety Plan and Contractor shall comply with the terms thereof. Each second anniversary of the approval of the Vehicle Safety Plan the Contractor shall submit an update thereof. The Vehicle Safety Plan shall include at the minimum the following components:

A. Vehicle List: List of City-contracted Vehicles, including the year, make, model, VIN and license plate number of each City-contracted Vehicle;

B. Safety Training: Documentation showing that all drivers of City-contracted Vehicles have completed the training detailed in section 2.02(B) of this Rider;

C. Technology: A list of all relevant technology investments installed on City-contracted vehicles, including but not limited to the technology listed in section 2.01 of this Rider;

D. Crash Tracking: An explanation of Contractor's process of monitoring and reviewing collisions including plans to notify Contracting Agency of collisions that take place while performing services under this Agreement;

E. Corrective Action: A corrective action program for drivers of City-contracted Vehicles that engage in unsafe or dangerous driving behaviors and license monitoring; and

F. Additional Safety Measures: Contractor must indicate if there are any additional safety technologies, safety practices, training, or other procedures that are utilized for City-contracted Vehicles during the term of this Agreement.

Section 3.01 Liquidated Damages

A. Contractor acknowledges that its failure to comply with the provisions of this Vehicle Safety Plan will cause loss and damage to the City, the precise extent of which is difficult to ascertain in monetary terms. For this reason, the parties desire to provide fair and reasonable compensation to the City for such losses, which compensation shall not be construed as a penalty. It is therefore agreed that, in addition to any other liquidated damages that the Contractor shall be required to pay to the City in accordance with the provisions of the Agreement, Contractor shall pay to the City the following:
    a. The sum of $500.00 for each instance of a failure by the Contractor to submit a Vehicle Safety Plan in accordance with the provisions of Section 2.03.

b. The sum of $500.00 for each instance of a failure by the Contractor to comply with the provisions of Section 2.02(A) [Licensing].
c. The sum of $500.00 for each instance of a failure by the Contractor to comply with the provisions of Section 2.02(B) [Training].
d. The sum of $500.00 for each instance of a failure by the Contractor to comply with the provisions of Section 2.02(C) [Crash Tracking].
e. The sum of $500.00 for each instance of a failure by the Contractor to comply with the provisions of Section 2.01(C) [Telematics].
f. The sum of $3,000 for each instance of a failure by the Contractor to comply with the provisions of Section 2.01(A).
g. The Contracting Agency will provide at least 5 working days of notice to the Contractor and opportunity to rectify before implementing these liquidated damages.

B. Liquidated damages received pursuant to this Agreement are not intended to be nor shall they be treated as either a partial or full waiver or discharge of the City's right to indemnification, or the Contractor's obligation to indemnify the City, or to any other remedy provided for in this Agreement or by Law. The City may deduct and retain out of the monies which may become due under this Agreement, the amount of any such liquidated damages; and in case the amount which may become due hereunder shall be less than the amount of liquidated damages suffered by the City, the Contractor shall be liable to pay the difference.

Community Hiring Rider

For Construction Contracts

Version: February 20, 2025

Program Description

Community Hiring, as authorized under Chapter 79 of the New York City Charter ("Charter"), is an initiative to set workforce goals on City procurement for contractors to employ low-income individuals and residents of economically disadvantaged communities.

The provisions set forth in this Rider shall apply to contracts with a total value exceeding three million dollars, unless otherwise exempt under the rules set forth under the Community Hiring Rules, adopted as Title 74 of the Rules of the City of New York (RCNY). Under 74 RCNY § 1-03(b), the following contracts are exempt: preferred source contracts; contracts for the performance of services by a city-affiliated not-for-profit corporation, goods contracts; contracts in an amount below the small purchase threshold; contracts for investigative or confidential services; contracts subject to federal or state funding requirements that preclude or substantially conflict with the application of Community Hiring Goals; contracts awarded through the United States General Services administration, or through the New York State Office of General Services; contracts for emergency demolition services procured by the Department of Housing Preservation and Development; contracts for which contractor selection is made by an elected official other than the Mayor or an agency other than a Mayoral Agency; contracts subject to 9 RCNY § 1-02(f); contracts designated for inclusion in a mentoring program as defined in Section 1206 or 1309 of the Charter; and contracts for banking services, electronic payment services, or other related services procured by the New York City Department of Finance.

The Community Hiring Rules are hereby incorporated in this Contract by reference and all terms used herein shall have the meanings given such terms in the Community Hiring Rules. In the event of any conflict between the Community Hiring Rules and this Rider, the rules shall control. As of the execution of this Contract, the Contactor represents that it has read, in its entirety, and agrees to comply with the Community Hiring Rules.

The Community Hiring program supersedes the HireNYC initiatives and the related riders, including, but not limited to references to the Public Assistance Commitment Rider and the HireNYC Hiring and Employment Rider. Article 35.6 of this Contract is amended and replaced with the Community Hiring Rules.

Community Hiring Requirements

The Contractor agrees to comply with the requirements of the Community Hiring Rules in the performance of this Contract.

A. Community Hiring Goal

Pursuant to 74 RCNY § 4-02(b), the Contractor shall make best efforts to meet the applicable Community Hiring Goal to employ Residence-Based Community Hires as defined in 74 RCNY § 2-01(a) for contracts involving construction work.

For each Contract involving Construction Work that is not subject to a Project Labor Agreement, the Contractor shall agree to make best efforts to meet the Community Hiring Goal of 30 percent of cumulative labor hours of construction work to be performed by Residence-Based Community Hires as established in 74 RCNY § 4-02(b)(1). For contracts involving Construction Work that are subject to a Project Labor Agreement, the Contractor shall agree to make best efforts to meet the numerical goal(s) regarding Residence-Based Community Hires and Apprentices established in such Project Labor Agreement.

In accordance with 74 RCNY § 5-01(b), the Contractor shall require its subcontractors, as defined under 74 RCNY § 1-02, to make best efforts to meet the applicable Community Hiring Goal.

B. Advertising Employment Opportunities

The Contractor, except those performing Construction Work pursuant to a Project Labor Agreement, agrees to advertise the Employment Opportunities, as defined in 74 RCNY § 1-02, in conspicuous places available to the public and in a manner reasonable for the industry.

For purposes of meeting a Community Hiring Goal, the Contractor shall notify a Referral Source, as provided in accordance with 74 RCNY § 3-02(a), of the job opportunities to be filled by Community Hires. The Contractor shall provide notice to the Office of Community Hiring and Workforce Development (OCH) when the Referral Source has impeded the Contractor's efforts to meet the Community Hiring Goal.

C. System Enrollment and Reporting

The Contractor shall enroll with an electronic system designated by the Director of OCH in accordance with 74 RCNY § 5-01(e).

Once enrolled into the system, the Contractor shall be responsible for updating the information in the system in a reasonable and timely manner.

The Contractor may fulfill the advertising requirement set forth in 74 RCNY § 5-01(c) by posting in such system all the relevant information of an Employment Opportunity to be filled by Community Hires. The Contractor shall also provide, upon request by the City with reasonable notice, any information related to the Contractor's compliance with or progress towards meeting the Community Hiring Goal.

Records

A. Retention

The Contractor shall maintain records in accordance with the applicable requirements set forth in 74 RCNY §§ 6-01 and 6-02.

For purposes of 74 RCNY § 6-01(b), the Contractor shall designate a representative to monitor all activity related to compliance to ensure that the Contractor is exercising best efforts to meet the Community Hiring Goal and maintain records to submit the documentation relating to the provisions herein.

B. Access to Records

The Contractor shall furnish, and require its subcontractors to furnish, all information and reports in accordance with the laws, rules, regulations or guidance from the City.

Compliance

Without limitation to any other provisions under this Contract and any other remedies available to the City, a failure to comply with the requirements under the Community Hiring Rules is a non-compliance that may be subject to civil penalties pursuant to Chapter 7 of the Community Hiring Rules and may be considered as a factor in evaluating contract performance in accordance with 9 RCNY § 4-01.

A. Best Efforts

Where the Contractor has failed to meet the Community Hiring Goal, the Contractor shall demonstrate that it exercised best efforts to meet the goal. Where determined, as set forth in 74 RCNY § 5-03, that the Contractor failed to make best efforts, the City shall send written notice to the Contractor's designated representative, notwithstanding the notice provisions in the Contract. The Contractor shall respond in accordance with the instructions in the notice. Failure to timely respond can result in a non-compliance determination subject to civil penalties as set forth in 74 RCNY § 7-01.

B. Corrective Action

Where the City determines that the non-compliance may be remedied through a corrective action and provides notice to the Contractor pursuant to 74 RCNY § 7-02(a)(2), the Contractor shall respond in accordance with the requirements outlined in the notice. The Contractor is responsible for timely demonstration of taking the requisite corrective action. Demonstration of corrective action to the satisfaction of the Director of OCH, may result in waiving of the civil penalties[1] as set forth in the Community Hiring Rules.

[1] Only civil penalties relating to non-compliance with the Community Hiring Rules can be waived in this instance.

C. Civil Penalties

Where Contractor is found non-compliant subject to civil penalties, the City can impose a civil penalty amount in accordance with the schedule set forth in 74 RCNY § 7-03.

The City may withhold from the Contractor the amount of the civil penalties upon final determination as set forth in 74 RCNY § 7-01(d).

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SIGNATURE OF THE CONTRACT

IN WITNESS WHEREOF, the Commissioner, on behalf of the City of New York and the Contractor, have executed **FIVE COPIES of this contract, three parts of which are to remain with the Commissioner, one other to be filed with the Comptroller of the City, and the fifth to be delivered to the Contractor.**

THE CITY OF NEW YORK

BY_____
COMMISSIONER

_____
NAME OF CONTRACTOR

BY_____
AUTHORIZED OFFICER OF THE FIRM OR CORPORATION

(Where Contractor is a Corporation, add):
Attest:

_____(Seal)
SECRETARY

ACKNOWLEDGMENT BY CORPORATION

State of_____, County of_____ ss:

On this_____ day of _____, _____

before me personally came_____

who affirms or being by me duly sworn, did depose and say that he/she resides in

the City of_____; that he/she is the_____

of the _____the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation, that the seal affixed to the said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said corporation; and that he/she signed his name thereto by like order.

_____
Notary Public or Commissioner of Deeds

ACKNOWLEDGMENT BY COMMISSIONER

State of New York, County of Queens ss:

On this_____ day of_____,_____

before me personally came_____

to me known and known to me to be the_____ Commissioner of the Department Environmental Protection of the City of New York, the person described as such in and who as such executed the foregoing instrument and he/she acknowledged to me that he/she executed the same as Commissioner for the purposes therein mentioned.

_____
Notary Public or Commissioner of Deeds

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ACKNOWLEDGMENT BY PARTNERSHIP

State of_____, County of_____ ss:

On this_____ day of _____, _____

before me personally came _____,to be known

and known to me to be a member of_____, the firm described in and which executed the foregoing instrument and he/she acknowledged to me that he/she subscribed the name of said firm thereto on behalf of said firm for the purposes therein mentioned.

_____
Notary Public or Commissioner of Deeds

ACKNOWLEDGMENT BY INDIVIDUAL

State of _____, County of _____ ss:

On this_____ day of_____,_____

before me personally came_____

to me known and known to me to be the same person described and who executed the foregoing instrument and he/she acknowledged to me that he/she executed the same for the purposes therein mentioned

_____
Notary Public or Commissioner of Deeds

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AUTHORITY

MAYOR'S CERTIFICATE NO. CBX _____ DATED_____

BUDGET DIRECTOR'S CERTIFICATE NO. CP/CAS_____ DATED_____

APPROPRIATION

COMMISSIONER'S CERTIFICATE

In conformity with the provisions of Section 6-101 of the Administrative Code of the City of New York, it is hereby certified that the estimated cost of the work, materials and supplies required by the within Contract, amounting to:

_____

$_____

is chargeable to the fund of the Department of Environmental Protection Budget Code(s):

_____

_____

I hereby certify that the specifications contained herein comply with the terms and conditions of the FY_____ BUDGET.

_____

Commissioner of the Department of Environmental Protection

COMPTROLLER'S CERTIFICATE

The City of New York_____,_____

In pursuance of the provisions of Section 6-101 of the Administrative Code of the City of New York, I hereby certify that there remains unapplied and unexpended a balance of the above mentioned fund applicable to this Contract sufficient to pay the estimated expense of executing the same, viz.:
$_____.

_____

Comptroller

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PERFORMANCE BOND

KNOW ALL PEOPLE BY THESE PRESENTS:,
That we,_____

hereinafter referred to as the "Principal,"
and,_____

hereinafter referred to as the "Surety" ("Sureties") are held and firmly bound to THE CITY OF NEW YORK, hereinafter referred to as the "City" or to its successors and assigns in the penal sum of_____

($ _____) Dollars, lawful money of the United States for the payment of which said sum of money well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, The Principal is about to enter, or has entered, into a Contract in writing with the City for

a copy of which Contract is annexed to and hereby made a part of this bond as though herein set forth in full;

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, his or its representatives or assigns, shall well and faithfully perform the said Contract and all modifications, amendments, additions and alterations thereto that may hereafter be made, according to its terms and its true intent and meaning, including repair and or replacement of defective work and guarantees of maintenance for the periods stated in the Contract, and shall fully indemnify and save harmless the City from all cost and damage which it may suffer by reason of the Principal's default of the Contract, and shall fully reimburse and repay the City for all outlay and expense which the City may incur in making

good any such default and shall protect the said City of New York against, and pay any and all amounts, damages, cost and judgments which may or shall be recovered against said City or its officers or agents or which the said City of New York may be called upon to pay any person or corporation by reason of any damages arising or growing out of the Principal's default of the Contract, then this obligation shall be null and void, otherwise to remain in full force and effect.

The Surety (Sureties), for value received, hereby stipulates and agrees, upon written notice from the City that the City has determined that the Principal is in default of the Contract, to either (1) pay the full amount of the above penal sum in complete discharge and exoneration of this bond and of all the liabilities of the Surety relating to this bond, or (2) fully perform and complete the Work to be performed under the Contract, pursuant to the terms, conditions, and covenants thereof. The Surety (Sureties) further agrees, at its option, either to tender the penal sum or to commence and diligently perform the Work specified in the Contract, including physical site work, within twenty-five (25) business days after written notice thereof from the City and to complete all Work within the time set forth in the Contract or such other time as agreed to between the City and Surety in accordance with the Contract. The Surety and the City reserve all rights and defenses each may have against the other; provided, however, that the Surety expressly agrees that its reservation of rights shall not provide a basis for non-performance of its obligation to commence and to complete all Work as provided herein.

The Surety (Sureties), for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety (Sureties) and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or to the said Contract or the Work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any Work to be performed or any moneys due or to become due thereunder; and said Surety (Sureties) does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to said Surety (Sureties) as though done or omitted to be done by or in relation to said Principal.

IN WITNESS WHEREOF, The Principal and the Surety (Sureties) have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereunto affixed and these presents to be signed by their proper officers, this

_____ day of _____ 20 _____ .

(Seal)

_____ (L.S.)

Principal

By _____.

(Seal)

Surety

By _____.

Performance Bond Greater Than $5 Million

_____.

(Seal) Surety

By _____.

_____.

(Seal) Surety

By _____.

_____.

(Seal) Surety

By _____.

_____.

(Seal) Surety

By _____.

Bond Premium Rate _____.

Bond Premium Cost _____.

If the Contractor (Principal) is a partnership, the bond should be signed by each of the individuals who are partners.

If the Contractor (Principal) is a corporation, the bond should be signed in its correct corporate name by a duly authorized officer, agent, or attorney-in-fact.

There should be executed an appropriate number of counterparts of the bond corresponding to the number of counterparts of the Contract.

ACKNOWLEDGMENT OF PRINCIPAL IF A CORPORATION

State of _____County of _____ ss:

On this__day of _____ 20 _____before me personally came_____,
to me known, who, being by me duly sworn did depose and say that he/she resides at_____
_____; that he/she is the_____
of ___the corporation described in and which executed the foregoing instrument; and that he signed his name to the foregoing instrument by order of the directors of said corporation as the duly authorized and binding act thereof.

_____
Notary Public or Commissioner of Deeds.

ACKNOWLEDGMENT OF PRINCIPAL IF A PARTNERSHIP

State of _____County of _____ ss:

On this__day of _____ 20 _____before me personally came_____
to me known, who, being by me duly sworn did depose and say that he/she resides at_____
_____; that he/she is _____ partner of _____, a limited/general partnership existing under the laws of the State of _____, the partnership described in and which executed the foregoing instrument; and that he/she signed his/her name to the foregoing instrument as the duly authorized and binding act of said partnership.

_____
Notary Public or Commissioner of Deeds.

ACKNOWLEDGMENT OF PRINCIPAL IF AN INDIVIDUAL

State of _____County of _____ ss:

On this__day of _____ 20 _____before me personally came_____
to me known, who, being by me duly sworn did depose and say that he/she resides at_____
_____, and that he/she is the individual whose name is subscribed to the within instrument and acknowledged to me that by his/her signature on the instrument, said individual executed the instrument.

_____
Notary Public or Commissioner of Deeds.

Affix Acknowledgments and justification of Sureties

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PERFORMANCE BOND

KNOW ALL PEOPLE BY THESE PRESENTS:,
That we,_____

hereinafter referred to as the "Principal,"
and,_____

hereinafter referred to as the "Surety" ("Sureties") are held and firmly bound to THE CITY OF NEW YORK, hereinafter referred to as the "City" or to its successors and assigns in the penal sum of_____

($ _____) Dollars, lawful money of the United States for the payment of which said sum of money well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, The Principal is about to enter, or has entered, into a Contract in writing with the City for

a copy of which Contract is annexed to and hereby made a part of this bond as though herein set forth in full;

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, his or its representatives or assigns, shall well and faithfully perform the said Contract and all modifications, amendments, additions and alterations thereto that may hereafter be made, according to its terms and its true intent and meaning, including repair and or replacement of defective work and guarantees of maintenance for the periods stated in the Contract, and shall fully indemnify and save harmless the City from all cost and damage which it may suffer by reason of the Principal's default of the Contract, and shall fully reimburse and repay the City for all outlay and expense which the City may incur in making

good any such default and shall protect the said City of New York against, and pay any and all amounts, damages, cost and judgments which may or shall be recovered against said City or its officers or agents or which the said City of New York may be called upon to pay any person or corporation by reason of any damages arising or growing out of the Principal's default of the Contract, then this obligation shall be null and void, otherwise to remain in full force and effect.

The Surety (Sureties), for value received, hereby stipulates and agrees, upon written notice from the City that the City has determined that the Principal is in default of the Contract, to (1) pay the City the cost to complete the contract as determined by the City in excess of the balance of the Contract held by the City, plus any damages or costs to which the City is entitled, up to the full amount of the above penal sum, (2) fully perform and complete the Work to be performed under the Contract, pursuant to the terms, conditions, and covenants thereof, or (3) tender a completion Contractor that is acceptable to the City. The Surety (Sureties) further agrees, at its option, either to notify the City that it elects to pay the city the cost of completion plus any applicable damages and costs under option (1) above, or to commence and diligently perform the Work specified in the Contract, including physical site work, within twenty-five (25) business days after written notice thereof from the City and, if the Surety elects to fully perform and complete the Work, then to complete all Work within the time set forth in the Contract or such other time as agreed to between the City and Surety in accordance with the Contract. If the Surety elects to tender payment pursuant to (1) above, then the Surety shall tender such amount within fifteen (15) business days notification from the City of the cost of completion. The Surety and the City reserve all rights and defenses each may have against the other; provided, however, that the Surety expressly agrees that its reservation of rights shall not provide a basis for non-performance of its obligation to pay the City the cost of completion, to commence and complete all Work as provided herein, or to tender a completion contractor.

The Surety (Sureties), for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety (Sureties) and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or to the said Contract or the Work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or any moneys due or to become due thereunder; and said Surety (Sureties) does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, and waivers, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to subcontractors shall have the same effect as to said Surety (Sureties) as though done or omitted to be done by or in relation to said Principal. Notwithstanding the above, if the City makes payments to the Principal before the time required by the contract that in the aggregate exceed $100,000 or 10% of the Contract price, whichever is less, and that have not become earned prior to the Principal being found to be in default, then all payments made to the Principal before the time required by the Contract shall be added to the remaining contract value available to be paid for the completion of the Contract as if such sums had not been paid to the Principal, but shall not provide a basis for non-performance of its obligation to pay the City the cost of completion, to commence and to complete all Work as provided herein, or to tender a completion contractor

IN WITNESS WHEREOF, The Principal and the Surety (Sureties) have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereunto affixed and these presents to be signed by their proper officers, this

_____ day of _____ 20 _____ .

(Seal)

_____ (L.S.)

Principal

By _____.

(Seal)

Surety

By _____.

_____.

(Seal) Surety

By _____.

_____.

(Seal) Surety

By _____.

_____.

(Seal) Surety

By _____.

_____.

(Seal) Surety

By _____.

Bond Premium Rate _____.

Bond Premium Cost _____.

If the Contractor (Principal) is a partnership, the bond should be signed by each of the individuals who are partners.

If the Contractor (Principal) is a corporation, the bond should be signed in its correct corporate name by a duly authorized officer, agent, or attorney-in-fact.

There should be executed an appropriate number of counterparts of the bond corresponding to the number of counterparts of the Contract.

ACKNOWLEDGMENT OF PRINCIPAL IF A CORPORATION

State of _____County of _____ ss:

On this__day of _____ 20 _____before me personally came_____,
to me known, who, being by me duly sworn did depose and say that he/she resides at_____
_____; that he/she is the_____
of ___the corporation described in and which executed the foregoing instrument; and that he signed his name to the foregoing instrument by order of the directors of said corporation as the duly authorized and binding act thereof.

_____
Notary Public or Commissioner of Deeds.

ACKNOWLEDGMENT OF PRINCIPAL IF A PARTNERSHIP

State of _____County of _____ ss:

On this__day of _____ 20 _____before me personally came_____
to me known, who, being by me duly sworn did depose and say that he/she resides at_____
_____; that he/she is _____ partner of _____, a limited/general partnership existing under the laws of the State of _____, the partnership described in and which executed the foregoing instrument; and that he/she signed his/her name to the foregoing instrument as the duly authorized and binding act of said partnership.

_____
Notary Public or Commissioner of Deeds.

ACKNOWLEDGMENT OF PRINCIPAL IF AN INDIVIDUAL

State of _____County of _____ ss:

On this__day of _____ 20 _____before me personally came_____
to me known, who, being by me duly sworn did depose and say that he/she resides at_____
_____, and that he/she is the individual whose name is subscribed to the within instrument and acknowledged to me that by his/her signature on the instrument, said individual executed the instrument.

_____
Notary Public or Commissioner of Deeds.

Affix Acknowledgments and justification of Sureties

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PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS, That we,

_____

_____

_____

hereinafter referred to as the "Principal" and

_____

_____

hereinafter referred to as the "Surety" ("Sureties") are held and firmly bound to THE CITY OF NEW YORK, hereinafter referred to as the "City" or to its successors and assigns, in the penal sum of:

_____

$_____ .

lawful money of the United States, for the payment of which said sum of money well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal is about to enter, or has entered, into a Contract in writing with the City for:

_____

_____

_____

_____

a copy of which Contract is annexed to and hereby made a part of this bond as though herein set forth in full.

PAYMENT BOND

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, his or its representatives or assigns and other Subcontractors to whom Work under this Contract is sublet and his or their successors and assigns shall promptly pay or cause to be paid all lawful claims for:

a) Wages and compensation for labor performed and services rendered by all persons engaged in the prosecution of the Work under said Contract, and any amendment or extension thereof or addition thereto, whether such persons be agents, servants or employees of the Principal or of any such Subcontractors, including all persons so engaged who perform the work of laborers or mechanics at or in the vicinity of the site of the Project regardless of any Contractual relationship between the Principal or such Subcontractors, or his or their successors or assigns, on the one hand and such laborers or mechanics on the other, but not including office employees not regularly stationed at the site of the Project, and

b) Materials and supplies (whether incorporated in the permanent (construction or not), as well as teams, fuels, oils, implements or machinery furnished, used or consumed by said Principal or any Subcontractors at or in the vicinity of the site of the Project in the prosecution of the Work under said Contract and any amendment or extension thereof or addition thereto; then this obligation shall be null and void; otherwise to remain in full force and effect. This bond is subject to the following additional conditions, limitations and agreements:

c) The Principal and Surety (Sureties) agree that this bond shall be for the benefit of any materialman or laborer having a just claim, as well as the City itself.

d) All persons who have performed labor, rendered services or furnished materials and supplies, as aforesaid, shall have a direct right of action against the Principal and his, its or their successors and assigns, and the Surety (Sureties) herein, or against either or both or any of them and their successors and assigns. Such persons may sue in their own name, and may prosecute the suit to judgment and execution without the necessity of joining with any other person as party plaintiff.

e) The Principal and Surety (Sureties) agree that neither of them will hold the City liable for any judgment for costs or otherwise, obtained against either or both of them by a laborer or materialman in a suit brought by either a laborer or materialman under this bond for moneys allegedly due for performing work or furnishing material.

f) The Surety (Sureties) or its successors and assigns shall not be liable for any compensation recoverable by an employee or laborer under the Workmen's Compensation Law.

PAYMENT BOND

g) In no event shall the Surety (Sureties), or its successors or assigns, be liable for a greater sum than the penalty of this bond or be subject to any suit, action or proceeding hereon that is instituted by any person, firm, or corporation hereunder later than two years after the complete performance of said Contract and final settlement thereof.

The Principal, for himself/herself and his successors and assigns, and the Surety (Sureties), for itself and its successors and assigns, do hereby expressly waive any objection that might be interposed as to the right of the City to require a bond containing the foregoing provisions, and they do hereby further expressly waive any defense which they or either of them might interpose to an action brought hereon by any person, firm or corporation, including Subcontractors, MATERIALMAN and third persons, for work, labor, services, supplies or material performed, rendered, or furnished as aforesaid upon the ground that there is no law authorizing the City to require the foregoing provisions to be placed in this bond.

And the Surety (Sureties) for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety (Sureties) and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or of the said Contract or the Work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any part thereof, or of any Work to be performed, or any moneys due or to become due thereunder; and said Surety (Sureties) does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, Subcontractors, and other transferees shall have the same effect as to said Surety (Sureties) as though done or omitted to be done by or in relation to said Principal.

PAYMENT BOND

IN WITNESS WHEREOF, the Principal and the Surety (Sureties) have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereunto affixed and these presents to be signed by their proper officers, this_____day of_____,_____.

(SEAL) _____(L.S.)
Principal
By: _____

(SEAL) _____
Surety

By: _____

(SEAL) _____
Surety

By: _____

(SEAL) _____
Surety

By: _____

(SEAL) _____
Surety

By: _____

BOND PREMIUM RATE: _____

BOND PREMIUM COST: _____

If the Contractor (Principal) is a partnership, the bond should be signed by each of the individuals who are partners. If the Contractor (Principal) is a corporation, the bond should be signed in its correct corporate name by a duly authorized officer, agent, or attorney-in-fact. There should be executed an appropriate member of counterparts of the bond corresponding to the number of counterparts of the Contract.

PAYMENT BOND

ACKNOWLEDGMENT OF PRINCIPAL - IF A CORPORATION

State of_____County of _____ss:

On this _____ day of _____, _____

before me personally came _____

to me known, who, affirms or being by me duly sworn did depose and say that he/she resides

at_____

_____

that he/she is the _____ of _____
the corporation described in and which executed the foregoing instrument; that he/she knows the seal of said corporation; that one of the seals affixed to said instrument is such seal; that it was so affixed by order of the directors of said corporation, and that he/she signed his name thereto by like order.

_____
Notary Public or Commissioner of Deeds

ACKNOWLEDGMENT OF PRINCIPAL - IF A PARTNERSHIP

State of_____ County of _____ss.:

On this _____day of _____,_____

before me personally appeared _____

to me known and known to me to be one of the members of the firm

of: _____
described in and who executed the foregoing instrument and he/she acknowledged to me that he/she executed the same as and for the act and deed of said firm.

_____
Notary Public or Commissioner of Deeds

PAYMENT BOND

ACKNOWLEDGMENT OF PRINCIPAL - IF AN INDIVIDUAL

State of_____ County of _____SS.:

On this _____ day of _____ , _____

before me personally appeared _____ me known and known to me to be the

person described in and who executed the foregoing instrument and acknowledged that he/she executed

the same.

_____
Notary Public or Commissioner of Deeds

Each executed bond should be accompanied by:

a) appropriate acknowledgments of the respective parties;

b) appropriate duly certified copy of Power of Attorney or other certificate of authority where bond is executed by agent, officer or other representative of Principal or Surety;

c) a duly certified extract from By-Laws or resolutions of Surety under which Power of Attorney or other certificate of authority of its agent, officer or representative was issued; and

d) duly certified copy of latest published financial statement of assets and liabilities of Surety.

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AFFIX ACKNOWLEDGMENTS AND JUSTIFICATIONS OF SURETIES

GENERAL CONDITIONS

ARTICLE 1 - SCOPE AND INTENT

Work Described. The Contractor shall furnish all labor, materials, plant, power, light, heat, fuel, water, tools, appliances, equipment, supplies and other means of construction necessary or proper for performing and completing the Work in accordance with the Contract. The Contractor shall also obtain and pay for all required permits to complete the Work. Any labor, materials and equipment that have been omitted in the description of the Work, but that are necessary or proper for the completion of the Work, shall be furnished by the Contractor at its sole cost and expense. The Contractor shall protect the Work during construction, clean up the Site and maintain the Work until Final Acceptance.

Incidental work. The Contractor shall perform all tasks and pay all costs of cutting, protecting, supporting, maintaining, relocating and restoring all surface, sub-surface, and/or overhead structures, and all other property, including, but not limited to, pipes, conduits, ducts, tubes, chambers, and appurtenances, public or private, in the vicinity of and at the Site of the Work (except that which by law, franchise, permit, contract, consent or other agreement, the owner thereof is required to protect, support, maintain, relocate or restore), repair the same if damaged and restore to their original condition all areas disturbed. The Contractor shall perform all tasks and pay all costs of protecting, supporting, maintaining, relocating, replacing and restoring street equipment owned by the City and under the jurisdiction of the New York City Department of Transportation ("NYCDOT"), whether attached to utility company structures or connected to the underground electrical distribution system, including installing suitable temporary lighting equipment when the maintenance of permanent equipment is not feasible. All work done in connection with street lighting shall be in accordance with the requirements of NYCDOT or, for projects outside the City of New York, a local Authority Having Jurisdiction ("AHJ") over such work.

Duties of the Contractor. The Contractor shall ensure that the requirements of the Contract, including but not limited to, the Contract Drawings and Specifications, are fully and faithfully complied with by all subcontractors, materialmen and workmen at all times, that all of this Work is prosecuted with the utmost diligence, and that all materials are provided promptly in sufficient quantities in order not to delay the Work. The Contractor shall exercise the closest inspection of all materials delivered, promptly returning defective materials without waiting for their rejection by the Engineer. The Contractor shall also become thoroughly familiar with the Contract Drawings and Specifications and shall promptly report to the Engineer all errors, discrepancies or omissions discovered therein. The Contractor shall abide by the decisions and explanations of the Engineer made in regard to such matters.

Contractor Assumes Risk of Loss or Damage. The Contractor agrees to assume the risk and to make no claim on account of any and all loss or damage arising out of the nature of the Work to be done under this Contract, or for any unforeseen obstructions or difficulties which may be encountered in the prosecution of the same, or from the effect of the elements, or from encumbrances on or near the line of the Work.

Local Laws. All materials, appliances and types or methods of construction shall be in accordance with the Contract and shall in no event be less than that necessary to conform to the requirements of the New York City Administrative Code, the Charter of the City of

New York (the "City Charter"), the Rules of the City of New York, and/or the applicable laws and rules of AHJs if the Work occurs outside the City of New York.

Ample quantities. The Contractor shall deliver materials in ample quantities to ensure speedy and uninterrupted progress of the Work in order to complete the Work within the Contract term.

Work and materials. All Work and materials mentioned in the Specifications and not shown on the Contract Drawings, and all Work and materials shown on the Contract Drawings and not mentioned in the Specifications, are to be furnished and performed as if the same were both mentioned in the Specifications and shown on the Contract Drawings.

Necessary and essential Work deemed included. In case any Work or materials shall be required for the more perfect performance of the Work, which are not specifically mentioned, specified or indicated on the Contract Drawings, in the Specifications, or other parts of this Contract, and which in the opinion of the Engineer are necessary and essential to a complete performance of this Contract, such Work or materials shall be deemed included within the requirements of this Contract. The Contractor hereby specifically promises, covenants and agrees to do and perform any and all such Work and to supply any and all such materials as if specifically provided for in this Contract.

Purport of schedules. All schedules are given for the convenience of the Engineer and the Contractor and are not guaranteed to be complete. The Contractor shall assume all responsibility for the making of estimates of the size, kind and quality of materials and equipment included in Work to be performed under this Contract.

Order of Precedence. In the event of an actual conflict among the City of New York Standard Construction Contract, General Conditions, and the Contract Drawings and Specifications, the City of New York Standard Construction Contract will control, followed by the General Conditions, followed by the Contract Drawings and Specifications.

Conflicts between Contract Drawings and Specifications. If the Contract Drawings and/or the Specifications are in conflict, or, if the Contract Drawings or the Specifications, or both the Contract Drawings and the Specifications are not clear as to (a) the method of performing any part of the Work; (b) the types of materials or equipment necessary to perform the Work; or (c) the quantities required, the Contractor shall be deemed to have based its bid upon performing the Work and furnishing materials or equipment in the manner most expensive to the Contractor. If DEP determines that such conflict(s) exist or that a clarification is needed, the DEP will furnish the Contractor with supplementary drawings and/or specifications to address such conflict(s) or necessary clarification. In such event, the Contractor agrees to execute the Work in accordance with such interpretation, and to make no charge or claim for any extra or additional work or damage on account of such interpretation.

Understanding of the Contract Drawings and Specifications. The Contractor expressly declares and acknowledges that, before the signing of this Contract, it has carefully read the entire Contract, together and in connection with the Contract Drawings and Specifications, and that through such reading, the Contractor can determine the Work required pursuant to this Contract. The Contractor agrees that it will not hereafter make any claim or demand upon the City based upon or arising out of any alleged

misunderstanding or misconception of the said requirements, covenants, stipulations and restrictions of the Contract.

Deviations from Contract Drawings and Specifications. No deviation from the Contract Drawings and Specifications will be allowed, unless the same has been previously authorized in writing by the Commissioner or his/her designee.

ARTICLE 2 - PROVISIONS REFERENCED WITH INFORMATION FOR BIDDERS AND THE CITY OF NEW YORK STANDARD CONSTRUCTION CONTRACT

(A) SCHEDULE "A" AND LIQUIDATED DAMAGES

1. Schedule “A” requirements for the Contract follow these General Conditions.

2. In view of the difficulty of accurately ascertaining the loss(es) which the City will suffer because of the Contractor exceeding substantial completion time for the Work, or failing to complete a designated milestone within the scheduled time for completion of such milestone, or failing to meet other requirements for which liquidated damages have been provided, the amounts set forth in Schedule A are hereby fixed and agreed to as liquidated damages that the City will suffer by reason of any such failure, and not as a penalty. The City of New York Standard Construction Contract, incorporated herein, shall govern with respect to assessment of all liquidated damages provided for in this Contract, not just those for failure to timely achieve substantial completion, unless specifically detailed in a Specification where any individual liquidated damages are specified.

(B) FEDERAL EXCISE TAXES

Pursuant to Section 37 of the "Information for Bidders", the Contractor may be exempted from the payment of Federal Excise Taxes in accord with the following:

1. An Excise Tax Exemption Certificate will be provided by DEP where requested by the Contractor, for items that fall within the scope of the Contract and may be exempt from the Federal Excise Tax.

(C) LABOR

Where labor is used under the Contract for intermediate skills and for which no prevailing rate of wages is herein certified, and where there is in existence at the time the Contract is entered into a labor agreement between the Contractor and a duly recognized labor union recognizing the existence of such skills, the Contractor shall pay not less than the rate so agreed upon between the Contractor and such labor organization for such skills.

(D) PARTIAL PAYMENTS FOR MATERIALS IN ADVANCE OF THEIR INCORPORATION IN THE WORK PURSUANT TO ARTICLE 42 OF THE CITY OF NEW YORK STANDARD CONSTRUCTION CONTRACT

In order to better ensure the availability of materials, fixtures and equipment when needed for the Work, the Commissioner may authorize partial payment for certain materials, fixtures and equipment, prior to their incorporation in the Work, but only in

strict accordance with and subject to all the terms and conditions set forth in the following subdivisions numbered 1 to 15, unless another method of payment is elsewhere provided in the Specifications for specified materials, fixtures or equipment. For purposes of this Article 2(D), when the term “materials” is used, it shall also apply to fixtures and/or equipment.

1. The Contractor shall submit to the Commissioner a written request for payment for materials purchased or to be purchased for which the Contractor desires to be paid prior to their actual incorporation in the Work. The request shall be accompanied by a schedule of the types and quantities of materials, and shall state whether such materials are to be stored on or off the Site.

2. Where the materials are to be stored off the Site, they shall be stored at a place other than the Contractor's premises (except with the written consent of the Commissioner) and under the conditions prescribed or approved by the Commissioner. The Contractor shall set apart and separately store at the place or places of storage all materials and shall clearly mark same "Property of the City of New York", and shall not at any time move any of said materials to another off-site place of storage without the prior written consent of the Commissioner. Materials may be removed from their place of storage off the Site for incorporation in the Work upon approval of the Resident Engineer.

3. Where materials are to be stored at the Site, they shall be stored at such locations as shall be designated by the Resident Engineer and only in such quantities as, in the opinion of the Resident Engineer, will not interfere with the proper performance of the Work by the Contractor or by other contractors then engaged in performing Work on the Site. Such materials shall not be removed from their place of storage on the Site except for incorporation in the Work, without the approval of the Resident Engineer.

4. All costs, charges and expenses arising out of the storage of such materials shall be borne by the Contractor and the City hereby reserves the right to retain out of any partial or final payment made under the Contract an amount sufficient to cover such costs, charges and expenses. There shall be no increase in the Contract price for such costs, charges and expenses and the Contractor shall not make any claim or demand for compensation for provision of such storage.

5. The Contractor shall pay any and all costs of handling and delivery of materials to the place of storage, to any approved other place of storage, and from the place of storage to the Site of the Work and the City shall have the right to retain from any partial or final payment an amount sufficient to cover the cost of such handling and delivery.

6. In the event that the whole or any part of these materials are lost, damaged or destroyed in advance of their satisfactory incorporation in the Work, the Contractor, at its sole cost and expense, shall promptly replace such lost, damaged or destroyed materials with materials of the same character and quality.

7. Should any of the materials paid for by the City hereunder be subsequently rejected or incorporated in the Work in a manner not in accordance with the Contract, the Contractor shall remove and replace such rejected or improperly incorporated material with materials complying with the Contract. Until such materials are replaced, the City will deduct from the value of the materials or from

any other money due to the Contractor, the amount paid by the City for such rejected or improperly incorporated materials.

8. Payment for the cost of materials made hereunder shall not be deemed to be an acceptance of such materials in accordance with the Contract, and the Contractor always retains and must comply with its duty to deliver to the Site and properly incorporate into the Work only materials which comply with the Contract.

9. The Contractor shall retain any and all risks in connection with the damage, destruction or loss of the materials paid for hereunder to the time of delivery of the same to the Site of the Work and their proper incorporation in the Work in accordance with the Contract.

10. The Contractor shall comply with all applicable laws, rules and regulations of any governmental body or agency pertaining to the purchase, allocation and use of materials.

11. When requesting payment for such materials, the Contractor shall submit with the partial payment request, duly authenticated documents of title, such as bills of sale, invoices or warehouse receipts, all in quadruplicate. The Contractor shall provide along with its partial payment request for such materials, appropriate documentation transferring title to such materials from the Contractor to the City. In the event that the invoices state that the material has been purchased by a subcontractor, the Contractor shall also provide appropriate documentation demonstrating transfer of title to such materials from the subcontractor to the Contractor.

12. Where the Contractor, with the approval of the Commissioner, has purchased unusually large quantities of materials in order to assure their availability for the Work, the Commissioner, at his or her option, may waive the requirements of subdivision 11, provided the Contractor furnishes evidence in the form of an affidavit of the Contractor, and such other proof as the Commissioner may require, that it is the sole owner of such materials and has purchased them free and clear of all liens and other encumbrances. In such event, the Contractor shall pay for such materials and submit proof thereof, in the same manner as provided in subdivision 11 hereof, within seven (7) days after receipt of payment therefor. Failure on the part of the Contractor to submit satisfactory evidence that it has paid in full for all such materials shall preclude it from any payments under the Contract.

13. The Contractor shall include in any succeeding partial payment requisition a summary of materials stored which shall set forth the quantity and value of materials in storage, on or off the Site, at the end of each preceding payment period; the amount removed for incorporation in the Work; the quantity and value of materials delivered during the current period and the total value of materials on hand for which payment thereof will be included in the current payment requisition.

14. Upon proof to the satisfaction of the Commissioner of the actual cost of such materials and upon submission of proper proof of title as required under subdivisions 11 and/or 12 hereof, DEP will pay the Contractor Eighty Five Percent (85%) of the value of such materials, however, in no event shall the Eighty Five Percent (85%) payment exceed the estimated cost of such materials included in the approved detailed estimate breakdown submitted in accordance with Article 41 of the City of New York Standard Construction Contract; if the value exceeds such

estimated cost, the City will pay only Eighty Five Percent (85%) of such approved estimated cost.

15. Upon the incorporation in the Work of any such materials which have been paid for in advance of such incorporation in accordance with the foregoing provisions, payment will be made for such materials incorporated in the Work pursuant to Article 42 or Article 45 of the City of New York Standard Construction Contract, less any sums paid pursuant to subdivision 14 herein.

(E) CONFLICTS OF INTEREST

The City Charter in relation to conflicts of interest (Chapter 68, Section 2604) provides, among a number of safeguards, that:

(1) No employee or person whose salary is payable in whole or in part from the City treasury shall accept any valuable gift, whether in the form of service, loan, thing or promise, or any other form from any person, firm or corporation which to his or her knowledge is interested, directly or indirectly, in any manner whatsoever in business dealings with the City; and

(2) Any violation of any of the provisions of this section shall, at the option of the Comptroller, render forfeit and void the Contract, work, business, sale or transaction affected.

Other sections of the City Charter, the New York City Administrative Code and the New York State Penal Law are applicable in implementing the basic conflicts of interest section and under certain circumstances penalties may be invoked against the donor as well as the recipient of any form of valuable gift.

Notice is hereby given that sections of the City Charter, the New York City Administrative Code and the New York State Penal Law alluded to herein shall apply under the terms of this Contract to circumstances relevant to conflicts of interest and shall be extended in application to subcontractors authorized to perform Work, labor and services pursuant to this Contract and further it shall be the duty and responsibility of the Contractor to so inform its subcontractors.

ARTICLE 3 – CONTRACT DRAWINGS AND SPECIFICATIONS

Related contracts. The Contractor shall study the requirements of any related contracts insofar as they affect the Work or as the Work may affect that of the related contracts and the Contractor will be required to coordinate its Work with that of all other related contractors performing work on such related contracts. The Contractor shall coordinate deliveries in order to avoid delaying or impeding the progress of the Work of any related contractor.

Contract Drawings and Specifications furnished to Contractor. After the Contract has been executed, the Contractor will be furnished with four sets of paper prints of the Contract Drawings and four set of Specifications of the Contract. The Contractor will also be furnished with one set of paper prints and Specifications of any related contracts.

Additional copies. Additional sets of Contract Drawings and Specifications may be issued provided such documents are available in sufficient quantity.

Supplementary drawings. When the Engineer decides to show more fully the Work to be done, or to show required changes, or to rectify errors which may have been discovered, drawings to be known as supplementary drawings and revision sheets with Specifications pertaining thereto will be provided to the Contractor. Changes of a minor nature may be made on the Contract Drawings, in which case the revised Contract Drawings will be issued to the Contractor. The supplementary drawings and revised Contract Drawings shall be as fully binding as the original Contract Drawings, and if such supplementary or revised Contract Drawings require either less or more than the estimated quantities of work, credit to the City or compensation therefor to the Contractor shall be subject to the terms of the City of New York Standard Construction Contract.

Information to subcontractors, manufacturers and others. The Contractor shall furnish each of its subcontractors and materialmen copies of such portions of the Contract, together with all necessary drawings and copies of Specifications, as may be required for the portion of the Work that the respective subcontractors or materialmen shall be responsible for.

Contractor to check drawings and other data. The Contractor shall verify all dimensions, quantities and details shown on Contract Drawings, plans, sketches, schedules, or on any other data received from the Engineer and shall notify the Engineer of all errors, omissions, conflicts and discrepancies found therein.

Failure to discover or correct errors, conflicts or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory work, faulty construction or improper operation resulting therefrom nor from rectifying such conditions at its sole cost and expense. Figures shall be used in preference to scaled dimensions and large scale drawings in preference to small scale drawings.

"Directed", etc. Whenever reference is made in the Contract to the Work or its performance, the terms "directed", "required", "permitted", "ordered", "designated", "prescribed", "determined", and words of similar import shall imply the direction, requirement, permission, order, designation, or prescription of the Commissioner.

"Approved", etc. "Approved", "acceptable", "satisfactory", and words of similar import shall mean approved, acceptable or satisfactory to the Commissioner.

ARTICLE 4 - TEMPORARY STRUCTURES

Contractor's Field Office. The Contractor shall, during the period of construction, erect or provide for its own use a temporary field office in which readily accessible copies of all Contract Documents and approved Shop and Working Drawings shall be kept. The field office shall be located at the Site, where directed by the Engineer, and shall be provided with the equipment necessary for a functional field office, as approved by the Engineer.

Material Sheds. Material sheds used by the Contractor for the storage of tools, materials and equipment shall be kept at all locations so as not to interfere at any time with the progress of the Work, the location of which shall be subject to the absolute discretion of the Engineer.

Construction of Temporary Structures. All of the Contractor's temporary structures shall be fully constructed and have a neat appearance and shall be painted a uniform gray, unless another color is ordered by the Engineer.

Contractor's Sign. The Contractor shall post and keep posted at the Site, outside of the field office, exterior fence or wall, a legible sign with the full name and address of the Contractor, and the telephone numbers of responsible representatives of the Contractor who can be reached in the event of an emergency.

Private property. When the Contractor temporarily occupies property adjacent to the Work, it shall provide the Engineer with certified copies of agreements which permit the use of such land, unless such permission has been obtained by DEP prior to bidding.

Land for Contractor's use. The Engineer shall in all cases determine the portion of the Site to be used by the Contractor for storage, plant or other purposes.

Obstructions, access. The Contractor shall not obstruct any highway or access thereto from private property except as otherwise specified in the Specifications. The necessary facilities and safeguards to comply with this requirement shall be provided and maintained at the sole cost and expense of the Contractor. If it becomes necessary to remove and restack materials to avoid impeding the progress of any part of the Work or interfering with the work to be done by any other contractor, the Contractor shall remove and restack such materials at no additional cost to the City.

Trespassing prohibited. All employees and subcontractors of the Contractor are prohibited from trespassing on private or public property except where the law permits such entrance for a purpose such as underpinning or otherwise protecting adjoining structures. If it becomes necessary for employees of the Contractor or its subcontractor(s) to enter onto private property for the above stated reasons, the Contractor shall advise DEP of such need. Employees of the Contractor or subcontractor may not enter onto the property until the requisite permission has been obtained and proper notice furnished to the property owner.

ARTICLE 5 - CONTRACTOR'S SUPERINTENDENT

The Contractor shall employ and retain at the Site of the Work, from the commencement until the completion of the Work, a superintendent competent and capable of maintaining proper supervision and care of the Work and acceptable to the Engineer, and who, in the

absence of the Contractor and irrespective of any superintendent or foreman employed by any subcontractor, shall carry out the directions of the Engineer.

ARTICLE 6 - SURVEYS

Lines and grades. All Work shall be constructed according to the lines and grades shown on the Contract Drawings and approved by the Engineer. The Engineer will establish a baseline and benchmark. The Contractor shall establish all other lines, elevations and grades required for the Work and be solely responsible for the accuracy thereof. The Engineer shall be notified prior to the establishment of any line, elevation or grade.

Safeguarding marks. The Contractor shall safeguard all points, stakes, grade marks, monuments and bench marks made or established on the Work, re-establish same if disturbed and bear the entire expense of rectifying work improperly installed due to not maintaining, not protecting or removing without authorization such established points, stakes, marks and monuments.

Survey before completion of structure. The Contractor for general construction work shall file with the New York City Department of Buildings in the borough where Work is being done or with the New York City Department of Small Business Services, or the local AHJ, a survey by a duly licensed surveyor showing the location of the new structure before completion of the structure, pursuant to Section 28.118.4 of the New York City Building Code or applicable local codes or regulations for projects outside the City. This survey shall show the location of the structure, the elevation of the first tier of beams or of the first floor, the finished grades of the open spaces on the plot, the established curb level and the location of all other structures on the plot, together with the location and boundaries of the lot or plot upon which the structure is constructed. One copy of the application and the survey shall be furnished to the Resident Engineer.

ARTICLE 7 - CONTRACTOR'S DAILY REPORTS

As soon as the Contractor has started Work on the Project, it shall submit to the Engineer written daily reports of the Work performed the previous day by any of its employees, including the employees of its subcontractors.

The reports shall be prepared by the Contractor's Superintendent and shall bear his or her signature. Each report shall contain the following information:

1. The type of materials and/or major equipment being installed by the Contractor and the total number of employees working in each category on that particular day.

2. The names of the subcontractors working and the type of materials and/or major equipment being installed by each together with the total number of employees working for each subcontractor on that particular day.

3. The major construction equipment being used by the Contractor and/or any subcontractor.

ARTICLE 8 – CONTRACTOR’S PLANT

The Contractor shall ensure that it obtains, provides and maintains a sufficient construction plant in close proximity to the Work all times during the progress of the Work in order to meet the demands of the Work, with ample margin for emergencies or

overload. The plant shall be of such capacity conducive to ensure the completion of the Work within the time stipulated in the Contract.

The Contractor may occupy any unused location within the area controlled by DEP with its construction plant, subject to the approval of the Engineer. If the Contractor desires to use additional area outside of that controlled by DEP, the Contractor shall arrange for the use of such area at its sole cost and expense. The location of the Contractor's stationary and mobile equipment shall be subject to the Engineer's approval.

The Engineer shall have the right to reject or condemn any construction plant, staging area, which, in his/her opinion, is unsafe, improper or inadequate. Whether or not the Engineer exercises this right, the Contractor shall not be relieved from its sole responsibility for the safe, proper and lawful construction, maintenance and use of such construction plant, staging area, or for the adequacy of such plant.

The Contractor shall, at its sole cost and expense, stack and restack as needed, all Project materials at locations that are easily accessible and convenient to the Project Site and that do not impede the progress of the Work, or as directed by the Engineer. The Contractor shall also take appropriate measures required to secure and protect all such materials from loss. Should the Contractor wish to stack any project materials on publicly mapped streets, it shall comply with all applicable local, state and federal laws, rules and regulations.

ARTICLE 9 - SECURITY GUARDS AND FIRE GUARDS ON THE SITE

The requirements of the Contract for security guard services and the responsibilities of the Contractor for safeguarding and protecting the Work and Site shall be in accordance with, but not limited to, the respective Division 01 Specifications.

The Contractor will be responsible for safeguarding and protecting its own Work, materials, tools, and equipment. When the provision of security guards is required, each Security Guard shall be required to possess a "Certificate of Fitness" issued by the Fire Department to qualify and serve as a Fire Guard whenever the structure under construction, alteration, or demolition exceeds the prescribed area and height requirements specified in Rule 2.4.1 of the "Rules for Erection, Alteration, Repair, Excavation for and Demolition of Buildings" adopted by the New York City Board of Standards and Appeals under Calendar Number 784-41SR. Each Security Guard shall, during his or her tour of duty, perform the duties of Fire Guards in addition to his or her security obligations.

The use of watchdogs requires the express written approval of DEP and at DEP’s sole discretion.

ARTICLE 10 - CERTIFICATES OF OCCUPANCY AND/OR COMPLETION

If the project structure is a building that is subject to the jurisdiction of the New York City Department of Buildings or similar local AHJ, before substantial completion of the project structure, the Commissioner will file an application for a Certificate of Occupancy or Certificate of Completion with the New York City Department of Buildings or New York City Department of Small Business Services or the local AHJ for project locations outside New York City, as applicable.

In connection with the application for Certificate of Occupancy or Certificate of Completion and before final payment is issued, the Contractor shall arrange for all final inspections by the inspection staffs of the New York City Department of Buildings, New York City Department of Small Business Services and other local AHJs for project locations outside New York City, as applicable, and shall do such remedial work and construction as is required and obtain all reports by such inspection staffs in order that the Certificate of Occupancy and/or Certificate of Completion or other similar certificate if occurring outside the City of New York be procured without delay.

ARTICLE 11 - COORDINATION AMONG CONTRACTORS

The Contractor is alerted to the importance of coordination and cooperation if other contractors are operating at or near the project Site. It is essential to the expeditious completion of this Project that the Contractor meet with any such other contractors at an early stage in the Work, to determine respective space requirements in areas where their operations or installations are in close proximity or are likely to be in conflict or interfere with each other, and to set up regular meetings as Shop Drawings are developed.

The Engineer will provide written notice of the time, place, and agenda of each such scheduled meeting.

The Contractor may also request a meeting by submitting a request for meeting to the Engineer.

Attendance at Coordination Meetings. To allow an orderly sequence of operations agreeable to all contractors, regular meetings shall be scheduled for the purpose of modifying work schedules and to address potential conflicts in work arrangements so that work stoppages and delays may be avoided. Coordination Meetings shall also be opportunities to prepare and circulate coordination drawings for the use and guidance of each contractor.

The Coordination Meetings will be arranged through the Engineer and shall be separate from and in addition to the regular job progress meetings. If it is desired that the architectural or engineering consultants be present at such meeting, this request should be directed to the Engineer.

The Contractor shall only send representatives to the meeting who have the competence and authority to make necessary decisions. Their statements shall commit the Contractor to the procedures, sequence of operations, and time schedules agreed upon.

The requirement to attend and effectively participate in all Progress and Coordination Meetings is subject to strict enforcement by the Commissioner. Failure to be represented at any of these meetings, when scheduled or approved by the Engineer, shall subject the Contractor to liability for any and all damages, delays, costs of alterations, etc., arising from the fact that it or its representatives were not present to coordinate its Work with the work that was scheduled, arrangements on or procedures developed at the meeting or meetings in question.

If, for compelling reasons, Contractor finds that its representative cannot attend a scheduled meeting, it shall give timely notice to the Engineer so that the meeting may be rescheduled.

Where procedures have been agreed upon and coordination drawings accepted by all contractors concerned, Contractor shall adhere to such drawings and procedures, both as to time and performance. No claim of delay or damages by a contractor, if it fails to comply, will be entertained by the Commissioner.

Contractor shall maintain at the Site sufficient competent personnel for the purpose of preparing layout and coordination drawings. Where such drawings are to be prepared by subcontractors, the subcontractor shall have the required personnel on Site in order to measure and asses proper, practical solutions found for problems arising from interferences, etc. and so that proper coordination among trades can be achieved.

ARTICLE 12 - PUBLIC DISSEMINATION OF INFORMATION

The Contractor agrees to hold confidential, both during and after the completion or termination of this Contract, all of the reports, information, or data, furnished to, or prepared, assembled or used by, the Contractor under this Contract. The Contractor agrees to maintain the confidentiality of such reports, information, or data by using a reasonable degree of care, and using at least the same degree of care that the Contractor uses to preserve the confidentiality of its own confidential information. The Contractor agrees that such reports, information, or data shall not be made available to any person or entity without the prior written approval of DEP. The obligation under this Article to hold reports, information or data confidential shall not apply where the Contractor is legally required to disclose such reports, information or data by virtue of a subpoena, court order or otherwise ("disclosure demand"), provided that the Contractor complies with the following: (1) the Contractor shall provide advance notice to the Commissioner, in writing or by e-mail, that it received a disclosure demand for such reports, information or data and (2) if requested by DEP, the Contractor shall not disclose such reports, information or data until the City has exhausted its legal rights, if any, to prevent disclosure of all or a portion of such reports, information, or data. The previous sentence shall not apply if the Contractor is prohibited by law from disclosing to DEP the disclosure demand for such reports, information or data.

The Contractor shall restrict access to confidential information to persons who have a legitimate work-related purpose to access such information. The Contractor agrees that it will instruct its officers, employees, and agents to maintain the confidentiality of any and all information required to be kept confidential by this Contract.

The Contractor, and its officers, employees, and agents shall notify DEP, at any time either during or after completion or termination of this Contract, of any intended statement to the press or any intended issuing of any material for publication in any media of communication (print, news, television, radio, Internet, etc.) regarding the services provided or the data collected pursuant to this Contract at least twenty-four (24) hours prior to any statement to the press or at least five (5) business days prior to the submission of the material for publication, or such shorter periods as are reasonable under the circumstances. The Contractor may not issue any statement or submit any material for publication that includes confidential information as prohibited by this Article.

SCHEDULE A

GENERAL CONDITIONS TO CONSTRUCTION CONTRACT
(INCLUDING GENERAL CONDITIONS RELATING TO ARTICLE 22 -- INSURANCE)

CONTRACT CSO-FC-DF

PART I. REQUIRED INFORMATION

INFORMATION FOR BIDDERS **BID BOND** The **Contractor** shall obtain a bid bond in the amount indicated to the right.	5 % of Bid
INFORMATION FOR BIDDERS **PERFORMANCE AND PAYMENT BONDS** The **Contractor** shall obtain performance and payment bonds in the amount indicated to the right.	100 % of Bid
CONTRACT ARTICLE 14. **DATE FOR SUBSTANTIAL COMPLETION** The **Contractor** shall substantially complete the **Work** in the number of calendar days indicated to the right.	1,280 consecutive calendar days
CONTRACT ARTICLE 15. **LIQUIDATED DAMAGES** If the **Contractor** fails to substantially complete the **Work** within the time fixed for substantial completion plus authorized time extensions or if the **Contractor**, in the sole determination of the **Commissioner**, has abandoned the **Work**, the **Contractor** shall pay to the **City** the amount indicated to the right.	$ 8584 for each consecutive calendar day over substantial completion time
Section 01 32 10 – Progress Schedule Liquidated Damages	$ 500 per day for delay of submittals
Section 01 33 00 - Submittal Procedures Liquidated Damages	$1,500 per each additional submission of a Shop Drawing after the third submission.

CONTRACT ARTICLE 17. **SUB-CONTRACTOR** The **Contractor** shall not make subcontracts totaling an amount more than the percentage of the total **Contract** price indicated to the right.	Not to exceed __40_% of the **Contract** price
CONTRACT ARTICLE 21. **RETAINAGE** The **Commissioner** shall deduct and retain until the substantial completion of the **Work** the percent value of the **Work** indicated to the right.	__5_% of the value of the **Work**
CONTRACT ARTICLE 22. **(Per Directions Below)**	
CONTRACT ARTICLE 24. **DEPOSIT GUARANTEE** As security for the faithful performance of its obligations, the **Contractor**, upon filing its requisition for payment on **Substantial Completion**, shall deposit with the **Commissioner** a sum equal to the percentage of the **Contract** price indicated to the right.	1% of **Contract** price
CONTRACT ARTICLE 24. **PERIOD OF GUARANTEE** Periods of maintenance and guarantee other than the period set forth in Article 24.1 are indicated to the right.	
CONTRACT ARTICLE 74. **STATEMENT OF WORK** The **Contractor** shall furnish all labor and materials and perform all **Work** in strict accordance with the **Contract Drawings**, **Specifications,** and all **Addenda** thereto**.**	Insert the Required Information Below.

CONTRACT ARTICLE 75. **COMPENSATION TO BE PAID TO CONTRACTOR** The **City** shall pay and the **Contractor** shall accept in full consideration for the performance of the **Contract**, subject to additions and deductions as provided herein, the total sum **shown in the column to the right,** this said sum being the amount at which the **Contract** was awarded to the **Contractor** at a public letting thereof, based upon the **Contractor's** bid for the **Contract.**	Amount for which the **Contract** was awarded: $ _____ [Agency: If the Bid Price, or any portion thereof, is based on unit prices, insert the words "Not to Exceed" before the amount.]

(GENERAL CONDITIONS RELATING TO ARTICLE 22 -- INSURANCE)

PART II. TYPES OF INSURANCE, MINIMUM LIMITS AND SPECIAL CONDITIONS

Note: All certificate(s) of insurance submitted pursuant to Contract Article 22.3. 3 must be accompanied by a Certification by Broker consistent with Part III below and include the following information:

- **For each insurance policy, the name and NAIC number of issuing company, number of policy, and effective dates;**
- **Policy limits consistent with the requirements listed below;**
- **Additional insureds or loss payees consistent with the requirements listed below; and**
- **The number assigned to the Contract by the City (in the "Description of Operations" field).**

Insurance indicated by a blackened box (■) or by X in a ☐ to left will be required under this contract

Types of Insurance (per Article 22 in its entirety, including listed paragraph)	Minimum Limits and Special Conditions
■ Commercial General Liability Art. 22.1.1	The minimum limits shall be $___10,000,000_____ per occurrence, $_____2,000,000_____ for personal and advertising injury, and $_____20,000,000_____ per project aggregate applicable to this Contract unless the Work requires a permit from the Department of Buildings and greater limits of Commercial General Liability Insurance are required pursuant to 1 RCNY section 101-08. Additional Insureds: 1. City of New York, including its officials and employees, with coverage at least as broad as ISO Forms CG 20 10 and CG 20 37, and 2. All person(s) or organization(s), if any, that Article 22.1.1(b) of the **Contract** requires to be named as Additional Insured(s), with coverage at least as broad as ISO Form CG 20 26. The Additional Insured endorsement shall either specify the entity's name, if known, or the entity's title (e.g., Project Manager). 3. New York State Environmental Facilities Corp. 4. New York City Municipal Water Finance Authority

■ Workers' Compensation Art. 22.1.2 ■ Disability Benefits Insurance Art. 22.1.2 ■ Employers' Liability Art. 22.1.2 ☐ Jones Act Art. 22.1.3 ☐ U.S. Longshoremen's and Harbor Workers Compensation Act Art. 22.1.3	Workers' Compensation, Employers' Liability, and Disability Benefits Insurance: Statutory per New York State law without regard to jurisdiction. **Note**: The following forms are acceptable: (1) New York State Workers' Compensation Board Form No. C-105.2, (2) State Insurance Fund Form No. U-26.3, (3) New York State Workers' Compensation Board Form No. DB-120.1 and (3) Request for WC/DB Exemption Form No. CE-200. The City will not accept an ACORD form as proof of Workers' Compensation or Disability Insurance. Jones Act and U.S. Longshoremen's and Harbor Workers' Compensation Act: Statutory per U.S. law.
■ Builders Risk Art. 22.1.4	100 % of total value of **Work** **Contractor** the Named Insured; the **City,** New York State Environmental Facilities Corporation, and New York City Municipal Water Finance Authority, both an Additional Insured and one of the loss payees as its interests may appear. Note: Builders Risk Insurance may terminate upon **Substantial Completion** of the **Work** in its entirety.
■ Commercial Auto Liability Art. 22.1.5	$ 2,000,000 per accident combined single limit If vehicles are used for transporting hazardous materials, the **Contractor** shall provide pollution liability broadened coverage for covered vehicles (endorsement CA 99 48) as well as proof of MCS 90

■ Contractors Pollution Liability Art. 22.1.6	$___5,000,000_____ per occurrence $____10,000,000_____ aggregate Additional Insureds: 1. City of New York, including its officials and employees, and 2. New York State Environmental Facilities Corporation 3. New York City Municipal Water Finance Authority
☐ Marine Protection and Indemnity Art. 22.1.7(a)	$_____ per occurrence $_____ aggregate Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____
☐ Hull and Machinery Insurance Art. 22.1.7(b)	$_____ per occurrence $_____ aggregate Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____
☐ Marine Pollution Liability Art. 22.1.7(c)	$_____ each occurrence Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____

[OTHER] Art. 22.1.8 □ _____	*[If other type(s) of insurance need to be required under the **Contract**, the Contracting Agency should (a) check the box and fill in the type of insurance in left-hand column, and (b) in this right-hand column, specify appropriate limit(s) and appropriate Named Insured and Additional Insured(s). Note that if Railroad Protective Liability Insurance is required, the appropriate Named Insured is the owner of the railroad and there are no additional insureds.]*
[OTHER] Art. 22.1.8 □ _____	*[See directly above.]*

SCHEDULE A

GENERAL CONDITIONS TO CONSTRUCTION CONTRACT

PART III. BROKER'S CERTIFICATION

CERTIFICATES OF INSURANCE

Instructions to New York City Agencies, Departments, and Offices

All certificates of insurance (except certificates of insurance solely evidencing Workers' Compensation Insurance, Employer's Liability Insurance, and/or Disability Benefits Insurance) must be accompanied by one of the following:

(1) the Certification by Insurance Broker or Agent on the following page setting forth the required information and signatures;

-- OR --

(2) copies of all policies as certified by an authorized representative of the issuing insurance carrier that are referenced in such certificate of insurance. If any policy is not available at the time of submission, certified binders may be submitted until such time as the policy is available, at which time a certified copy of the policy shall be submitted.

SCHEDULE A

CITY OF NEW YORK
CERTIFICATION BY INSURANCE BROKER OR AGENT

The undersigned insurance broker or agent represents to the City of New York that the attached Certificate of Insurance is accurate in all material respects.

_____
[Name of broker or agent (typewritten)]

_____
[Address of broker or agent (typewritten)]

_____
[Email address of broker or agent (typewritten)]

_____
[Phone number/Fax number of broker or agent (typewritten)]

_____
[Signature of authorized official, broker, or agent]

_____
[Name and title of authorized official, broker, or agent (typewritten)]

State of …….)
) ss.:
County of …….)

Sworn to before me this _____ day of _____ 20___

_____
NOTARY PUBLIC FOR THE STATE OF _____

SCHEDULE A
(GENERAL CONDITIONS TO CONSTRUCTION CONTRACT)

PART IV. ADDRESS OF COMMISSIONER

Wherever reference is made in Article 7 or Article 22 to documents to be sent to the **Commissioner** (e.g., notices, filings, or submissions), such documents shall be sent to the address set forth below or, in the absence of such address, to the **Commissioner's** address as provided elsewhere in this **Contract**.

[**Note to Contracting Agency**: Fill in Risk Manager, ACCO or other person responsible for insurance]

NYC Department of Environmental Protection
Office of the Agency Chief Contracting Officer
59-17 Junction Blvd., 17th Floor Bid Room
Flushing NY, 11373
Email: insurance@dep.nyc.gov

NEW YORK CITY
PREVAILING WAGE RATES
Labor Law §220 – Schedule of Prevailing Wages

Notes:

1. The prime Contractor and its Subcontractors shall pay the applicable and lawful prevailing wages and supplements to workers at the time work is performed.
2. The latest Labor Law Prevailing Wage Schedules are available at the NYC Office of the Comptroller's web site link below.

   https://comptroller.nyc.gov/services/for-the-public/nyc-wage-standards/wage-schedules/

3. Changes in wage rates or supplements resulting from changes to the prevailing wages shall not be the basis for a change in the Contract price.

NO TEXT ON THIS PAGE

Note: The following is a listing of those trades expected to utilized on this project. If a Contractor proposes to use an alternative trade, he must notify the DEP Contract Compliance Office at 718-595-3211.

Contract(s): _____

Description: _____

SCHEDULE OF WORKERS, MECHANICS AND LABORERS
(Listed by Individual Contract)

NO TEXT ON THIS PAGE

LABOR LAW ARTICLE 8 - NYC PUBLIC WORKS

Workers, Laborers and Mechanics employed on a public work project must receive not less than the prevailing rate of wage and benefits for the classification of work performed by each upon such public work. Pursuant to New York Labor Law Article 8 the Comptroller of the City of New York has promulgated this schedule solely for Workers, Laborers and Mechanics engaged by private contractors on New York City public work projects. Prevailing rates are required to be annexed to and form part of the public work contract pursuant to Labor Law section 220 (3).

This schedule is a compilation of separate determinations of the prevailing rate of wage and supplements made by the Comptroller for each trade classification listed herein pursuant to Labor Law section 220 (5). The source of the wage and supplement rates, whether a collective bargaining agreement, survey data or other, is listed at the end of each classification.

Agency Chief Contracting Officers should contact the Bureau of Labor Law's Classification Unit with any questions concerning trade classifications, prevailing rates or prevailing practices with respect to procurement on New York City public work contracts. Contractors are advised to review the Comptroller's Prevailing Wage Schedule before bidding on public work contracts. Contractors with questions concerning trade classifications, prevailing rates or prevailing practices with respect to public work contracts in the procurement stage must contact the contracting agency responsible for the procurement.

Any error as to compensation under the prevailing wage law or other information as to trade classification, made by the contracting agency in the contract documents or in any other communication, will not preclude a finding against the contractor of prevailing wage violation.

Any questions concerning trade classifications, prevailing rates or prevailing practices on New York City public work contracts that have already been awarded may be directed to the Bureau of Labor Law's Classification Unit by calling (212) 669-4443. All callers must have the agency name and contract registration number available when calling with questions on public work contracts. Please direct all other compliance issues to: laborlaw@comptroller.nyc.gov or Bureau of Labor Law, Attn: Paul Brumlik, Office of the Comptroller, 1 Centre Street, Room 651, New York, N.Y. 10007.

Pursuant to Labor Law § 220 (3-a) (a), the appropriate schedule of prevailing wages and benefits must be posted in a prominent and accessible place at all public work sites along with the Construction Poster provided on our web site at comptroller.nyc.gov/wages. In addition, covered employees must be given the appropriate schedule of prevailing wages and benefits along with the Worker Notice provided on our web site at the time the public work project begins, and with the first paycheck to each such employee after July first of each year.

This schedule is applicable to work performed during the effective period, unless otherwise noted. Changes to this schedule are published on our web site comptroller.nyc.gov/wages. Contractors must pay the wages and supplements in effect when the worker, laborer, mechanic performs the work. Preliminary schedules for future one-year periods appear in the City Record on or about June 1 each succeeding year. Final schedules appear on or about July 1 in the City Record and on our web site comptroller.nyc.gov/wages.

Prevailing rates and ratios for apprentices are published in the Construction Apprentice Prevailing Wage Schedule. Pursuant to Labor Law § 220 (3-e), only apprentices who are individually registered in a bona fide program to which the employer contractor is a participant, registered with the

New York State Department of Labor, may be paid at the apprentice rates. Apprentices who are not so registered must be paid as journey persons.

New York City public work projects awarded pursuant to a Project Labor Agreement ("PLA") in accordance with Labor Law section 222 may have different labor standards for shift, premium and overtime work. Please refer to the PLA's pre-negotiated labor agreements for wage and benefit rates applicable to work performed outside of the regular workday. More information is available at the Mayor's Office of Contract Services (MOCS) web page at:

https://www1.nyc.gov/site/mocs/legal-forms/project-labor-agreements.page

All the provisions of Labor Law Article 8 remain applicable to PLA work including, but not limited to, the enforcement of prevailing wage requirements by the Comptroller in accordance with the trade classifications in this schedule; however, we will enforce shift, premium, overtime and other non-standard rates as they appear in a project's pre-negotiated labor agreement.

In order to meet their obligation to provide prevailing supplemental benefits to each covered employee, employers must either:

1) **Provide bona fide fringe benefits which cost the employer no less than the prevailing supplemental benefits rate; or**
2) **Supplement the employee's hourly wage by an amount no less than the prevailing supplemental benefits rate; or**
3) **Provide a combination of bona fide fringe benefits and wage supplements which cost the employer no less than the prevailing supplemental benefits rate in total.**

Although prevailing wage laws do not require employers to provide bona fide fringe benefits (as opposed to wage supplements) to their employees, other laws may. For example, the Employee Retirement Income Security Act, 29 U.S.C. § 1001 et seq., the Patient Protection and Affordable Care Act, 42 U.S.C. § 18001 et seq., and the New York City Paid Sick Leave Law, N.Y.C. Admin. Code § 20-911 et seq., require certain employers to provide certain benefits to their employees. Labor agreements to which employers are a party may also require certain benefits. The Comptroller's Office does not enforce these laws or agreements.

Employers must provide prevailing supplemental benefits at the straight time rate for each hour worked unless otherwise noted in the classification.

Paid Holidays, Vacation and Sick Leave when listed must be paid or provided in addition to the prevailing hourly supplemental benefit rate.

For more information, please refer to the Comptroller's Prevailing Wage Law Regulations in Title 44 of the Rules of the City of New York, Chapter 2, available at comptroller.nyc.gov/wages.

Paul Brumlik
Director of Classifications
Bureau of Labor Law

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ASBESTOS HANDLER
SEE HAZARDOUS MATERIAL HANDLER

BLASTER

Blaster

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $59.81
Supplemental Benefit Rate per Hour: $57.77

Blaster - Hydraulic Trac Drill

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $53.95
Supplemental Benefit Rate per Hour: $57.77

Blaster - Wagon: Air Trac: Quarry Bar: Drillrunners

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $53.12
Supplemental Benefit Rate per Hour: $57.77

Blaster - Journeyperson

(Laborer, Chipper/Jackhammer including Walk Behind Self Propelled Hydraulic Asphalt and Concrete Breakers and Hydro (Water) Demolition, Powder Carrier, Hydraulic Chuck Tender, Chuck Tender and Nipper)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $46.60
Supplemental Benefit Rate per Hour: $57.77

Blaster - Magazine Keepers: (Watch Person)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $23.30
Supplemental Benefit Rate per Hour: $57.77

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).
New Year's Day
Memorial Day
Independence Day
Columbus Day
Christmas Day

Triple time the regular rate for work on the following holiday(s).
Labor Day
Thanksgiving Day

Paid Holidays

Labor Day
Thanksgiving Day

Shift Rates

When two shifts are employed, single time rate shall be paid for each shift. When three shifts are found necessary, each shift shall work seven and one half hours (7 ½), but shall be paid for eight (8) hours of labor, and be permitted one half hour for lunch.

(Local #731)

BOILERMAKER

Boilermaker

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $70.38
Supplemental Benefit Rate per Hour: $50.33
Supplemental Note: For time and one half overtime - $74.92 For double overtime - $99.51

Overtime Description

For Repair and Maintenance work:
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
For New Construction work:
Double time the regular rate after an 8 hour day.
Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).
New Year's Day
Martin Luther King Jr. Day

President's Day
Memorial Day
Independence Day
Columbus Day
Election Day
Veteran's Day
Thanksgiving Day
Christmas Day
Juneteenth

Quadruple time the regular rate for work on the following holiday(s).
Labor Day

Paid Holidays
Good Friday
Day after Thanksgiving
Day before Christmas
Day before New Year's Day

Shift Rates
On jobs requiring two (2) or three (3) shifts, the first shift shall work eight (8) hours at the regular straight-time hourly rate. The second shift shall work eight (8) hours and receive eight hours at the regular straight time hourly rate plus two dollars ($2.00) per hour. The third shift shall work eight (8) hours and receive eight hours at the regular straight time hourly rate plus two dollars and twenty-five cents ($2.25) per hour.

(Local #5)

BRICKLAYER

Bricklayer

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $61.29
Supplemental Benefit Rate per Hour: $46.60

Overtime Description
Time and one half the regular rate after a 7 hour day. If working on a job that is predominately Pointer, Cleaner, Caulker work, then Time and one half the regular rate after an 8 hour day.

Overtime
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).

New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
The second shift wage rate shall be a 15% wage premium with no premium for supplemental benefits. There must be a first shift in order to work a second shift.

(Bricklayer District Council)

CARPENTER - BUILDING COMMERCIAL

Building Commercial

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $60.05
Supplemental Benefit Rate per Hour: $50.83

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Day after Thanksgiving
Day before Christmas
Christmas Day
Day before New Year's Day

Paid Holidays
None

Shift Rates
The second shift will receive one hour at the double time rate of pay for the last hour of the shift; eight hours pay for seven hours of work, nine hours pay for eight hours of work. There must be a first shift in order to work a second shift. When it is not possible to conduct alteration or repair work during regular working hours in a building occupied by tenants, the rule for the second shift will apply.

(Carpenters District Council)

CARPENTER - HEAVY CONSTRUCTION WORK
(Construction of Engineered Structures and Building Foundations including all form work)

Heavy Construction Work

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $62.59
Supplemental Benefit Rate per Hour: $57.84

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates

Off shift work commencing between 5:00 P.M. and 11:00 P.M. shall work eight and one half hours allowing for one half hour for lunch. The wage rate shall be 113% of the straight time hourly wage rate and the supplemental benefits shall be paid at the straight time rate. When two (2) or more shifts of Carpenters are employed, single time will be paid for each shift.

(Carpenters District Council)

CARPENTER - HIGH RISE CONCRETE FORMS
(Excludes Engineered Structures and Building Foundations)

Carpenter High Rise A

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $51.48
Supplemental Benefit Rate per Hour: $44.74

Carpenter High Rise B

Carpenter High Rise B worker is excluded from high risk operations such as erection decking, perimeter debris netting, leading edge work, self-climbing form systems, and the installation of cocoon systems unless directly supervised by a Carpenter High Rise A worker.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $40.89
Supplemental Benefit Rate per Hour: $18.05

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Time and one half the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
The second shift wage rate shall be 113% of the straight time hourly wage rate. However, any shift beginning after 5:00 P.M. shall be paid at time and one half the regular hourly rate. There must be a first shift in order to work a second shift. When it is not possible to conduct alteration or repair work during regular working hours in a building occupied by tenants, the rule for the second shift will apply.

(Carpenters District Council)

CARPENTER - SIDEWALK SHED, SCAFFOLD AND HOIST

Carpenter - Hod Hoist

(Assisted by Mason Tender)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $57.20
Supplemental Benefit Rate per Hour: $51.20

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

Shift Rates

The second shift will receive 112% of the straight time hourly rate. Benefit fund contributions shall be paid at the straight time rate. There must be a first shift in order to work a second shift. When it is not possible to conduct alteration or repair work during regular working hours in a building occupied by tenants, the rule for the second shift will apply.

(Carpenters District Council)

CARPENTER - WOOD WATER STORAGE TANK

Tank Mechanic

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $39.58
Supplemental Benefit Rate per Hour: $27.26

Tank Helper

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $31.04
Supplemental Benefit Rate per Hour: $27.18

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Time and one half the regular rate for work on a holiday plus the day's pay.

Paid Holidays

New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Thanksgiving Day
Day after Thanksgiving
1/2 day on Christmas Eve if work is performed in the A.M.
Christmas Day
1/2 day on New Year's Eve if work is performed in the A.M.

Vacation

Employed for one (1) year.....one (1) week vacation (40 hours)
Employed for three (3) years.....two (2) weeks vacation (80 hours)
Employed for more than twenty (20) years.....three (3) weeks vacation (120 hours)

SICK LEAVE:

Two (2) sick days after being employed for twenty (20) years.

(Carpenters District Council)

CEMENT & CONCRETE WORKER
Building Work

Cement & Concrete Worker

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $47.28
Supplemental Benefit Rate per Hour: $34.20
Supplemental Note: $39.20 on Saturdays; $44.20 on Sundays & Holidays

Cement & Concrete Worker - (Hired after 2/6/2016)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $36.80
Supplemental Benefit Rate per Hour: $26.20
Supplemental Note: $29.20 on Saturdays; $32.20 on Sundays & Holidays

Overtime Description
Time and one half the regular rate after 7 hour day (time and one half the regular rate after an 8 hour day when working with Dockbuilders on pile cap forms and for work below street level to the top of the foundation wall, not to exceed 2 feet or 3 feet above the sidewalk-brick shelf, when working on the foundation and structure.)

Overtime
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays
1/2 day before Christmas Day
1/2 day before New Year's Day

Shift Rates
All night shifts are paid at straight time plus 10% differential.

(Cement & Concrete Workers District Council 16)

CEMENT MASON

Cement Mason

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $59.87
Supplemental Benefit Rate per Hour: $34.76
Supplemental Note: Supplemental benefit time and one half rate: $63.22; Double time rate: double the base supplemental benefit rate.

Overtime Description
Time and one-half the regular rate after an 8 hour day, double time the regular rate after 10 hours. Time and one-half the regular rate on Saturday, double time the regular rate after 10 hours. Double time the regular rate on Sunday. Four Days a week at Ten (10) hours straight time is allowed.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays
Any worker who reports to work on Christmas Eve or New Year's Eve pursuant to his employer's instruction shall be entitled to three (3) hours afternoon pay without working.

Shift Rates
For off shift work, (at times other than the regular 7:00 A.M. to 3:30 P.M. work day) a cement mason shall be paid at the regular hourly rate plus a 25% per hour differential.

(Local #780) (BCA)

CORE DRILLER
Test Boring

Core Driller

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $48.78
Supplemental Benefit Rate per Hour: $36.07

Core Driller Helper

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $38.15
Supplemental Benefit Rate per Hour: $36.07

Core Driller Helper(Third year in the industry)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $34.37
Supplemental Benefit Rate per Hour: $36.07
eucli

Core Driller Helper (Second year in the industry)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $30.61
Supplemental Benefit Rate per Hour: $36.07

Core Driller Helper (First year in the industry)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $26.83
Supplemental Benefit Rate per Hour: $36.07

Overtime Description
Time and one half the regular rate for work on a holiday plus Holiday pay when worked.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Time and one half the regular rate for work on the following holiday(s).

Paid Holidays
New Year's Day
Memorial Day

Independence Day
Labor Day
Veteran's Day
Thanksgiving Day
Christmas Day

Shift Rates

When two (2) or more shifts are employed, single time shall be paid for each shift, but those employees employed on a shift other than from 8:00 A.M. to 5:00 P.M. shall, in addition, receive two dollars ($2.00) per hour differential for each hour worked. When three (3) shifts are needed, each shift shall work seven and one-half (7 ½) hours paid for eight (8) hours of labor and be permitted one-half (½) hour for mealtime.

(Carpenters District Council)

DERRICKPERSON AND RIGGER

Derrick Person & Rigger

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $61.82
Supplemental Benefit Rate per Hour: $63.63

Overtime Description

The first two hours of overtime on weekdays and the first seven hours of work on Saturdays are paid at time and one half for wages and supplemental benefits. All additional overtimes is paid at double time for wages and supplemental benefits.

Overtime

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays

1/2 day on Christmas Eve if work is performed in the A.M.

Derrick Person & Rigger- Handset

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $59.67
Supplemental Benefit Rate per Hour: $62.64

Overtime Description
The first two hours of overtime on weekdays and the first seven hours of work on Saturdays are paid at time and one half for wages and supplemental benefits. All additional overtimes is paid at double time for wages and supplemental benefits.

Overtime
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
1/2 day on Christmas Eve if work is performed in the A.M.

(Local #197)

DIVER

Diver (Marine)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $77.46
Supplemental Benefit Rate per Hour: $57.84

Diver Tender (Marine)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $57.00
Supplemental Benefit Rate per Hour: $57.84

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
When three shifts are utilized each shift shall work seven and one half-hours (7 1/2 hours) and paid for 8 hours, allowing for one half hour for lunch.

(Carpenters District Council)

DOCKBUILDER - PILE DRIVER

Dockbuilder - Pile Driver

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $62.59
Supplemental Benefit Rate per Hour: $57.84

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day

President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays

None

Shift Rates

Off shift work commencing between 5:00 P.M. and 11:00 P.M. shall work eight and one half hours allowing for one half hour for lunch. The wage rate shall be 113% of the straight time hourly wage rate and the supplemental benefits shall be paid at the straight time rate. When two (2) or more shifts of Dockbuilders are employed, single time will be paid for each shift.

(Carpenters District Council)

DRIVER: TRUCK (TEAMSTER)

Including work involving the delivery to and hauling from such worksites of aggregate supply construction materials and any time spent loading/unloading

Driver - Dump Truck

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $47.07
Supplemental Benefit Rate per Hour: $61.15
Supplemental Note: Over 40 hours worked: at time and one half rate - $25.50; at double time rate - $34.00

Driver - Tractor Trailer

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $50.76
Supplemental Benefit Rate per Hour: $60.15
Supplemental Note: Over 40 hours worked: at time and one half rate - $32.83; at double time rate - $41.60

Driver - Euclid & Turnapull Operator

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $50.07

Supplemental Benefit Rate per Hour: $60.15
Supplemental Note: Over 40 hours worked: at time and one half rate - $32.83; at double time rate - $41.60

Driver – Boom Truck

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $52.51
Supplemental Benefit Rate per Hour: $60.15
Supplemental Note: Over 40 hours worked: at time and one half rate - $32.83; at double time rate - $41.60

Driver – Goldhofer & Self Propelled Modular Trailer (SPMT)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $53.51
Supplemental Benefit Rate per Hour: $60.15
Supplemental Note: Over 40 hours worked: at time and one half rate - $32.83; at double time rate - $41.60

Overtime Description
For Paid Holidays: Holiday pay for all holidays shall be prorated based two hours per day for each day worked in the holiday week, not to exceed 8 hours of holiday pay.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Christmas Day

Paid Holidays
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Christmas Day

Shift Rates
Off shift work commencing between 6:00 P.M. and 5:00 A.M. shall work eight and one half (8 1/2) hours allowing for one half hour for lunch

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Driver Redi-Mix (Sand & Gravel)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $44.50
Supplemental Benefit Rate per Hour: $54.88
Supplemental Note: Over 40 hours worked: time and one half rate $22.59; double time rate $30.12

Overtime Description
For Paid Holidays: Employees who do not work on a contractual holiday shall be compensated two (2) hours extra pay in straight time wages and benefits for every day on which the Employee does not pass up a day's work during the calendar week (Sunday through Saturday) of the holiday, up to a maximum of ten (10) hours in wages and eight (8) hours in benefit contributions for the holiday

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
Martin Luther King Jr. Day
President's Day
Columbus Day
Veteran's Day

Triple time the regular rate for work on the following holiday(s).
New Year's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Election Day
Thanksgiving Day
Christmas Day

(Local #282)

ELECTRICIAN

(Including installation of low voltage cabling carrying data, video and/or voice on building construction/alteration/renovation projects.)

Electrician "A" (Regular Day / Day Shift)

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $64.00
Supplemental Benefit Rate per Hour: $70.28
*** Supplemental Note: See Supplemental Benefit Rate per Hour Note below**

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $64.00
Supplemental Benefit Rate per Hour: $72.74
*** Supplemental Note: See Supplemental Benefit Rate per Hour Note below**

Electrician "A" (Regular Day Overtime after 7 hrs / Day Shift Overtime after 8 hrs)

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $96.00
Supplemental Benefit Rate per Hour: $72.34
*** Supplemental Note: See Supplemental Benefit Rate per Hour Note below**

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $96.00
Supplemental Benefit Rate per Hour: $74.80
*** Supplemental Note: See Supplemental Benefit Rate per Hour Note below**

Electrician "A" (Swing Shift)

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $75.10
Supplemental Benefit Rate per Hour: $78.93
*** Supplemental Note: See Supplemental Benefit Rate per Hour Note below**

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $75.10
Supplemental Benefit Rate per Hour: $81.66
*** Supplemental Note: See Supplemental Benefit Rate per Hour Note below**

Electrician "A" (Swing Shift Overtime after 7.5 hours)

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $112.65
Supplemental Benefit Rate per Hour: $81.35
*** Supplemental Note: See Supplemental Benefit Rate per Hour Note below**

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $112.65
Supplemental Benefit Rate per Hour: $84.07
*** Supplemental Note: See Supplemental Benefit Rate per Hour Note below**

Electrician "A" (Graveyard Shift)

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $84.12
Supplemental Benefit Rate per Hour: $86.28
*** Supplemental Note: See Supplemental Benefit Rate per Hour Note below**

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $84.12
Supplemental Benefit Rate per Hour: $89.25
*** Supplemental Note: See Supplemental Benefit Rate per Hour Note below**

Electrician "A" (Graveyard Shift Overtime after 7 hours)

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $126.18
Supplemental Benefit Rate per Hour: $88.98
*** Supplemental Note: See Supplemental Benefit Rate per Hour Note below**

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $126.18
Supplemental Benefit Rate per Hour: $91.96
*** Supplemental Note: See Supplemental Benefit Rate per Hour Note below**

*** Supplemental Benefit Rate per Hour Note**
In addition to the Supplemental Benefit Rates per Hour listed above, the employer must provide an additional 6.2% of taxable gross pay earned on covered work only. This additional Supplemental Benefit Rate will terminate when the employee has contributed the maximum annual Social Security tax required by law, on all work performed.

Overtime
Time and one half the regular rate after a 7 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays
Time and one half the regular rate for work on a holiday.
New Year's Day
Martin Luther King Jr. Day
President's Day

Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays

None

Shift Rates

For multiple shifts of temporary light and/or power, the temporary light and/or power employee shall be paid for 8 hours at the straight time rate. For three or less workers performing 8 hours temporary light and/or power the supplemental benefit rate is $27.91, effective 04/15/2027 the supplemental benefit rate is $29.91 - See * Supplemental Benefit Rate per Hour Note above.

Electrician "M" 1st Year

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $27.50
Supplemental Benefit Rate per Hour: $26.79

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $27.50
Supplemental Benefit Rate per Hour: $27.42

Electrician "M" 1st Year (Overtime)

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $41.25
Supplemental Benefit Rate per Hour: $28.52

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $41.25
Supplemental Benefit Rate per Hour: $29.16

Electrician "M" 2nd Year

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $28.50
Supplemental Benefit Rate per Hour: $27.32

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $28.50
Supplemental Benefit Rate per Hour: $27.97

Electrician "M" 2nd Year (Overtime)

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $42.75
Supplemental Benefit Rate per Hour: $29.12

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $42.75
Supplemental Benefit Rate per Hour: $29.77

Electrician "M" 3rd Year

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $30.50
Supplemental Benefit Rate per Hour: $28.40

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $30.50
Supplemental Benefit Rate per Hour: $29.05

Electrician "M" 3rd Year (Overtime)

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $45.75
Supplemental Benefit Rate per Hour: $30.33

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $45.75
Supplemental Benefit Rate per Hour: $30.98

Electrician "M" 4th Year

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $33.50
Supplemental Benefit Rate per Hour: $30.01

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $33.50
Supplemental Benefit Rate per Hour: $30.68

Electrician "M" 4th Year (Overtime)

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $50.25
Supplemental Benefit Rate per Hour: $32.13

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $50.25

Supplemental Benefit Rate per Hour: $32.80

Electrician "M" 5th Year

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $36.50
Supplemental Benefit Rate per Hour: $31.62

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $36.50
Supplemental Benefit Rate per Hour: $32.31

Electrician "M" 5th Year (Overtime)

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $54.75
Supplemental Benefit Rate per Hour: $33.93

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $54.75
Supplemental Benefit Rate per Hour: $34.61

Electrician "M" 6th Year

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $43.50
Supplemental Benefit Rate per Hour: $35.39

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $43.50
Supplemental Benefit Rate per Hour: $36.11

Electrician "M" 6th Year (Overtime)

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $65.25
Supplemental Benefit Rate per Hour: $38.14

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $65.25
Supplemental Benefit Rate per Hour: $38.85

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays

Time and one half the regular rate for work on the following holiday(s).

New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

(Local #3)

ELECTRICIAN - ALARM TECHNICIAN
(Scope of Work - Inspect, test, repair, and replace defective, malfunctioning, or broken devices, components and controls of Fire, Burglar and Security Systems)

Alarm Technician

Effective Period: 7/1/2026 - 3/11/2027
Wage Rate per Hour: $39.45
Supplemental Benefit Rate per Hour: $23.33
Supplemental Note: $21.20 only after 8 hours worked in a day

Effective Period: 3/12/2027 - 6/30/2027
Wage Rate per Hour: $40.45
Supplemental Benefit Rate per Hour: $23.86
Supplemental Note: $21.74 only after 8 hours worked in a day

Overtime Description
Time and one half the regular rate for work on the following holidays: Columbus Day, Veterans Day, Day after Thanksgiving.
Double time the regular rate for work on the following holidays: New Year's day, Martin Luther King Jr. Day, President's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Paid Holidays

New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Shift Rates

Night Differential is based upon a ten percent (10%) differential between the hours of 4:00 P.M. and 12:30 A.M. and a fifteen percent (15%) differential for the hours 12:00 A.M. to 8:30 A.M.

Vacation

At least 1 year of employment.....ten (10) days
5 years or more of employment.....fifteen (15) days
10 years of employment.....twenty (20) days
Plus one Personal Day per year

Sick Days:
One day per Year. Up to 4 vacation days may be used as sick days.

(Local #3)

ELECTRICIAN-STREET LIGHTING WORKER

Electrician - Electro Pole Electrician

Effective Period: 7/1/2026 - 4/21/2027
Wage Rate per Hour: $64.00
Supplemental Benefit Rate per Hour: $72.46
*** Supplemental Note: See Supplemental Benefit Rate per Hour Note below**

Effective Period: 4/22/2027 - 6/30/2027
Wage Rate per Hour: $64.00
Supplemental Benefit Rate per Hour: $74.92
*** Supplemental Note: See Supplemental Benefit Rate per Hour Note below**

Electrician - Electro Pole Foundation Installer

Effective Period: 7/1/2026 - 4/21/2027
Wage Rate per Hour: $49.66
Supplemental Benefit Rate per Hour: $53.91
*** Supplemental Note: See Supplemental Benefit Rate per Hour Note below**

Effective Period: 4/22/2027 - 6/30/2027
Wage Rate per Hour: $49.66
Supplemental Benefit Rate per Hour: $55.91
*** Supplemental Note: See Supplemental Benefit Rate per Hour Note below**

Electrician - Electro Pole Maintainer

Effective Period: 7/1/2026 - 4/21/2027
Wage Rate per Hour: $43.61
Supplemental Benefit Rate per Hour: $48.96
*** Supplemental Note: See Supplemental Benefit Rate per Hour Note below**

Effective Period: 4/22/2027 - 6/30/2027
Wage Rate per Hour: $43.61
Supplemental Benefit Rate per Hour: $50.89
*** Supplemental Note: See Supplemental Benefit Rate per Hour Note below**

*** Supplemental Benefit Rate per Hour Note**
In addition to the Supplemental Benefit Rates per Hour listed above, the employer must provide an additional 6.2% of taxable gross pay earned on covered work only. This additional Supplemental Benefit Rate will terminate when the employee has contributed the maximum annual Social Security tax required by law, on all work performed.

Overtime Description
Electrician - Electro Pole Electrician: Time and one half the regular rate after a 7 hour day and after 5 consecutive days worked per week.
Electrician - Electro Pole Foundation Installer: Time and one half the regular rate after 8 hours within a 24 hour period and Saturday and Sunday.
Electrician - Electro Pole Maintainer: Time and one half the regular rate after a 7 hour day and after 5 consecutive days worked per week. Saturdays and Sundays may be used as a make-up day at straight time when a day is lost during the week to inclement weather.

Overtime Holidays
Time and one half the regular rate for work on the following holiday(s).
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

(Local #3)

ELEVATOR CONSTRUCTOR

Elevator Constructor

Effective Period: 7/1/2026 - 3/16/2027
Wage Rate per Hour: $86.43
Supplemental Benefit Rate per Hour: $43.43

Effective Period: 3/17/2027 - 6/30/2027
Wage Rate per Hour: $89.76
Supplemental Benefit Rate per Hour: $44.53

Overtime Description
For New Construction: work performed after an 8 hour day, Saturday, Sunday or between 5:30pm and 6:00am shall be paid at double time rate.

Existing buildings: work performed after an 8 hour day, Saturday, Sunday or between 6:00pm and 5:00 am shall be paid time and one half.

Overtime
Double time the regular rate for work on the following holiday(s).

Paid Holidays
New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Vacation
Employer contributes 8% of regular basic hourly rate as vacation pay for employees with more than 15 years of service, and 6% for employees with 5 to 15 years of service, and 4% for employees with less than 5 years of service.

(Local #1)

ELEVATOR REPAIR & MAINTENANCE

Elevator Service/Modernization Mechanic

Effective Period: 7/1/2026 - 3/16/2027
Wage Rate per Hour: $68.06
Supplemental Benefit Rate per Hour: $43.38

Effective Period: 3/17/2027 - 6/30/2027
Wage Rate per Hour: $70.72
Supplemental Benefit Rate per Hour: $44.48

Overtime Description
For Scheduled Service Work: Double time - work scheduled in advance by two or more workers performed on Sundays, Holidays, and between midnight and 5:00am.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.
Time and one half the regular rate for work on a holiday plus the day's pay.

Paid Holidays
New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Shift Rates
Afternoon shift - regularly hourly rate plus a (15%) fifteen percent differential. Graveyard shift - time and one half the regular rate.

Vacation
Employer contributes 8% of regular basic hourly rate as vacation pay for employees with more than 15 years of service, and 6% for employees with 5 to 15 years of service, and 4% for employees with less than 5 years of service.

(Local #1)

ENGINEER

Engineer - Heavy Construction Operating Engineer I

Cherrypickers 20 tons and over and Loaders (rubber tired and/or tractor type with a manufacturer's minimum rated capacity of six cubic yards and over).

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $79.50
Supplemental Benefit Rate per Hour: $51.76
Supplemental Note: $95.97 on overtime
Shift Wage Rate: $127.20

Engineer - Heavy Construction Operating Engineer II

Backhoes, Basin Machines, Groover, Mechanical Sweepers, Bobcat, Boom Truck, Barrier Transport (Barrier Mover) & machines of similar nature. Operation of Churn Drills and machines of a similar nature, Stetco Silent Hoist and machines of similar nature, Vac-Alls, Meyers Machines, John Beam and machines of a similar nature, Ross Carriers and Travel Lifts and machines of a similar nature, Bulldozers, Scrapers and Turn-a-Pulls: Tugger Hoists (Used exclusively for handling excavated material); Tractors with attachments, Hyster and Roustabout Cranes, Cherrypickers. Austin Western, Grove and machines of a similar nature, Scoopmobiles, Monorails, Conveyors, Trenchers: Loaders-Rubber Tired and Tractor: Barber Greene and Eimco Loaders and Eimco Backhoes; Mighty Midget and similar breakers and Tampers, Curb and Gutter Pavers and Motor Patrol, Motor Graders and all machines of a similar nature. Locomotives 10 Tons or under. Mini-Max, Break-Tech and machines of a similar nature; Milling machines, robotic and demolition machines and machines of a similar nature, shot blaster, skid steer machines and machines of a similar nature including bobcat, pile rig rubber-tired excavator (37,000 lbs. and under), 2 person auger.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $76.95
Supplemental Benefit Rate per Hour: $51.76
Supplemental Note: $95.97 on overtime
Shift Wage Rate: $123.12

Engineer - Heavy Construction Operating Engineer III

Minor Equipment such as Tractors, Post Hole Diggers, Ditch Witch (Walk Behind), Road Finishing Machines, Rollers five tons and under, Tugger Hoists, Dual Purpose Trucks, Fork Lifts, and Dempsey Dumpers, Fireperson.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $72.72
Supplemental Benefit Rate per Hour: $51.76
Supplemental Note: $95.97 on overtime
Shift Wage Rate: $116.35

Engineer - Heavy Construction Maintenance Engineer I

Installing, Repairing, Maintaining, Dismantling of all equipment including Steel Cutting, Bending and Heat Sealing Machines, Mechanical Heaters, Grout Pumps, Bentonite Pumps & Plants, Screening Machines, Fusion Coupling Machines, Tunnel Boring Machines Moles and Machines of a similar nature, Power Packs, Mechanical Hydraulic Jacks; all drill rigs including but not limited to Churn, Rotary Caisson, Raised Bore & Drills of a similar

nature; Personnel, Inspection & Safety Boats or any boats used to perform functions of same, Mine Hoists, Whirlies, all Climbing Cranes, all Tower Cranes, including but not limited to Truck Mounted and Crawler Type and machines of similar nature; Maintaining Hydraulic Drills and machines of a similar nature; Well Point System-Installation and dismantling; Burning, Welding, all Pumps regardless of size and/or motor power, except River Cofferdam Pumps and Wells Point Pumps; Motorized Buggies (three or more); equipment used in the cleaning and televising of sewers, but not limited to jet-rodder/vacuum truck, vacall/vactor, closed circuit television inspection equipment; high powered water pumps, jet pumps; screed machines and concrete finishing machines of a similar nature; vermeers.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $76.55
Supplemental Benefit Rate per Hour: $51.76
Supplemental Note: $95.97 on overtime
Shift Wage Rate: $122.48

Engineer - Heavy Construction Maintenance Engineer II

On Base Mounted Tower Cranes

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $102.42
Supplemental Benefit Rate per Hour: $51.76
Supplemental Note: $95.97 on overtime
Shift Wage Rate: $163.87

Engineer - Heavy Construction Maintenance Engineer III

On Generators, Light Towers

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $48.50
Supplemental Benefit Rate per Hour: $51.76
Supplemental Note: $95.97 on overtime
Shift Wage Rate: $77.60

Engineer - Heavy Construction Maintenance Engineer IV

On Pumps and Mixers including mud sucking

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $49.90
Supplemental Benefit Rate per Hour: $51.76
Supplemental Note: $95.97 on overtime
Shift Wage Rate: $79.84

Engineer - Heavy Construction Service Engineer

Gradalls: Concrete Pumps: Power Houses: Driving Truck Cranes: Driving and Operating Fuel and Grease Trucks.

Effective Period: 7/1/2026 - 6/30/2027

Wage Rate per Hour: $68.42
Supplemental Benefit Rate per Hour: $51.76
Supplemental Note: $95.97 on overtime
Shift Wage Rate: $109.47

Engineer - Heavy Construction Service Mechanic

Shovels: Cranes: Draglines: Backhoes: Keystones: Pavers: Trenching Machines: Gunite Machines: Compressors (three (3) or more in Battery): Crawler Cranes- having a straight lattice boom with no attachment or luffing boom, no jib and no auxiliary attachment.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $45.50
Supplemental Benefit Rate per Hour: $51.76
Supplemental Note: $95.97 on overtime
Shift Wage Rate: $72.80

Engineer - Steel Erection Maintenance Engineers

Derrick, Travelers, Tower, Crawler Tower and Climbing Cranes

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $73.88
Supplemental Benefit Rate per Hour: $51.76
Supplemental Note: $95.97 on overtime
Shift Wage Rate: $118.21

Engineer - Steel Erection Oiler I

On a Truck Crane

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $68.81
Supplemental Benefit Rate per Hour: $51.76
Supplemental Note: $95.97 on overtime
Shift Wage Rate: $110.10

Engineer - Steel Erection Oiler II

On a Crawler Crane

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $46.83
Supplemental Benefit Rate per Hour: $51.76
Supplemental Note: $95.97 on overtime
Shift Wage Rate: $74.93

Overtime Description

On jobs of more than one shift, if the next shift employee fails to report for work through any cause over which the employer has no control, the employee on duty who works the next shift continues to work at the single time rate.

Overtime

Double time the regular rate after an 8 hour day.
Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.
Double time the regular rate for work on the following holiday(s).

Paid Holidays

New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Engineer - Building Work Maintenance Engineers I

Installing, repairing, maintaining, dismantling (of all equipment including: Steel Cutting and Bending Machines, Mechanical Heaters, Mine Hoists, Climbing Cranes, Tower Cranes, Linden Peine, Lorain, Liebherr, Mannes, or machines of a similar nature, Well Point Systems, Deep Well Pumps, Concrete Mixers with loading Device, Concrete Plants, Motor Generators when used for temporary power and lights), skid steer machines of a similar nature including bobcat.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $63.77
Supplemental Benefit Rate per Hour: $50.85
Supplemental Note: $94.15 on overtime

Engineer - Building Work Maintenance Engineers II

On Pumps, Generators, Mixers and Heaters

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $48.27
Supplemental Benefit Rate per Hour: $50.85
Supplemental Note: $94.15 on overtime

Engineer - Building Work Oilers I

All gasoline, electric, diesel or air operated Gradealls: Concrete Pumps, Overhead Cranes in Power Houses: Their duties shall be to assist the Engineer in oiling, greasing and repairing of all machines; Driving Truck

Cranes: Driving and Operating Fuel and Grease Trucks, Cherrypickers (hydraulic cranes) over 70,000 GVW, and machines of a similar nature.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $60.35
Supplemental Benefit Rate per Hour: $50.85
Supplemental Note: $94.15 on overtime

Engineer - Building Work Oilers II

Oilers on Crawler Cranes, Backhoes, Trenching Machines, Gunite Machines, Compressors (three or more in Battery).

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $43.39
Supplemental Benefit Rate per Hour: $50.85
Supplemental Note: $94.15 on overtime

Overtime Description
On jobs of more than one shift, if an Employee fails to report for work through any cause over which the Employer has no control, the Employee on duty will continue to work at the rate of single time.

Overtime
Double time the regular rate after an 8 hour day.
Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.
Double time the regular rate for work on the following holiday(s).

Paid Holidays
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Christmas Day

Shift Rates
When two (2) or more shifts are employed, single time will be paid for each shift.

(Local #15)

ENGINEER - CITY SURVEYOR AND CONSULTANT

Party Chief

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $48.27
Supplemental Benefit Rate per Hour: $29.92
Supplemental Note: Overtime Benefit Rate - $35.66 per hour (time & one half) $41.39 per hour (double time).

Instrument Person

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $39.26
Supplemental Benefit Rate per Hour: $29.92
Supplemental Note: Overtime Benefit Rate -$35.66 per hour (time & one half) $41.39 per hour (double time).

Rodperson

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $33.55
Supplemental Benefit Rate per Hour: $29.92
Supplemental Note: Overtime Benefit Rate - $35.66 per hour (time & one half) $41.39 per hour (double time).

Rodperson 1st Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $25.00
Supplemental Benefit Rate per Hour: $29.92
Supplemental Note: Overtime Benefit Rate - $35.66 per hour (time & one half) $41.39 per hour (double time).

Overtime Description

Time and one half the regular rate after an 8 hour day, Time and one half the regular rate for Saturday for the first eight hours worked, Double time the regular time rate for Saturday for work performed in excess of eight hours, Double time the regular rate for Sunday and Double time the regular rate for work on a holiday.

Paid Holidays

New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day
Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

(Operating Engineer Local #15-D)

ENGINEER - FIELD (BUILDING CONSTRUCTION)
(Construction of Building Projects, Concrete Superstructures, etc.)

Field Engineer - BC Party Chief

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $71.62
Supplemental Benefit Rate per Hour: $46.38
Supplemental Note: Overtime Benefit Rate - $65.85 per hour (time & one half) $85.31 per hour (double time).

Field Engineer - BC Instrument Person

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $50.50
Supplemental Benefit Rate per Hour: $46.38
Supplemental Note: Overtime Benefit Rate - $65.85 per hour (time & one half) $85.31 per hour (double time).

Field Engineer - BC Rodperson

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $30.86
Supplemental Benefit Rate per Hour: $46.38
Supplemental Note: Overtime Benefit Rate - $65.85 per hour (time & one half) $85.31 per hour (double time).

Overtime Description
Time and one half the regular rate after a 7 hour work and time and one half the regular rate for Saturday for the first seven hours worked, Double time the regular time rate for Saturday for work performed in excess of seven hours, Double time the regular rate for Sunday and Double time the regular rate for work on a holiday.

Paid Holidays
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day
Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

(Operating Engineer Local #15-D)

ENGINEER - FIELD (HEAVY CONSTRUCTION)
(Construction of Roads, Tunnels, Bridges, Sewers, Building Foundations, Engineering Structures etc.)

Field Engineer - HC Party Chief

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $80.18
Supplemental Benefit Rate per Hour: $51.37
Supplemental Note: Overtime benefit rate - $73.21 per hour (time & one half), $95.05 per hour (double time).

Field Engineer - HC Instrument Person

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $56.72
Supplemental Benefit Rate per Hour: $51.37
Supplemental Note: Overtime benefit rate - $73.21 per hour (time & one half), $95.05 per hour (double time).

Field Engineer - HC Rodperson

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $46.30
Supplemental Benefit Rate per Hour: $51.37
Supplemental Note: Overtime benefit rate - $73.21 per hour (time & one half), $95.05 per hour (double time).

Field Engineer - HC Rodperson 1st Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $25.00
Supplemental Benefit Rate per Hour: $51.37
Supplemental Note: Overtime benefit rate - $73.21 per hour (time & one half), $95.05 per hour (double time).

Overtime Description
Time and one half the regular rate after an 8 hour day, Time and one half the regular rate for Saturday for the first eight hours worked, Double time the regular time rate for Saturday for work performed in excess of eight hours, Double time the regular rate for Sunday and Double time the regular rate for work on a holiday.

Paid Holidays
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day

Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day
Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

(Operating Engineer Local #15-D)

ENGINEER - FIELD (STEEL ERECTION)

Field Engineer - Steel Erection Party Chief

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $76.11
Supplemental Benefit Rate per Hour: $49.70
Supplemental Note: Overtime benefit rate - $70.71 per hour (time & one half), $91.71 per hour (double time).

Field Engineer - Steel Erection Instrument Person

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $53.33
Supplemental Benefit Rate per Hour: $49.70
Supplemental Note: Overtime benefit rate - $70.71 per hour (time & one half), $91.71 per hour (double time).

Field Engineer - Steel Erection Rodperson

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $33.45
Supplemental Benefit Rate per Hour: $49.70
Supplemental Note: Overtime benefit rate - $70.71 per hour (time & one half), $91.71 per hour (double time).

Field Engineer - Steel Erection Rodperson 1st Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $25.00
Supplemental Benefit Rate per Hour: $49.70
Supplemental Note: Overtime benefit rate - $67.22 per hour (time & one half), $87.07 per hour (double time).

Overtime Description
Time and one half the regular rate for Saturday for the first eight hours worked.
Double time the regular rate for Saturday for work performed in excess of eight hours.

Overtime
Time and one half the regular rate after an 8 hour day.
Double time the regular rate for Sunday.

Double time the regular rate for work on the following holiday(s).

Paid Holidays

New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day
Employees must work at least one (1) day in the payroll week in which the holiday occurs to receive the paid holiday

(Operating Engineer Local #15-D)

ENGINEER - OPERATING

Operating Engineer - Road & Heavy Construction I

Back Filling Machines, Cranes, Mucking Machines and Dual Drum Paver.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $95.27
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $152.43

Operating Engineer - Road & Heavy Construction II

Backhoes, Power Shovels, Hydraulic Clam Shells, Steel Erection, Moles and machines of a similar nature.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $98.67
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $157.87

Operating Engineer - Road & Heavy Construction III

Mine Hoists (Cranes, etc. when used as Mine Hoists)

Effective Period: 7/1/2026 - 6/30/2027

Wage Rate per Hour: $101.86
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $162.98

Operating Engineer - Road & Heavy Construction IV

Gradealls, Keystones, Cranes on land or water (with digging buckets), Bridge Cranes, Vermeer Cutter and machines of a similar nature, Trenching Machines.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $99.37
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $158.99

Operating Engineer - Road & Heavy Construction V

Pile Drivers & Rigs (working alongside Dock Builder foreperson): Derrick Boats, Tunnel Shovels.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $97.41
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $155.86

Operating Engineer - Road & Heavy Construction VI

Mixers (Concrete with loading attachment), Concrete Pavers, Cableways, Land Derricks, Power Houses (Low Air Pressure Units).

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $92.51
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $148.02

Operating Engineer - Road & Heavy Construction VII

Barrier Movers, Barrier Transport and Machines of a Similar Nature.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $74.63
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $119.41

Operating Engineer - Road & Heavy Construction VIII

Utility Compressors

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $57.84
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $73.02

Operating Engineer - Road & Heavy Construction IX

Horizontal Boring Rig

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $87.98
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $140.77

Operating Engineer - Road & Heavy Construction X

Elevators (manually operated as personnel hoist).

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $80.83
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $129.33

Operating Engineer - Road & Heavy Construction XI

Compressors (Portable 3 or more in battery), Driving of Truck Mounted Compressors, Well-point Pumps, Tugger Machines Well Point Pumps, Churn Drill.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $62.68
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $100.29

Operating Engineer - Road & Heavy Construction XII

All Drills and Machines of a similar nature.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $93.50
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $149.60

Operating Engineer - Road & Heavy Construction XIII

Concrete Pumps, Concrete Plant, Stone Crushers, Double Drum Hoist, Power Houses (other than above).

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $90.57
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $144.91

Operating Engineer - Road & Heavy Construction XIV

Concrete Mixer

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $86.55
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $138.48

Operating Engineer - Road & Heavy Construction XV

Compressors (Portable Single or two in Battery, not over 100 feet apart), Pumps (River Cofferdam) and Welding Machines, Push Button Machines, All Engines Irrespective of Power (Power-Pac) used to drive auxiliary equipment, Air, Hydraulic, etc.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $58.23
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $93.17

Operating Engineer - Road & Heavy Construction XVI

Concrete Breaking Machines, Hoists (Single Drum), Load Masters, Locomotives (over ten tons) and Dinkies over ten tons, Hydraulic Crane-Second Engineer.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $82.63
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $132.21

Operating Engineer - Road & Heavy Construction XVII

On-Site concrete plant engineer, On-site Asphalt Plant Engineer, and Vibratory console.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $83.23
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours

Shift Wage Rate: $133.17

Operating Engineer - Road & Heavy Construction XVIII

Tower Crane

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $119.67
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $191.47

Operating Engineer - Paving I

Asphalt Spreaders, Autogrades (C.M.I.), Roto/Mil

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $92.51
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $148.02

Operating Engineer - Paving II

Asphalt Roller

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $90.14
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $144.22

Operating Engineer - Paving III

Asphalt Plants

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $76.11
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $121.78

Operating Engineer - Concrete I

Cranes

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $98.93
Supplemental Benefit Rate per Hour: $40.40

Supplemental Note: $74.50 overtime hours

Operating Engineer - Concrete II

Compressors

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $58.68
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours

Operating Engineer - Concrete III

Micro-traps (Negative Air Machines), Vac-All Remediation System.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $78.97
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours

Operating Engineer - Steel Erection I

Three Drum Derricks

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $103.35
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $165.36

Operating Engineer - Steel Erection II

Cranes, 2 Drum Derricks, Hydraulic Cranes, Fork Lifts and Boom Trucks.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $99.29
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $158.86

Operating Engineer - Steel Erection III

Compressors, Welding Machines.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $54.73
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $87.57

Operating Engineer - Steel Erection IV

Compressors - Not Combined with Welding Machine. (Public Works Only)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $52.08
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
Shift Wage Rate: $83.33

Operating Engineer - Building Work I

Forklifts, Plaster (Platform machine), Plaster Bucket, Concrete Pump and all other equipment used for hoisting material.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $74.34
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours

Operating Engineer - Building Work II

Compressors, Welding Machines (Cutting Concrete-Tank Work), Paint Spraying, Sandblasting, Pumps (with the exclusion of Concrete Pumps), All Engines irrespective of Power (Power-Pac) used to drive Auxiliary Equipment, Air, Hydraulic, Jacking System, etc.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $55.45
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours

Operating Engineer - Building Work III

Double Drum

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $94.79
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours

Operating Engineer - Building Work IV

Stone Derrick, Cranes, Hydraulic Cranes Boom Trucks.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $100.43
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours

Operating Engineer - Building Work V

Dismantling and Erection of Cranes, Relief Engineer.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $82.68
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours

Operating Engineer - Building Work VI

4 Pole Hoist, Single Drum Hoists.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $81.79
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours

Operating Engineer - Building Work VII

Rack & Pinion and House Cars

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $64.87
Supplemental Benefit Rate per Hour: $40.40
Supplemental Note: $74.50 overtime hours
For New House Car projects Wage Rate per Hour $51.61
For New House Car projects: Supplemental Benefit overtime hours: $74.50

Overtime Description
On jobs of more than one shift, if an Employee fails to report for work through any cause over which the Employer has no control, the Employee on duty will continue to work at the rate of single time.

For House Cars and Rack & Pinion only: Overtime paid at time and one-half for all hours in excess of eight hours in a day, Saturday, Sunday and Holidays worked.

Overtime
Double time the regular rate after an 8 hour day.
Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.
Double time the regular rate for work on the following holiday(s).

Paid Holidays
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving

Christmas Day

Shift Rates

When two (2) or more shifts are employed, single time will be paid for each shift.
For Steel Erection Only: Shifts may be worked at the single time rate at other than the regular working hours (8:00 A.M. to 4:30 P.M.) on the following work ONLY: Heavy construction jobs on work below the street level, over railroad tracks and on building jobs.

(Operating Engineer Local #14)

FLAGGER

Flagger to be paid at the rate of the journeyperson or apprentice in the trade performing the underlying work.

In accordance with the Comptroller's Prevailing Wage Memorandum Regarding Flag Persons dated June 1, 2024, this title includes traffic control duty only for City public works contracts and subcontracts solicited on or after July 1, 2024.

On City public works contracts and subcontracts solicited on or after July 1, 2024, traffic control worker to be paid at the rate of the journeyperson or apprentice in the trade performing the underlying work.

If the trade performing the underlying work does not regularly employ a flagger or traffic control worker, then one of the following titles must be used on such projects:
Laborer - Heavy & Highway
Laborer - Paver & Roadbuilder
Laborer - Paver & Roadbuilder Line Striping (Roadway)

FLOOR COVERER

(Interior vinyl composition tile, sheath vinyl linoleum and wood parquet tile including site preparation and synthetic turf not including site preparation)

Floor Coverer

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $60.05
Supplemental Benefit Rate per Hour: $50.83

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Day after Thanksgiving
Day before Christmas
Christmas Day
Day before New Year's Day

Shift Rates
Two shifts may be utilized with the first shift working 8 a.m. to the end of the shift at straight time rate of pay. The wage rate for the second shift consisting of 7 hours shall be paid at 114.29% of straight time wage rate. The wage rate for the second shift consisting of 8 hours shall be paid 112.5% of the straight time wage rate. When it is not possible to conduct alteration or repair work during regular working hours in a building occupied by tenants, the rule for the second shift will apply.

(Carpenters District Council)

GLAZIER
(New Construction, Remodeling, and Alteration)

Glazier

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $49.72
Supplemental Benefit Rate per Hour: $60.05

Supplemental Note: Supplemental benefit contributions are to be made at the applicable overtime rates.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

DC9 (Local #1087)

GLAZIER - REPAIR & MAINTENANCE
(For the Installation of Glass - All repair and maintenance work on a particular building.)

Craft Jurisdiction for repair, maintenance and fabrication

Plate glass replacement, Storm windows and storm doors, Herculite door repairs, Door closer repairs, Glass tinting.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $28.32
Supplemental Benefit Rate per Hour: $28.68

Overtime
Time and one half the regular rate after an 8 hour day.
Double time the regular rate for Sunday.
Time and one half the regular rate for work on the following holiday(s).
Time and one half the regular hourly rate after 40 straight time hours in any work week.

Paid Holidays
New Year's Day
President's Day
Memorial Day

Independence Day
Labor Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day
Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

DC9 (Local #1087)

HAZARDOUS MATERIAL HANDLER
(Removal, abatement, encapsulation or decontamination of asbestos, lead, mold, or other toxic or hazardous waste/materials)

Handler

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $40.00
Supplemental Benefit Rate per Hour: $26.27

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Sunday.
Time and one half the regular hourly rate after 40 straight time hours in any work week.

Overtime Holidays
Time and one half the regular rate for work on the following holiday(s).
New Year's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Veteran's Day
Thanksgiving Day
Christmas Day
Easter

Paid Holidays
None

(Local #78 and Local #12A)

HEAT AND FROST INSULATOR

Heat & Frost Insulator

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $73.21
Supplemental Benefit Rate per Hour: $37.81

Overtime Description
Supplemental Benefit contributions are to be made at the applicable overtime rates.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Triple time the regular rate for work on the following holiday(s).
Labor Day

Paid Holidays
None

Shift Rates
The first shift shall work seven hours at the regular straight time rate. The second and third shift shall work seven hours the regular straight time hourly rate plus a fourteen percent wage and benefit premium. There must be a first shift to work the second shift, and a second shift to work the third shift. Off-hour jobs in occupied buildings may be worked on weekdays with an increment of one-dollar ($1.00) per hour and eight (8) hours pay for seven (7) hours worked.

(Local #12) (BCA)

HOUSE WRECKER
(TOTAL DEMOLITION)

House Wrecker - Tier A

On all work sites the first, second, eleventh and every third House Wrecker thereafter will be Tier A House Wreckers (i.e. 1st, 2nd, 11th, 14th etc). Other House Wreckers may be Tier B House Wreckers.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $40.60
Supplemental Benefit Rate per Hour: $32.80

House Wrecker - Tier B

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $29.83
Supplemental Benefit Rate per Hour: $25.21

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

(Mason Tenders District Council)

IRON WORKER - ORNAMENTAL

Iron Worker - Ornamental

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $48.65
Supplemental Benefit Rate per Hour: $69.29
Supplemental Note: Supplemental benefits are to be paid at the applicable overtime rate when overtime is in effect.

Overtime Description
Monday through Friday- the first eight hours are paid at straight time, the 9th and 10th hours are paid at time and one-half the regular rate, all additional weekday overtime is paid at double the regular rate. Saturdays- the first eight hours are paid at time and one-half the regular rate, double time thereafter. Sunday-all shifts are paid at double time. Four Days a week at Ten (10) hours straight time is allowed.

Overtime
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
When two or three shifts are employed on a job, Monday through Friday, each shift will be paid eight (8) hours at the straight time rate for eight (8) hours of work; at time and one-half the regular straight time rate for the first two (2) hours of overtime worked beyond eight (8) hours; and at double time for all work thereafter. When it is not possible to conduct alteration or repair work during regular working hours in a building occupied by tenants, eight (8) hours will be paid at straight time rate for seven (7) hours of work, and all overtime shall be paid at time and one-half the regular straight time rates. On Saturday, Sundays and Holidays, time and one-half the regular straight time rate shall be paid for all work up to seven (7) hours and double time shall be paid for all work thereafter.

(Local #580)

IRON WORKER - STRUCTURAL

Iron Worker - Structural

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $59.45
Supplemental Benefit Rate per Hour: $94.63
Supplemental Note: Supplemental benefits are to be paid at the applicable overtime rate when overtime is in effect.

Overtime Description

Monday through Friday- the first eight hours are paid at straight time, the 9th and 10th hours are paid at time and one-half the regular rate, all additional weekday overtime is paid at double the regular rate. Saturdays- the first eight hours are paid at time and one-half the regular rate, double time thereafter. Sunday-all shifts are paid at double time. Four Days a week at Ten (10) hours straight time is allowed.

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays

1/2 day on Christmas Eve if work is performed in the A.M.
1/2 day on New Year's Eve if work is performed in the A.M.

Shift Rates

Monday through Friday - First Shift: First eight hours are paid at straight time, the 9th & 10th hours are paid at time and a half, double time paid thereafter. Second and third Shifts: First eight hours are paid at time and one-half, double time thereafter. Saturdays: All shifts, first eight hours paid at time and one-half, double time thereafter: Sunday all shifts are paid at double time.

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday.

(Local #40 & #361)

LABORER – HEAVY & HIGHWAY
(Foundation, Concrete, Excavating, Street Pipe Layer and Common)

Laborer - Heavy & Highway

Excavation and foundation work for buildings, heavy construction, street pipe laying, engineering work, and hazardous waste removal in connection with the above work. Landscaping tasks in connection with heavy construction work, engineering work and building projects. Projects include, but are not limited to pollution plants, sewers, parks, subways, bridges, highways, etc. In accordance with the Comptroller's Prevailing Wage Memorandum Regarding Flag Persons dated June 1, 2024, for City public work contracts and subcontracts solicited on or after July 1, 2024 only, includes traffic control duty associated with such projects.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $46.60
Supplemental Benefit Rate per Hour: $57.77

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Memorial Day
Independence Day
Columbus Day
Christmas Day

Triple time the regular rate for work on the following holiday(s).
Labor Day
Thanksgiving Day

Paid Holidays
Labor Day
Thanksgiving Day

Shift Rates
When two shifts are employed, single time rate shall be paid for each shift. When three shifts are found necessary, each shift shall work seven and one half hours (7 ½), but shall be paid for eight (8) hours of labor, and be permitted one half hour for lunch.

(Local #731)

LABORER - PAVER & ROADBUILDER

Laborer - Paver & Roadbuilder

Paving and road construction work, regardless of material used, including but not limited to preparation of job sites, removal of old surfaces, asphalt and/or concrete, by whatever method, including but not limited to milling; laying of concrete; laying of asphalt for temporary, patchwork, and utility paving (but not production paving); site preparation and incidental work for installation of rubberized materials and similar surfaces; installation and repair of temporary construction fencing; slurry/seal coating, paving stones, maintenance of safety surfaces; play equipment installation, and other related work. In accordance with the Comptroller's Prevailing Wage Memorandum Regarding Flag Persons dated June 1, 2024, for City public work contracts and subcontracts solicited on or after July 1, 2024 only, includes traffic control duty associated with such projects.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $46.98

Supplemental Benefit Rate per Hour: $56.65
Supplemental Note: For time and one half overtime - $61.53 For double overtime - $66.40

Paver & Roadbuilder - Formsetter

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $50.85
Supplemental Benefit Rate per Hour: $56.65
Supplemental Note: For time and one half overtime - $61.53 For double overtime - $66.40

Production Paver & Roadbuilder - Shoveler

General laborer (except removal of surfaces - see Paver and Roadbuilder-Laborer) including but not limited to tamper, AC paint and liquid tar work.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $46.98
Supplemental Benefit Rate per Hour: $56.65
Supplemental Note: For time and one half overtime - $61.53 For double overtime - $66.40

Production Paver & Roadbuilder - Raker

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $50.85
Supplemental Benefit Rate per Hour: $56.65
Supplemental Note: For time and one half overtime - $61.53 For double overtime - $66.40

Production Paver & Roadbuilder - Screed Person

(Production paving is asphalt paving when using a paving machine or on a project where a paving machine is traditionally used)

Adjustment of paving machinery on production paving jobs.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $51.45
Supplemental Benefit Rate per Hour: $56.65
Supplemental Note: For time and one half overtime - $61.53 For double overtime - $66.40

Overtime Description

If an employee works New Year's Day or Christmas Day, they receive the single time rate plus 25%.

For Paid Holidays: Holiday pay for all holidays shall be prorated based two hours per day for each day worked in the holiday week, not to exceed 8 hours of holiday pay.

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).
Memorial Day
Independence Day
Labor Day
Columbus Day
Thanksgiving Day

Paid Holidays

Memorial Day
Independence Day
Labor Day
Thanksgiving Day

Shift Rates

When two shifts are employed, the work period for each shift shall be a continuous eight (8) hours. When three shifts are employed, each shift will work seven and one half (7 ½) hours but will be paid for eight (8) hours at the straight time rate since only one half (1/2) hour is allowed for meal time.
When two or more shifts are employed, single time will be paid for each shift.

(Local #1010)

LABORER - PAVER & ROADBUILDER LINE STRIPING (ROADWAY)

(Road markings, applications of striping and surface coatings on Roadways, Bus lanes, Bike lanes & Pedestrian Plazas)

Striping - Machine Operator (Thermoplastic & Epoxy)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $43.00
Supplemental Benefit Rate per Hour: $25.77
Supplemental Note: For time and one half overtime - $28.02 For double overtime - $30.27

Lineperson - Crew Chief

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $47.00
Supplemental Benefit Rate per Hour: $25.77
Supplemental Note: For time and one half overtime - $28.02 For double overtime - $30.27

Laborer: Striping Assistant - Green Infrastructure - Traffic Control

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $41.00

Supplemental Benefit Rate per Hour: $25.77
Supplemental Note: For time and one half overtime - $28.02 For double overtime - $30.27

Overtime Description
For Paid Holidays: Employees will only receive Holiday Pay for holidays not worked if said employee worked both the regularly scheduled workday before and after the holiday.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.
Time and one half the regular rate for work on the following holiday(s).

Paid Holidays
New Year's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Shift Rates
Vacation
As of January 1, 2026, Vacation removed and its value was incorporated in the Supplemental Benefit rate above.

Vacation
Vacation Employees with one to two years service shall accrue vacation based on hours worked: 250 hours worked - 1 day vacation; 500 hours worked - 2 days vacation; 750 hours worked - 3 days vacation; 900 hours worked - 4 days vacation; 1,000 hours worked - 5 days vacation. Employees with two to five years service receive two weeks vacation. Employees with five to twenty years service receive three weeks vacation. Employees with twenty to twenty-five years service receive four weeks vacation. Employees with 25 or more years service receive five weeks vacation.

(Local #1010)

LANDSCAPING

Landscaper (Year 6 and above)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $40.66
Supplemental Benefit Rate per Hour: $18.55

Landscaper (Year 3 - 5)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $39.39
Supplemental Benefit Rate per Hour: $18.55

Landscaper (up to 3 years)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $36.19
Supplemental Benefit Rate per Hour: $18.55

Groundsperson

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $36.19
Supplemental Benefit Rate per Hour: $18.55

Tree Remover / Pruner

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $47.08
Supplemental Benefit Rate per Hour: $18.55

Landscaper Sprayer (Pesticide Applicator)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $34.28
Supplemental Benefit Rate per Hour: $18.55

Watering - Plant Maintainer

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $27.85
Supplemental Benefit Rate per Hour: $18.55

Overtime Description
For all overtime work performed, supplemental benefits shall include an additional seventy-five ($0.75) cents per hour.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Time and one half the regular rate for work on a holiday plus the day's pay.

Paid Holidays
New Year's Day
Memorial Day
Independence Day

Labor Day
Thanksgiving Day
Christmas Day

Shift Rates

Work performed on a 4pm to 12am shift has a 15% differential. Work performed on a 12am to 8am shift has a 20% differential.

(Local #175)

MARBLE MECHANIC

Marble Setter

Effective Period: 7/1/2026 - 7/1/2026
Wage Rate per Hour: $60.21
Supplemental Benefit Rate per Hour: $44.96

Effective Period: 7/2/2026 - 6/30/2027
Wage Rate per Hour: $60.61
Supplemental Benefit Rate per Hour: $45.31

Marble Finisher

Effective Period: 7/1/2026 - 7/1/2026
Wage Rate per Hour: $46.17
Supplemental Benefit Rate per Hour: $41.91

Effective Period: 7/2/2026 - 6/30/2027
Wage Rate per Hour: $46.49
Supplemental Benefit Rate per Hour: $42.11

Marble Polisher

Effective Period: 7/1/2026 - 7/1/2026
Wage Rate per Hour: $45.11
Supplemental Benefit Rate per Hour: $35.01

Effective Period: 7/2/2026 - 6/30/2027
Wage Rate per Hour: $45.47
Supplemental Benefit Rate per Hour: $35.21

Marble Maintenance Finisher

Effective Period: 7/1/2026 - 7/1/2026

Wage Rate per Hour: $28.30
Supplemental Benefit Rate per Hour: $15.94

Effective Period: 7/2/2026 - 6/30/2027
Wage Rate per Hour: $28.56
Supplemental Benefit Rate per Hour: $16.09

Overtime Description
Supplemental Benefit contributions are to be made at the applicable overtime rates.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

(Local #7)

MASON TENDER
Building Laborer

Mason Tender

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $42.55
Supplemental Benefit Rate per Hour: $34.64

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays

None

Shift Rates

The employer may work two (2) shifts with the first shift at the straight time wage rate and the second shift receiving 114.3% of straight time on wage rate and fringe benefit rate. When it is not possible to conduct alteration work during regular working hours in a building occupied by tenants, the rule for the second shift will apply.

(Local #79)

MASON TENDER (INTERIOR DEMOLITION WORKER)

Mason Tender Tier A

Tier A Interior Demolition Worker performs all burning, chopping, and other technically skilled tasks related to interior demolition work.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $38.40
Supplemental Benefit Rate per Hour: $26.89

Mason Tender Tier B

Tier B Interior Demolition Worker performs manual work and work incidental to demolition work, such as loading and carting of debris from the work site to an area where it can be loaded in to bins/trucks for removal.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $27.59
Supplemental Benefit Rate per Hour: $21.21

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

(Local #79)

METALLIC LATHER

Metallic Lather

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $47.85
Supplemental Benefit Rate per Hour: $57.11
Supplemental Note: For time and one half overtime - $69.11 For double overtime - $90.51

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Thanksgiving Day
Christmas Day

Paid Holidays
1/2 day on Christmas Eve if work is performed in the A.M.

1/2 day on New Year's Eve if work is performed in the A.M.

Shift Rates
Off-shift work outside of normal working hours shall receive straight time rate plus $12 per hour for the first eight (8) hours.

(Local #46)

MILLWRIGHT

Millwright

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $62.03
Supplemental Benefit Rate per Hour: $59.98

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Veteran's Day
Thanksgiving Day
Christmas Day

Paid Holidays
1/2 day on Christmas Eve if work is performed in the A.M.
1/2 day on New Year's Eve if work is performed in the A.M.

Shift Rates
Second and third shifts receives the straight time rate of pay plus fifteen (15%) percent allowing for one half hour for a meal. There must be a first shift to work a second and third shift. All additional hours worked shall be paid at the time and one-half rate of pay plus fifteen (15%) percent for weekday hours.

(Local #740)

MOSAIC MECHANIC

Mosaic Mechanic - Mosaic & Terrazzo Mechanic

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $55.82
Supplemental Benefit Rate per Hour: $49.47

Mosaic Mechanic- Mosaic & Terrazzo Mechanic / Machine Operator Grinder

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $54.22
Supplemental Benefit Rate per Hour: $49.47

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

(Local #7)

PAINTER

Painter - Brush & Roller

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $45.50
Supplemental Benefit Rate per Hour: $45.72
Supplemental Note: Supplemental benefits for time and one half overtime - $54.78, For double overtime - $63.83

Spray & Scaffold / Decorative / Sandblast

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $48.50
Supplemental Benefit Rate per Hour: $45.72
Supplemental Note: Supplemental benefits for time and one half overtime - $54.78, For double overtime - $63.83

Overtime
Time and one half the regular rate after a 7 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

(District Council of Painters #9)

PAINTER - BRIDGE & STRUCTURAL STEEL

Painters on Structural Steel

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $57.00
Supplemental Benefit Rate per Hour: $57.21

Painter - Power Tool

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $64.00

Supplemental Benefit Rate per Hour: $57.21
Overtime Wage Rate: $7.00 above the "Painters on Structural Steel" overtime rate.

Overtime Description
Supplemental Benefits shall be paid for each hour worked, up to forty (40) hours per week for the period of May 1st to November 15th or up to fifty (50) hours per week for the period of November 16th to April 30th.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
Second shift is paid at regular hourly wage rates plus a ten percent (10%) differential. There must be a first shift to work a second shift.

(Local #806)

PAINTER - METAL POLISHER

METAL POLISHER

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $35.00
Supplemental Benefit Rate per Hour: $12.84

METAL POLISHER - NEW CONSTRUCTION

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $35.95
Supplemental Benefit Rate per Hour: $12.84

METAL POLISHER - SCAFFOLD OVER 34 FEET

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $38.50
Supplemental Benefit Rate per Hour: $12.84

ASSISTANT METAL POLISHER

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $27.19
Supplemental Benefit Rate per Hour: $12.47

ASSISTANT METAL POLISHER - NEW CONSTRUCTION

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $27.94
Supplemental Benefit Rate per Hour: $12.47

ASSISTANT METAL POLISHER - SCAFFOLD OVER 34 FEET

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $29.69
Supplemental Benefit Rate per Hour: $12.47

Overtime Description
All work performed on Saturdays shall be paid at time-in-a half. The exception being; for suspended scaffold work and work deemed as a construction project; an eight (8) hour shift lost during the week due to circumstances beyond the control of the employer, up to a maximum of eight (8) hours per week, may be worked on Saturday at the straight time rate.

Holiday Pay
Double time the regular rate for work on the following Holiday plus the day's pay. Only employees who have completed one year of service, including any trial period shall be eligible for holiday pay.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Paid Holidays
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day

Day after Thanksgiving
Christmas Day

Shift Rates
Four Days a week at Ten (10) hours straight a day.

Local 8A-28A

PAINTER - SIGN

Sign Painter

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $49.39
Supplemental Benefit Rate per Hour: $29.75

Assistant Sign Painter

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $41.98
Supplemental Benefit Rate per Hour: $29.04

Overtime Description
If any employee is required to work on any of the paid holidays then the employee shall receive double time rate of wages as well as the holiday pay for that day.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Paid Holidays
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Election Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day
Personal Day

Vacation
At least 1 year of employment.....1 week

2 years or more of employment.....2 weeks
8 years or more of employment.....3 weeks

(Local #8A-28A)

PAPERHANGER

Paperhanger

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $49.02
Supplemental Benefit Rate per Hour: $46.90
Supplemental Note: Supplemental benefits for time and one half overtime - $55.87, For double overtime - $64.84

Overtime
Time and one half the regular rate after a 7 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

Shift Rates
None

(District Council of Painters #9)

PLASTERER

Plasterer

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $48.51
Supplemental Benefit Rate per Hour: $32.78

Plasterer II

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $32.11
Supplemental Benefit Rate per Hour: $16.70

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
When it is not possible to conduct work during regular working hours (between 6:00am and 4:30pm), a shift differential shall be paid at the regular hourly rate plus a twelve percent (12%) per hour differential. Workers on shift work shall be allowed a paid one-half hour meal break.

(Local #262)

PLASTERER - TENDER

Plasterer - Tender

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $42.55
Supplemental Benefit Rate per Hour: $34.64

Overtime
Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
When work commences outside regular work hours, workers receive an hour additional (differential) wage and supplement payment. Eight hours pay for seven hours work or nine hours pay for eight hours work.

(Mason Tenders District Council)

PLUMBER

Plumber

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $78.05
Supplemental Benefit Rate per Hour: $46.40
Supplemental Note: Double time shall be paid for supplemental benefits during overtime work.

Plumber - Temporary Services

Temporary Services - When there are no Plumbers on the job site, there may be three shifts designed to cover the entire twenty-four hour period, including weekends if necessary, at the following rate straight time.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $62.52
Supplemental Benefit Rate per Hour: $37.04
Supplemental Note: Double time shall be paid for supplemental benefits during overtime work.

Overtime Description
Where the plumbing contract price is one and one half million dollars ($1,500,000.00) or less, double time the regular rate after an 8 hour day.

Overtime
Double time the regular rate after a 7 hour day.
Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Shift Rates
Shift work, when directly specified in public agency or authority contract documents, and continues for a period of not less than ten (10) consecutive work days. A shift shall consist of seven (7) hours with one-half (1/2) hour for lunch after the first four (4) hours of each shift. A premium of thirty percent (30%) for wages and supplemental benefits on shift work performed Monday through Friday on the 4 P.M. and midnight shifts. For shift work performed on weekends the shift premium shall be fifty percent (50%) of wages and supplemental benefits. For shift work performed on holidays designated below, double time wages and supplemental benefits shall be paid. Also noted that the normal workday Monday through Friday 8:00 A.M. to 3:30 P.M. is not considered shift work, and therefore not subject to shift premium.

(Plumbers Local #1)

PLUMBER (MECHNICAL EQUIPMENT AND SERVICE)
Mechanical Equipment and Service work is any repair and/or replacement of the present plumbing system that does not change existing roughing or water supply lines. Projects regardless of work type which have approved plans and specifications wherein the plumbing exceeds $725,000 are excluded.

Plumber

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $49.90
Supplemental Benefit Rate per Hour: $22.86

Overtime
Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

(Plumbers Local # 1)

PLUMBER (RESIDENTIAL RATES FOR 1, 2 AND 3 FAMILY HOME CONSTRUCTION)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $54.25
Supplemental Benefit Rate per Hour: $33.21

Overtime
Double time the regular rate after an 8 hour day.
Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

Shift Rates

Shift work, when directly specified in public agency or authority contract documents, and continues for a period of not less than ten (10) consecutive work days. A shift shall consist of seven (7) hours with one-half (1/2) hour for lunch after the first four (4) hours of each shift. A premium of thirty percent (30%) for wages and supplemental benefits on shift work performed Monday through Friday on the 4 P.M. and midnight shifts. For shift work performed on weekends the shift premium shall be fifty percent (50%) of wages and supplemental benefits. For shift work performed on holidays designated below, double time wages and supplemental benefits shall be paid. Also noted that the normal workday Monday through Friday 8:00 A.M. to 3:30 P.M. is not considered shift work, and therefore not subject to shift premium.

(Plumbers Local #1)

PLUMBER: PUMP & TANK

Oil Trades (Installation and Maintenance)

Plumber - Pump & Tank

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $75.00
Supplemental Benefit Rate per Hour: $35.81

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays

Time and one half the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Election Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays

None

Shift Rates

All work outside the regular workday (8:00 A.M. to 4:30 P.M.) is to be paid at time and one half the regular hourly rate

(Plumbers Local #1)

POINTER, WATERPROOFER, CAULKER, SANDBLASTER, STEAMBLASTER
(Exterior Building Renovation)

Journeyperson

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $66.58
Supplemental Benefit Rate per Hour: $33.85

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Time and one half the regular rate for work on the following holiday(s).
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
All work outside the regular work day (an eight hour workday between the hours of 6:00 A.M. and 4:00 P.M.) is to be paid at time and one half the regular rate. However, the employer may establish one (1) or two (2) shifts starting at or after 4:00 P.M. to be paid at the regular hourly rate plus a 10% differential. For projects bid and performed after July 1, 2023, the first shift shall be paid at the regular hourly rate plus a 5% differential.

(Bricklayer District Council)

ROOFER

Roofer

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $52.50
Supplemental Benefit Rate per Hour: $40.03

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays
Time and one half the regular rate for work on the following holiday(s).
New Year's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
Second shift - Regular hourly rate plus a 10% differential. Third shift - Regular hourly rate plus a 15% differential. There must be a first shift to work the second shift, and a second shift to work the third shift. All other work outside the regular work day (an eight hour workday between the hours of 5:00 A.M. and 4:00 P.M.) is to be paid at time and one half the regular rate.

(Local #8)

SHEET METAL WORKER

Sheet Metal Worker

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $57.08
Supplemental Benefit Rate per Hour: $60.70
Supplemental Note: Supplemental benefit contributions are to be made at the applicable overtime rates.

Sheet Metal Worker - Fan Maintenance

(The temporary operation of fans or blowers in new or existing buildings for heating and/or ventilation, and/or air conditioning prior to the completion of the project.)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $45.66
Supplemental Benefit Rate per Hour: $60.70

Sheet Metal Worker - Duct Cleaner

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $21.00
Supplemental Benefit Rate per Hour: $13.06

Overtime Description
Double time the regular rate after 10 hours on Saturday.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day
Juneteenth

Paid Holidays
None

Shift Rates
Work that can only be performed outside regular working hours (eight hours of work between 7:30 A.M. and 3:30 P.M.) - First shift (work between 3:30 P.M. and 11:30 P.M.) - 10% differential above the established hourly rate. Second shift (work between 11:30 P.M. and 7:30 A.M.) - 15% differential above the established hourly rate.

For Fan Maintenance: On all full shifts of fan maintenance work the straight time hourly rate of pay will be paid for each shift, including nights, Saturdays, Sundays, and holidays.

(Local #28)

SHEET METAL WORKER - SPECIALTY
(Decking & Siding)

Sheet Metal Specialty Worker

The first worker to perform this work must be paid at the rate of the Sheet Metal Worker. The second and third workers shall be paid the Specialty Worker Rate. The ratio of One Sheet Metal Worker, then Two Specialty Workers shall be utilized thereafter.

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $52.54
Supplemental Benefit Rate per Hour: $31.61
Supplemental Note: Supplemental benefit contributions are to be made at the applicable overtime rates.

Overtime Description
Double time the regular rate after 10 hours on Saturday.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Christmas Day
Juneteenth

Paid Holidays
None

(Local #28)

SHIPYARD WORKER

Shipyard Mechanic - First Class

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $33.06
Supplemental Benefit Rate per Hour: $3.04

Shipyard Mechanic - Second Class

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $22.89
Supplemental Benefit Rate per Hour: $2.26

Shipyard Laborer - First Class

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $27.74
Supplemental Benefit Rate per Hour: $3.28

Shipyard Laborer - Second Class

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $19.92
Supplemental Benefit Rate per Hour: $2.41

Shipyard Dockhand - First Class

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $28.65
Supplemental Benefit Rate per Hour: $3.27

Shipyard Dockhand - Second Class

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $20.78
Supplemental Benefit Rate per Hour: $3.20

Overtime Description

Work performed on holiday is paid double time the regular hourly wage rate plus holiday pay.

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Time and one half the regular hourly rate after 40 straight time hours in any work week.

Paid Holidays

New Year's Day
Martin Luther King Jr. Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Based on Survey Data

SIGN ERECTOR
(Sheet Metal, Plastic, Electric, and Neon)

Sign Erector

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $58.00
Supplemental Benefit Rate per Hour: $63.44

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.
Time and one half the regular rate for work on the following holiday(s).

Paid Holidays

New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Election Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Shift Rates

Time and one half the regular hourly rate is to be paid for all hours worked outside the regular workday either (7:00 A.M. through 2:30 P.M.) or (8:00 A.M. through 3:30 P.M.)

(Local #137)

STEAMFITTER

Steamfitter

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $61.80
Supplemental Benefit Rate per Hour: $64.89
Supplemental Note: Overtime supplemental benefit rate for double time: $129.04. For time & half: $96.97

Steamfitter -Temporary Services

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $46.97
Supplemental Benefit Rate per Hour: $52.50

Overtime
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Time and one half the regular rate for work on the following holiday(s).
New Year's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

The single time rate plus 15%.
Martin Luther King Jr. Day
President's Day
Columbus Day
Veteran's Day

Paid Holidays
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Christmas Day

Shift Rates
When shift work is
performed the wage rate for regular time worked is a 15% percent premium on wage.

Local 638

STEAMFITTER - REFRIGERATION AND AIR CONDITIONER
(Maintenance and Installation Service Person)

Refrigeration and Air Conditioner Mechanic

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $48.35
Supplemental Benefit Rate per Hour: $23.46

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Independence Day
Labor Day
Veteran's Day
Thanksgiving Day
Christmas Day

Double time and one half the regular rate for work on the following holiday(s).
Martin Luther King Jr. Day
President's Day
Memorial Day
Columbus Day

Paid Holidays
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day

Christmas Day

(Local #638-B)

STONE MASON - SETTER

Stone Mason - Setter

(Assisted by Derrickperson and Rigger)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $62.52
Supplemental Benefit Rate per Hour: $56.92

Overtime Description
Monday through Friday: Time and one quarter after seven hours worked. Time and one half after eight hours worked. Double time after 9 hours worked.
Saturday: Time and one half for the first nine hours worked. Double time after 9 hours worked.
Sunday and Holiday: double time for all hours worked.
Site Work: (paving and base course) paid at straight time for the first eight hours.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
1/2 day on Christmas Eve if work is performed in the A.M.

Shift Rates
For all hours worked outside 8:00 am to 3:30 pm shall be paid double time unless flex band hours and/or site work are in use.

(Bricklayers District Council)

TAPER

Drywall Taper

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $49.01
Supplemental Benefit Rate per Hour: $37.67
Supplemental Note: Supplemental benefits for time and one half overtime - $42.80, For double overtime - $75.34

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Martin Luther King Jr. Day
President's Day
Good Friday
Memorial Day
Independence Day
Columbus Day
Thanksgiving Day
Day before Christmas
Christmas Day
Day before New Year's Day

(Local #1974)

TELECOMMUNICATION WORKER
(Install/maintain/repair telecommunications cables carrying data, video, and/or voice except for installation on building construction/alteration/renovation projects.)

Telecommunication Worker

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $47.03
Supplemental Benefit Rate per Hour: $23.15
Supplemental Note: The above rate applies for Manhattan, Bronx, Brooklyn, Queens. $22.84 for Staten Island only.

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays

Time and one half the regular rate for work on the following holiday(s).
New Year's Day
Lincoln's Birthday
Washington's Birthday
Memorial Day
Independence Day
Labor Day
Columbus Day
Election Day
Veteran's Day
Thanksgiving Day
Christmas Day

Paid Holidays

New Year's Day
Lincoln's Birthday
Washington's Birthday
Memorial Day
Independence Day
Labor Day
Columbus Day
Election Day
Veteran's Day
Thanksgiving Day
Christmas Day
Employees have the option of observing either Martin Luther King's Birthday or the day after Thanksgiving instead of Lincoln's Birthday

Shift Rates

For any workday that starts before 8A.M. or ends after 6P.M. there is a 10% differential for the applicable worker's hourly rate.

Vacation

After 6 months.....one week.
After 12 months but less than 7 years.....two weeks.
After 7 or more but less than 15 years.....three weeks.
After 15 years or more but less than 25 years.....four weeks.

(C.W.A.)

TILE FINISHER

Tile Finisher

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $50.93
Supplemental Benefit Rate per Hour: $34.66

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Martin Luther King Jr. Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

Shift Rates
Off shift work day (work performed outside the regular 8:00 A.M. to 3:30 P.M. workday): shift differential of one and one quarter (1¼) times the regular straight time rate of pay for the seven hours of actual off-shift work.

(Local #7)

TILE LAYER - SETTER

Tile Layer - Setter

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $66.35
Supplemental Benefit Rate per Hour: $38.06

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).
New Year's Day
Martin Luther King Jr. Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Shift Rates

Off shift work day (work performed outside the regular 8:00 A.M. to 3:30 P.M. workday): shift differential of one and one quarter (1¼) times the regular straight time rate of pay for the seven hours of actual off-shift work.

(Local #7)

TIMBERPERSON

Timberperson

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $57.59
Supplemental Benefit Rate per Hour: $57.41

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
Off shift work commencing between 5:00 P.M. and 11:00 P.M. shall work eight and one half hours allowing for one half hour for lunch. The wage rate shall be 113% of the straight time hourly wage rate. Benefits for off-shift work shall be paid at the straight time rate.

(Local #1556)

TUNNEL WORKER

Blasters, Mucking Machine Operators (Compressed Air Rates)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $75.14
Supplemental Benefit Rate per Hour: $66.51

Tunnel Workers (Compressed Air Rates)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $72.46
Supplemental Benefit Rate per Hour: $64.41

Top Nipper (Compressed Air Rates)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $71.24
Supplemental Benefit Rate per Hour: $63.14

Outside Lock Tender, Outside Gauge Tender,Muck Lock Tender (Compressed Air Rates)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $69.83
Supplemental Benefit Rate per Hour: $62.11

Bottom Bell & Top Bell Signal Person: Shaft Person (Compressed Air Rates)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $69.83
Supplemental Benefit Rate per Hour: $62.11

Changehouse Attendant: Powder Watchperson (Compressed Air Rates)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $61.57
Supplemental Benefit Rate per Hour: $58.18

Blasters (Free Air Rates)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $71.69
Supplemental Benefit Rate per Hour: $63.84

Tunnel Workers (Free Air Rates)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $68.58
Supplemental Benefit Rate per Hour: $61.18

All Others (Free Air Rates)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $63.40
Supplemental Benefit Rate per Hour: $56.62

Microtunneling (Free Air Rates)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $54.86
Supplemental Benefit Rate per Hour: $48.95

Overtime Description

For work performed during excavation and primary concrete tunnel lining phases - Double time the regular rate after an 8 hour day and Saturday, Sunday and on the following holiday(s) listed below.
For Repair-Maintenance Work on Existing Equipment and Facilities - Time and one half the regular rate after a 8 hour day, Saturday, Sunday and double time the regular rate for work on the following holiday(s) listed below.
For Small-Bore Micro Tunneling Machines - Time and one-half the regular rate shall be paid for all overtime.
For work not listed above - Time and one half the regular rate after an 8 hour day and Saturday and double time the regular rate on Sunday and on the following holiday(s) listed below.

Paid Holidays

New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving

Christmas Day

(Local #147)

UTILITY LOCATOR
(Locate & mark underground utilities including gas for street excavation and utility line repairs)

Utility Locator (Months Over 60)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $38.03
Supplemental Benefit Rate per Hour: $1.43

Utility Locator (Months 55-60)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $35.83
Supplemental Benefit Rate per Hour: $1.43

Utility Locator (Months 49-54)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $34.07
Supplemental Benefit Rate per Hour: $1.43

Utility Locator (Months 43-48)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $32.30
Supplemental Benefit Rate per Hour: $1.43

Utility Locator (Months 37-42)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $30.54
Supplemental Benefit Rate per Hour: $1.43

Utility Locator (Months 31-36)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $28.78

OFFICE OF THE COMPTROLLER

CITY OF NEW YORK

CONSTRUCTION APPRENTICE PREVAILING WAGE SCHEDULE

Pursuant to Labor Law § 220 (3-e), only apprentices who are individually registered in a bona fide program to which the employer contractor is a participant and registered with the New York State Department of Labor, may be paid at the apprentice rates in this schedule. Apprentices who are not so registered must be paid as journey persons in accordance with the trade classification of the work they actually performed.

Apprentice ratios are established to ensure the proper safety, training and supervision of apprentices. A ratio establishes the number of journey workers required for each apprentice in a program and on a job site. Ratios are interpreted as follows: in the case of a 1:1, 1:4 ratio, there must be one journey worker for the first apprentice, and four additional journey workers for each subsequent apprentice.

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BOILERMAKER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Boilermaker (First Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $45.75
Supplemental Benefit Rate per Hour: $35.60

Boilermaker (Second Year: 1st Six Months)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $49.27
Supplemental Benefit Rate per Hour: $37.70

Boilermaker (Second Year: 2nd Six Months)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $52.79
Supplemental Benefit Rate per Hour: $39.81

Boilermaker (Third Year: 1st Six Months)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $56.30
Supplemental Benefit Rate per Hour: $41.89

Boilermaker (Third Year: 2nd Six Months)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $59.82
Supplemental Benefit Rate per Hour: $44.02

Boilermaker (Fourth Year: 1st Six Months)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $63.34
Supplemental Benefit Rate per Hour: $46.13

Boilermaker (Fourth Year: 2nd Six Months)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $66.86
Supplemental Benefit Rate per Hour: $48.24

(Local #5)

BRICKLAYER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Bricklayer (First 650 Hours)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $24.52
Supplemental Benefit Rate per Hour: $29.85

Bricklayer (Second 650 Hours)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $30.65
Supplemental Benefit Rate per Hour: $29.85

Bricklayer (Third 650 Hours)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $36.77
Supplemental Benefit Rate per Hour: $29.85

Bricklayer (Fourth 650 Hours)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $42.90
Supplemental Benefit Rate per Hour: $29.85

Bricklayer (Fifth 650 Hours)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $49.03
Supplemental Benefit Rate per Hour: $29.85

Bricklayer (Last 750 Hours)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $55.16
Supplemental Benefit Rate per Hour: $29.85

(Bricklayer District Council)

CARPENTER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Carpenter (First Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate Per Hour For Building Apprentice: $25.20
Supplemental Benefit Rate Per Hour For Building Apprentice: $20.20

Wage Rate Per Hour For Heavy Apprentice: $28.98
Supplemental Benefit Rate Per Hour For Heavy Apprentice: $39.89

Carpenter (Second Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate Per Hour For Building Apprentice: $28.20
Supplemental Benefit Rate Per Hour For Building Apprentice: $21.70

Wage Rate Per Hour For Heavy Apprentice: $34.58
Supplemental Benefit Rate Per Hour For Heavy Apprentice: $39.89

Carpenter (Third Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate Per Hour For Building Apprentice: $32.45
Supplemental Benefit Rate Per Hour For Building Apprentice: $25.30

Wage Rate Per Hour For Heavy Apprentice: $42.96
Supplemental Benefit Rate Per Hour For Heavy Apprentice: $39.89

Carpenter (Fourth Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate Per Hour For Building Apprentice: $40.33
Supplemental Benefit Rate Per Hour For Building Apprentice: $27.30

Wage Rate Per Hour For Heavy Apprentice: $51.35
Supplemental Benefit Rate Per Hour For Heavy Apprentice: $39.89

(Carpenters District Council)

CARPENTER - HIGH RISE CONCRETE FORMS
(Ratio of Apprentice to Journeyperson: 1 to 1, 2 to 5)

Carpenter - High Rise (First Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $18.27
Supplemental Benefit Rate per Hour: $17.55

Carpenter - High Rise (Second Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $24.70
Supplemental Benefit Rate per Hour: $17.68

Carpenter - High Rise (Third Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $31.28
Supplemental Benefit Rate per Hour: $17.81

Carpenter - High Rise (Fourth Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $38.90
Supplemental Benefit Rate per Hour: $17.96

(Carpenters District Council)

CEMENT AND CONCRETE WORKER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Cement & Concrete Worker (First 1333 hours)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $19.27
Supplemental Benefit Rate per Hour: $17.97

Cement & Concrete Worker (Second 1333 hours)

Effective Period: 7/1/2026 - 6/30/2027

Wage Rate per Hour: **$25.24**
Supplemental Benefit Rate per Hour: **$23.41**

Cement & Concrete Worker (Last 1334 hours)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: **$31.21**
Supplemental Benefit Rate per Hour: **$24.85**

(Cement Concrete Workers District Council)

CEMENT MASON
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Cement Mason (First Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: **$23.77**
Supplemental Benefit Rate per Hour: **$14.86**

Cement Mason (Second Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: **$28.74**
Supplemental Benefit Rate per Hour: **$15.16**

Cement Mason (Third Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: **$34.27**
Supplemental Benefit Rate per Hour: **$15.27**

(Local #780)

DERRICKPERSON & RIGGER (STONE)
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Derrickperson & Rigger (stone) - First Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $30.91
Supplemental Benefit Rate per Hour: $31.63

Derrickperson & Rigger (stone) - Second Year: 1st Six Months

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $43.27
Supplemental Benefit Rate per Hour: $47.63

Derrickperson & Rigger (stone) - Second Year: 2nd Six Months

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $49.46
Supplemental Benefit Rate per Hour: $47.63

Derrickperson & Rigger (stone) - Third Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $55.64
Supplemental Benefit Rate per Hour: $47.63

(Local #197)

DOCKBUILDER/PILE DRIVER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 6)

Dockbuilder/Pile Driver (First Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate Per Hour: $28.98
Supplemental Benefit Rate Per Hour: $39.89

Dockbuilder/Pile Driver (Second Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate Per Hour: $34.58
Supplemental Benefit Rate Per Hour: $39.89

Dockbuilder/Pile Driver (Third Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate Per Hour: $42.96
Supplemental Benefit Rate Per Hour: $39.89

Dockbuilder/Pile Driver (Fourth Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate Per Hour: $51.35
Supplemental Benefit Rate Per Hour: $39.89

(Carpenters District Council)

ELECTRICIAN
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Electrician 1st year

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $19.25
Supplemental Benefit Rate per Hour: $19.84
Overtime Supplemental Rate Per Hour: $21.11

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $19.25
Supplemental Benefit Rate per Hour: $20.93
Overtime Supplemental Rate Per Hour: $22.21

Electrician 2nd Year

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $21.25
Supplemental Benefit Rate per Hour: $20.88
Overtime Supplemental Rate Per Hour: $22.29

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $21.25
Supplemental Benefit Rate per Hour: $21.99
Overtime Supplemental Rate Per Hour: $23.40

Electrician 3rd Year

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $23.25
Supplemental Benefit Rate per Hour: $21.93

Overtime Supplemental Rate Per Hour: $23.48

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $23.25
Supplemental Benefit Rate per Hour: $23.05
Overtime Supplemental Rate Per Hour: $24.59

Electrician 4th Year

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $26.25
Supplemental Benefit Rate per Hour: $23.50
Overtime Supplemental Rate Per Hour: $25.25

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $26.25
Supplemental Benefit Rate per Hour: $24.64
Overtime Supplemental Rate Per Hour: $26.38

Electrician 5th Term (0-12 Months)

MIJ 1

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $27.50
Supplemental Benefit Rate per Hour: $26.79
Overtime Supplemental Rate Per Hour: $28.52

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $27.50
Supplemental Benefit Rate per Hour: $27.42
Overtime Supplemental Rate Per Hour: $29.16

Electrician 5th Term (13-18 Months)

MIJ 2

Effective Period: 7/1/2026 - 4/14/2027
Wage Rate per Hour: $33.50
Supplemental Benefit Rate per Hour: $30.01
Overtime Supplemental Rate Per Hour: $32.13

Effective Period: 4/15/2027 - 6/30/2027
Wage Rate per Hour: $33.50
Supplemental Benefit Rate per Hour: $30.68
Overtime Supplemental Rate Per Hour: $32.80

Overtime Description

Overtime Wage paid at time and one half the regular rate

(Local #3)

ELEVATOR CONSTRUCTOR
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 2)

Elevator (Constructor) - First Year

Effective Period: 7/1/2026 - 3/16/2027
Wage Rate per Hour: $37.09
Supplemental Benefit Rate per Hour: $36.18

Effective Period: 3/17/2027 - 6/30/2027
Wage Rate per Hour: $38.53
Supplemental Benefit Rate per Hour: $36.88

Elevator (Constructor) - Second Year

Effective Period: 7/1/2026 - 3/16/2027
Wage Rate per Hour: $47.54
Supplemental Benefit Rate per Hour: $36.90

Effective Period: 3/17/2027 - 6/30/2027
Wage Rate per Hour: $49.37
Supplemental Benefit Rate per Hour: $37.64

Elevator (Constructor) - Third Year

Effective Period: 7/1/2026 - 3/16/2027
Wage Rate per Hour: $56.18
Supplemental Benefit Rate per Hour: $38.35

Effective Period: 3/17/2027 - 6/30/2027
Wage Rate per Hour: $58.34
Supplemental Benefit Rate per Hour: $39.17

Elevator (Constructor) - Fourth Year

Effective Period: 7/1/2026 - 3/16/2027
Wage Rate per Hour: $64.82

Supplemental Benefit Rate per Hour: $39.81

Effective Period: 3/17/2027 - 6/30/2027
Wage Rate per Hour: $67.32
Supplemental Benefit Rate per Hour: $40.71

(Local #1)

ELEVATOR REPAIR & MAINTENANCE
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 2)

Elevator Service/Modernization Mechanic (First Year)

Effective Period: 7/1/2026 - 3/16/2027
Wage Rate per Hour: $37.09
Supplemental Benefit Rate per Hour: $36.15

Effective Period: 3/17/2027 - 6/30/2027
Wage Rate per Hour: $38.53
Supplemental Benefit Rate per Hour: $36.85

Elevator Service/Modernization Mechanic (Second Year)

Effective Period: 7/1/2026 - 3/16/2027
Wage Rate per Hour: $37.43
Supplemental Benefit Rate per Hour: $36.87

Effective Period: 3/17/2027 - 6/30/2027
Wage Rate per Hour: $38.90
Supplemental Benefit Rate per Hour: $37.61

Elevator Service/Modernization Mechanic (Third Year)

Effective Period: 7/1/2026 - 3/16/2027
Wage Rate per Hour: $44.24
Supplemental Benefit Rate per Hour: $38.32

Effective Period: 3/17/2027 - 6/30/2027
Wage Rate per Hour: $45.97
Supplemental Benefit Rate per Hour: $39.14

Elevator Service/Modernization Mechanic (Fourth Year)

Effective Period: 7/1/2026 - 3/16/2027
Wage Rate per Hour: $51.05
Supplemental Benefit Rate per Hour: $39.76

Effective Period: 3/17/2027 - 6/30/2027
Wage Rate per Hour: $53.04
Supplemental Benefit Rate per Hour: $40.66

(Local #1)

ENGINEER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 5)

Engineer - First Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $29.09
Supplemental Benefit Rate per Hour: $36.76

Engineer - Second Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $36.36
Supplemental Benefit Rate per Hour: $36.76

Engineer - Third Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $40.00
Supplemental Benefit Rate per Hour: $36.76

Engineer - Fourth Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $43.63
Supplemental Benefit Rate per Hour: $36.76

(Local #15)

ENGINEER - OPERATING
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 5)

Operating Engineer - First Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $38.96
Supplemental Benefit Rate per Hour: $29.90

Operating Engineer - Second Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $48.70
Supplemental Benefit Rate per Hour: $29.90

Operating Engineer - Third Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $58.44
Supplemental Benefit Rate per Hour: $29.90

(Local #14)

FLOOR COVERER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Floor Coverer (First Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $26.54
Supplemental Benefit Rate per Hour: $19.11

Floor Coverer (Second Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $29.60
Supplemental Benefit Rate per Hour: $20.87

Floor Coverer (Third Year)

Effective Period: 7/1/2026 - 6/30/2027

Wage Rate per Hour: **$34.05**
Supplemental Benefit Rate per Hour: **$24.87**

Floor Coverer (Fourth Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: **$42.40**
Supplemental Benefit Rate per Hour: **$27.12**

(Carpenters District Council)

GLAZIER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Glazier (First Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: **$22.52**
Supplemental Benefit Rate per Hour: **$20.08**

Glazier (Second Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: **$24.41**
Supplemental Benefit Rate per Hour: **$35.41**

Glazier (Third Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: **$31.96**
Supplemental Benefit Rate per Hour: **$44.44**

Glazier (Fourth Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: **$39.42**
Supplemental Benefit Rate per Hour: **$49.97**

DC9 (Local #1087)

HAZARDOUS MATERIAL HANDLER
(Ratio of Apprentice Journeyperson: 1 to 1, 1 to 3)

Handler (First 1000 Hours)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $20.80
Supplemental Benefit Rate per Hour: $19.00

Handler (Second 1000 Hours)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $21.85
Supplemental Benefit Rate per Hour: $19.00

Handler (Third 1000 Hours)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $24.92
Supplemental Benefit Rate per Hour: $19.00

Handler (Fourth 1000 Hours)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $27.08
Supplemental Benefit Rate per Hour: $19.00

(Local #78)

HEAT & FROST INSULATOR
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Heat & Frost Insulator (First Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $32.95
Supplemental Benefit Rate per Hour: $17.02

Heat & Frost Insulator (Second Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $40.27
Supplemental Benefit Rate per Hour: $20.80

Heat & Frost Insulator (Third Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $47.59
Supplemental Benefit Rate per Hour: $24.58

Heat & Frost Insulator (Fourth Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $54.91
Supplemental Benefit Rate per Hour: $28.37

(Local #12)

HOUSE WRECKER
(TOTAL DEMOLITION)
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

House Wrecker - First Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $22.27
Supplemental Benefit Rate per Hour: $12.22

House Wrecker - Second Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $24.02
Supplemental Benefit Rate per Hour: $12.22

House Wrecker - Third Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $25.52
Supplemental Benefit Rate per Hour: $12.22

House Wrecker - Fourth Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $28.02
Supplemental Benefit Rate per Hour: $12.22

(Mason Tenders District Council)

IRON WORKER - ORNAMENTAL
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Iron Worker (Ornamental) - First Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $25.98
Supplemental Benefit Rate per Hour: $15.99

Iron Worker (Ornamental) - Second Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $28.45
Supplemental Benefit Rate per Hour: $17.99

Iron Worker (Ornamental) - Third Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $30.80
Supplemental Benefit Rate per Hour: $18.99

Iron Worker (Ornamental) - Fourth Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $34.39
Supplemental Benefit Rate per Hour: $20.99

(Local #580)

IRON WORKER - STRUCTURAL
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 6)

Iron Worker (Structural) - 1st Six Months

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $30.87
Supplemental Benefit Rate per Hour: $65.75

Iron Worker (Structural) - 7- 18 Months

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $31.47
Supplemental Benefit Rate per Hour: $65.75

Iron Worker (Structural) - 19 - 36 months

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $32.08
Supplemental Benefit Rate per Hour: $65.75

(Local #40 and #361)

LABORER - HEAVY & HIGHWAY
(Ratio Apprentice to Journeyperson: 1 to 1, 1 to 3)

Laborer - Heavy & Highway - First 1000 hours

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $23.30
Supplemental Benefit Rate per Hour: $57.77

Laborer - Heavy & Highway - Second 1000 hours

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $27.96
Supplemental Benefit Rate per Hour: $57.77

Laborer - Heavy & Highway - Third 1000 hours

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $34.95
Supplemental Benefit Rate per Hour: $57.77

Laborer - Heavy & Highway - Fourth 1000 hours

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $41.94
Supplemental Benefit Rate per Hour: $57.77

(Local #731)

LABORER - PAVER & ROADBUILDER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Paver and Roadbuilder - First Year (Minimum 1000 hours)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $32.86
Supplemental Benefit Rate per Hour: $28.87

Paver and Roadbuilder - Second Year (Minimum 1000 hours)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $34.50
Supplemental Benefit Rate per Hour: $28.87

(Local#1010)

LABORER - PAVER AND ROADBUILDER - LINE STRIPING (ROADWAY)
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Paver and Roadbuilder - Line Striping (Roadway) - First Year (Minimum 1000 hours)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $32.86
Supplemental Benefit Rate per Hour: $25.77

Paver and Roadbuilder - Line Striping (Roadway) - Second Year (Minimum 1000 hours)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $34.50
Supplemental Benefit Rate per Hour: $25.77

(Local #1010)

MARBLE MECHANICS
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Cutters & Setters - 0-3000 Hours

Effective Period: 7/1/2026 - 7/1/2026
Wage Rate per Hour: $25.39
Supplemental Benefit Rate per Hour: $30.18
NO BENEFITS PAID DURING THE FIRST TWO MONTHS (PROBATIONARY PERIOD)

Effective Period: 7/2/2026 - 6/30/2027
Wage Rate per Hour: $26.35
Supplemental Benefit Rate per Hour: $29.52
NO BENEFITS PAID DURING THE FIRST TWO MONTHS (PROBATIONARY PERIOD)

Cutters & Setters - 3001-3750 Hours

Effective Period: 7/1/2026 - 7/1/2026
Wage Rate per Hour: $38.07
Supplemental Benefit Rate per Hour: $34.03

Effective Period: 7/2/2026 - 6/30/2027
Wage Rate per Hour: $39.51
Supplemental Benefit Rate per Hour: $33.04

Cutters & Setters - 3751-4500 Hours

Effective Period: 7/1/2026 - 7/1/2026
Wage Rate per Hour: $41.24
Supplemental Benefit Rate per Hour: $34.99

Effective Period: 7/2/2026 - 6/30/2027
Wage Rate per Hour: $42.80
Supplemental Benefit Rate per Hour: $33.92

Cutters & Setters - 4501-5250 Hours

Effective Period: 7/1/2026 - 7/1/2026
Wage Rate per Hour: $44.41
Supplemental Benefit Rate per Hour: $35.96

Effective Period: 7/2/2026 - 6/30/2027
Wage Rate per Hour: $46.09
Supplemental Benefit Rate per Hour: $34.80

Cutters & Setters - 5251-6000 Hours

Effective Period: 7/1/2026 - 7/1/2026
Wage Rate per Hour: $47.58
Supplemental Benefit Rate per Hour: $36.92

Effective Period: 7/2/2026 - 6/30/2027
Wage Rate per Hour: $49.39
Supplemental Benefit Rate per Hour: $35.68

Cutters & Setters - 6001-7500 Hours

Effective Period: 7/1/2026 - 7/1/2026
Wage Rate per Hour: $49.48
Supplemental Benefit Rate per Hour: $44.08

Effective Period: 7/2/2026 - 6/30/2027
Wage Rate per Hour: $51.51
Supplemental Benefit Rate per Hour: $42.68

Finisher- 0-750 Hours

Effective Period: 7/1/2026 - 7/1/2026
Wage Rate per Hour: $23.56
Supplemental Benefit Rate per Hour: $12.18

Effective Period: 7/2/2026 - 6/30/2027
Wage Rate per Hour: $23.78
Supplemental Benefit Rate per Hour: $12.29

Finisher- 751-1500 Hours

Effective Period: 7/1/2026 - 7/1/2026
Wage Rate per Hour: $24.20
Supplemental Benefit Rate per Hour: $12.68

Effective Period: 7/2/2026 - 6/30/2027
Wage Rate per Hour: $24.43

Supplemental Benefit Rate per Hour: $12.79

Finisher- 1501-2250 Hours

Effective Period: 7/1/2026 - 7/1/2026
Wage Rate per Hour: $24.83
Supplemental Benefit Rate per Hour: $13.18

Effective Period: 7/2/2026 - 6/30/2027
Wage Rate per Hour: $25.07
Supplemental Benefit Rate per Hour: $13.30

Finisher- 2251-3000 Hours

Effective Period: 7/1/2026 - 7/1/2026
Wage Rate per Hour: $25.46
Supplemental Benefit Rate per Hour: $13.68

Effective Period: 7/2/2026 - 6/30/2027
Wage Rate per Hour: $25.70
Supplemental Benefit Rate per Hour: $13.81

Finisher- 3001-3750 Hours

Effective Period: 7/1/2026 - 7/1/2026
Wage Rate per Hour: $26.41
Supplemental Benefit Rate per Hour: $14.43

Effective Period: 7/2/2026 - 6/30/2027
Wage Rate per Hour: $26.65
Supplemental Benefit Rate per Hour: $14.57

Finisher- 3751-4500 Hours

Effective Period: 7/1/2026 - 7/1/2026
Wage Rate per Hour: $27.68
Supplemental Benefit Rate per Hour: $15.43

Effective Period: 7/2/2026 - 6/30/2027
Wage Rate per Hour: $27.93
Supplemental Benefit Rate per Hour: $15.58

Polisher- 0-900 Hours

Effective Period: 7/1/2026 - 7/1/2026
Wage Rate per Hour: $33.84
Supplemental Benefit Rate per Hour: $30.90

Effective Period: 7/2/2026 - 6/30/2027

Wage Rate per Hour: $31.82
Supplemental Benefit Rate per Hour: $30.71

Polisher- 901-1800 Hours

Effective Period: 7/1/2026 - 7/1/2026
Wage Rate per Hour: $38.68
Supplemental Benefit Rate per Hour: $31.32

Effective Period: 7/2/2026 - 6/30/2027
Wage Rate per Hour: $36.37
Supplemental Benefit Rate per Hour: $31.12

Polisher- 1801-2700 Hours

Effective Period: 7/1/2026 - 7/1/2026
Wage Rate per Hour: $43.51
Supplemental Benefit Rate per Hour: $31.79

Effective Period: 7/2/2026 - 6/30/2027
Wage Rate per Hour: $40.91
Supplemental Benefit Rate per Hour: $31.55

(Local #7)

MASON TENDER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Mason Tender - First Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $22.27
Supplemental Benefit Rate per Hour: $11.72

Mason Tender - Second Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $24.02
Supplemental Benefit Rate per Hour: $11.72

Mason Tender - Third Year

Effective Period: 7/1/2026 - 6/30/2027

Wage Rate per Hour: $25.52
Supplemental Benefit Rate per Hour: $11.72

Mason Tender - Fourth Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $28.02
Supplemental Benefit Rate per Hour: $11.72

(Local #79)

MASON TENDER (INTERIOR DEMOLITION WORKER)
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Mason Tender (Interior Demolition) - First Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $21.75
Supplemental Benefit Rate per Hour: $11.27

Mason Tender (Interior Demolition) - Second Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $23.50
Supplemental Benefit Rate per Hour: $11.27

Mason Tender (Interior Demolition) - Third Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $25.00
Supplemental Benefit Rate per Hour: $11.27

Mason Tender (Interior Demolition) - Fourth Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $27.50
Supplemental Benefit Rate per Hour: $11.27

(Local #79)

METALLIC LATHER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Metallic Lather (First Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $22.55
Supplemental Benefit Rate per Hour: $17.87

Metallic Lather (Second Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $25.00
Supplemental Benefit Rate per Hour: $17.92

Metallic Lather (Third Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $28.00
Supplemental Benefit Rate per Hour: $16.92

Metallic Lather (Fourth Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $30.00
Supplemental Benefit Rate per Hour: $16.92

(Local #46)

MILLWRIGHT
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Millwright (First Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $33.04
Supplemental Benefit Rate per Hour: $39.09

Millwright (Second Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $38.89
Supplemental Benefit Rate per Hour: $42.79

Millwright (Third Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $44.74
Supplemental Benefit Rate per Hour: $47.14

Millwright (Fourth Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $56.44
Supplemental Benefit Rate per Hour: $53.90

(Local #740)

MOSAIC MECHANIC
Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4

Mosaic & Terrazzo Mechanic 0-1500

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $23.45
Supplemental Benefit Rate per Hour: $10.96

Mosaic & Terrazzo Mechanic 1501-3000

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $30.80
Supplemental Benefit Rate per Hour: $14.08

Mosaic & Terrazzo Mechanic 3001-3750

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $38.35
Supplemental Benefit Rate per Hour: $22.33

Mosaic & Terrazzo Mechanic 3751-4500

Effective Period: 7/1/2026 - 6/30/2027

Wage Rate per Hour: $39.00
Supplemental Benefit Rate per Hour: $31.70

Mosaic & Terrazzo Mechanic 4501-5250

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $45.56
Supplemental Benefit Rate per Hour: $33.67

Mosaic & Terrazzo Mechanic 5251-6000

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $51.05
Supplemental Benefit Rate per Hour: $37.71

(Local 7)

PAINTER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Painter - Brush & Roller - First Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $18.20
Supplemental Benefit Rate per Hour: $20.34

Painter - Brush & Roller - Second Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $22.76
Supplemental Benefit Rate per Hour: $25.91

Painter - Brush & Roller - Third Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $27.30
Supplemental Benefit Rate per Hour: $30.60

Painter - Brush & Roller - Fourth Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $36.40

Supplemental Benefit Rate per Hour: $39.74

(District Council of Painters)

PAINTER - BRIDGE & STRUCTURAL STEEL
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Painter - Bridge & Structural Steel (First Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $22.80
Supplemental Benefit Rate per Hour: $18.53

Painter - Bridge & Structural Steel (Second Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $34.20
Supplemental Benefit Rate per Hour: $34.29

Painter - Bridge & Structural Steel (Third Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $45.60
Supplemental Benefit Rate per Hour: $45.76

(Local #806)

PAINTER - METAL POLISHER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Metal Polisher (First Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $20.17
Supplemental Benefit Rate per Hour: $8.91
New Construction - Wage Rate Per Hour: $20.56
Scaffold Over 34 Feet - Wage Rate Per Hour: $22.67

Metal Polisher (Second Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $22.18
Supplemental Benefit Rate per Hour: $8.91
New Construction - Wage Rate Per Hour: $22.62
Scaffold Over 34 Feet - Wage Rate Per Hour: $24.68

Metal Polisher (Third Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $24.20
Supplemental Benefit Rate per Hour: $8.91
New Construction - Wage Rate Per Hour: $24.74
Scaffold Over 34 Feet - Wage Rate Per Hour: $26.70

(Local 8A-28)

PLASTERER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)
(Each Term is 800 Hours.)
(Rates are based of the Plasterer II)

Plasterer - First Term

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $19.15
Supplemental Benefit Rate per Hour: $12.98

Plasterer - Second Term

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $22.54
Supplemental Benefit Rate per Hour: $13.47

Plasterer - Third Term

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $25.95
Supplemental Benefit Rate per Hour: $14.12

(Local #262)

PLASTERER - TENDER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Plasterer Tender - First Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $22.27
Supplemental Benefit Rate per Hour: $11.72

Plasterer Tender - Second Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $24.02
Supplemental Benefit Rate per Hour: $11.72

Plasterer Tender - Third Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $25.52
Supplemental Benefit Rate per Hour: $11.72

Plasterer Tender - Fourth Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $28.02
Supplemental Benefit Rate per Hour: $11.72

(Local #79)

PLUMBER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Plumber - First Year: 1st Six Months

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $19.00

Supplemental Benefit Rate per Hour: $5.43

Plumber - First Year: 2nd Six Months

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $21.00
Supplemental Benefit Rate per Hour: $6.43

Plumber - Second Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $31.78
Supplemental Benefit Rate per Hour: $24.44

Plumber - Third Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $33.88
Supplemental Benefit Rate per Hour: $24.44

Plumber - Fourth Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $36.73
Supplemental Benefit Rate per Hour: $24.44

Plumber - Fifth Year: 1st Six Months

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $38.13
Supplemental Benefit Rate per Hour: $24.44

Plumber - Fifth Year: 2nd Six Months

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $50.20
Supplemental Benefit Rate per Hour: $24.44

(Plumbers Local #1)

POINTER, WATERPROOFER, CAULKER, SANDBLASTER, STEAMBLASTER
(Exterior Building Renovation)

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Pointer, Waterproofer, Caulker, Sandblaster, Steamblaster - First Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $34.96
Supplemental Benefit Rate per Hour: $15.65

Pointer, Waterproofer, Caulker, Sandblaster, Steamblaster - Second Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $39.69
Supplemental Benefit Rate per Hour: $21.00

Pointer, Waterproofer, Caulker, Sandblaster, Steamblaster - Third Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $46.12
Supplemental Benefit Rate per Hour: $24.75

Pointer, Waterproofer, Caulker, Sandblaster, Steamblaster - Fourth Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $55.30
Supplemental Benefit Rate per Hour: $25.75

(Bricklayer District Council)

ROOFER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 2)

Roofer - First Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $19.95
Supplemental Benefit Rate per Hour: $8.06

Roofer - Second Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $23.63

Supplemental Benefit Rate per Hour: $18.39

Roofer - Third Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $26.25
Supplemental Benefit Rate per Hour: $20.35

Roofer - Fourth Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $31.50
Supplemental Benefit Rate per Hour: $24.28

Roofer - Fifth Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $39.38
Supplemental Benefit Rate per Hour: $30.20

(Local #8)

SHEET METAL WORKER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Sheet Metal Worker (0-6 Months)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $19.57
Supplemental Benefit Rate per Hour: $8.26

Sheet Metal Worker (7-18 Months)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $19.84
Supplemental Benefit Rate per Hour: $22.30

Sheet Metal Worker (19-30 Months)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $25.57
Supplemental Benefit Rate per Hour: $30.13

Sheet Metal Worker (31-36 Months)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $31.31
Supplemental Benefit Rate per Hour: $35.67

Sheet Metal Worker (37-42 Months)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $31.31
Supplemental Benefit Rate per Hour: $35.67

Sheet Metal Worker (43-48 Months)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $39.93
Supplemental Benefit Rate per Hour: $44.01

Sheet Metal Worker (49-54 Months)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $39.93
Supplemental Benefit Rate per Hour: $44.01

Sheet Metal Worker (55-60 Months)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $45.64
Supplemental Benefit Rate per Hour: $49.58

(Local #28)

SIGN ERECTOR
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Sign Erector - First Year: 1st Six Months

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $20.30
Supplemental Benefit Rate per Hour: $18.25

Sign Erector - First Year: 2nd Six Months

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $23.20
Supplemental Benefit Rate per Hour: $20.68

Sign Erector - Second Year: 1st Six Months

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $26.10
Supplemental Benefit Rate per Hour: $23.14

Sign Erector - Second Year: 2nd Six Months

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $29.00
Supplemental Benefit Rate per Hour: $25.61

Sign Erector - Third Year: 1st Six Months

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $31.90
Supplemental Benefit Rate per Hour: $34.50

Sign Erector - Third Year: 2nd Six Months

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $34.80
Supplemental Benefit Rate per Hour: $37.54

Sign Erector - Fourth Year: 1st Six Months

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $37.70
Supplemental Benefit Rate per Hour: $41.43

Sign Erector - Fourth Year: 2nd Six Months

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $40.60
Supplemental Benefit Rate per Hour: $44.55

Sign Erector - Fifth Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $43.50
Supplemental Benefit Rate per Hour: $47.68

Sign Erector - Sixth Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $46.40
Supplemental Benefit Rate per Hour: $50.78

(Local #137)

STEAMFITTER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Steamfitter - First Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $24.72
Supplemental Benefit Rate per Hour: $26.40

Steamfitter - Second Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $30.90
Supplemental Benefit Rate per Hour: $32.82

Steamfitter - Third Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $37.08
Supplemental Benefit Rate per Hour: $39.23

Steamfitter - Fourth Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $43.26
Supplemental Benefit Rate per Hour: $45.65

Steamfitter - Fifth Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $49.44
Supplemental Benefit Rate per Hour: $52.06

(Local #638)

STEAMFITTER - REFRIGERATION & AIR CONDITIONER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Refrigeration & Air Conditioner (First Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $23.39
Supplemental Benefit Rate per Hour: $15.35

Refrigeration & Air Conditioner (Second Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $28.25
Supplemental Benefit Rate per Hour: $16.91

Refrigeration & Air Conditioner (Third Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $32.91
Supplemental Benefit Rate per Hour: $18.53

Refrigeration & Air Conditioner (Fourth Year)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $39.75
Supplemental Benefit Rate per Hour: $20.73

(Local #638-B)

STONE MASON - SETTER
(Ratio Apprentice of Journeyperson: 1 to 1, 1 to 2)

Stone Mason - Setters - First 750 Hours

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $23.41
Supplemental Benefit Rate per Hour: $23.93

Stone Mason - Setters - Second 750 Hours

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $29.26
Supplemental Benefit Rate per Hour: $32.93

Stone Mason - Setters - Third 750 Hours

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $34.85
Supplemental Benefit Rate per Hour: $32.93

Stone Mason - Setters - Fourth 750 Hours

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $40.44
Supplemental Benefit Rate per Hour: $32.93

Stone Mason - Setters - Fifth 750 Hours

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $46.04
Supplemental Benefit Rate per Hour: $32.93

Stone Mason - Setters - Sixth 750 Hours

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $51.63
Supplemental Benefit Rate per Hour: $32.93

(Bricklayers District Council)

TAPER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Drywall Taper - First Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $22.96
Supplemental Benefit Rate per Hour: $15.55

Drywall Taper - Second Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $24.51
Supplemental Benefit Rate per Hour: $26.61

Drywall Taper - Third Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $29.41
Supplemental Benefit Rate per Hour: $28.82

Drywall Taper - Fourth Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $39.21
Supplemental Benefit Rate per Hour: $33.24

(Local #1974)

TILE LAYER - SETTER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Tile Layer - Setter - First 750 Hours

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $23.09
Supplemental Benefit Rate per Hour: $13.45

Tile Layer - Setter - Second 750 Hours

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $28.32
Supplemental Benefit Rate per Hour: $13.45

Tile Layer - Setter - Third 750 Hours

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $35.65
Supplemental Benefit Rate per Hour: $16.56

Tile Layer - Setter - Fourth 750 Hours

Effective Period: 7/1/2026 - 6/30/2027

Wage Rate per Hour: **$40.86**
Supplemental Benefit Rate per Hour: **$16.56**

Tile Layer - Setter - Fifth 750 Hours

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: **$44.67**
Supplemental Benefit Rate per Hour: **$17.98**

Tile Layer - Setter - Sixth 750 Hours

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: **$48.38**
Supplemental Benefit Rate per Hour: **$19.48**

Tile Layer - Setter - Seventh 750 Hours

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: **$52.23**
Supplemental Benefit Rate per Hour: **$20.86**

Tile Layer - Setter - Eighth 750 Hours

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: **$57.45**
Supplemental Benefit Rate per Hour: **$20.86**

Tile Layer - Setter - Ninth 750 Hours

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: **$59.83**
Supplemental Benefit Rate per Hour: **$23.71**

(Local #7)

TIMBERPERSON
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 6)

Timberperson - First Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate Per Hour: $26.96
Supplemental Rate Per Hour: $39.69

Timberperson - Second Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate Per Hour: $32.07
Supplemental Rate Per Hour: $39.69

Timberperson - Third Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate Per Hour: $39.72
Supplemental Rate Per Hour: $39.69

Timberperson - Fourth Year

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate Per Hour: $47.38
Supplemental Rate Per Hour: $39.69

(Local #1536)

Supplemental Benefit Rate per Hour: $1.43

Utility Locator (Months 25-30)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $27.02
Supplemental Benefit Rate per Hour: $1.43

Utility Locator (Months 19-24)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $25.26
Supplemental Benefit Rate per Hour: $1.43

Utility Locator (Months 13-18)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $23.50
Supplemental Benefit Rate per Hour: $1.43

Utility Locator (Months 7-12)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $21.74
Supplemental Benefit Rate per Hour: $1.43

Utility Locator (Months 0-6)

Effective Period: 7/1/2026 - 6/30/2027
Wage Rate per Hour: $19.98
Supplemental Benefit Rate per Hour: $1.43
Supplemental Note: No Benefits for the first 90 days of employment.

Overtime

Time and one half the regular rate for work on the following holiday(s).
Time and one half the regular hourly rate after 40 straight time hours in any work week.

Paid Holidays

New Year's Day
Memorial Day
Independence Day
Thanksgiving Day
Christmas Day

Shift Rates

10% shift differential to employees working any shift starting between noon and 5 AM.

Vacation

For up to 1 year 0 hours

For year 1 - 2 48 hours per year
For year 3 - 9 96 hours per year
For year 10 or more 144 hours per year

Sick Days:
For up to 1 year employee receives 40 hours paid sick leave.
For year 1 employee earns 2 hours of paid sick leave for every 100 overtime hours worked.
For year 2 - 9 years employee earns 4 hours of paid sick leave for every 100 overtime hours worked.
For year 10 or more employee earns 6 hours of paid sick leave for every 100 overtime hours worked.

(C.W.A.)

WELDER

WELDER AND FIREWATCH TO BE PAID AT THE RATE OF THE JOURNEYPERSON OR REGISTERED APPRENTICE IN THE TRADE PERFORMING THE WORK.

Davis- Bacon Act

SCHEDULE OF PREVAILING WAGES

Note: This Contract is funded under the New York State Revolving Loan Program (SRF), and is subject to the prevailing wages under NYS Labor Law Section 220 and the prevailing wages under United States Davis-Bacon Act. If there is a conflict between the wage rate set forth by the Davis Bacon Act or the wage rate established pursuant to §220 of the NYS Labor Law, the contractor shall pay the higher rate.

The prime contractor and its subcontractors shall pay the applicable and lawful prevailing wages and supplements to workers at the time work is performed. Changes in wage rates and supplements resulting from changes to the applicable and lawful prevailing wage schedules shall not be the basis for a change in the contract price.

NO TEXT FOR THIS PAGE

"General Decision Number: NY20220003 08/05/2022

Superseded General Decision Number: NY20210003

State: New York

Construction Types: Building, Heavy, Highway and Residential

Counties: Bronx, Kings, New York, Queens and Richmond
Counties in New York.

BUILDING & RESIDENTIAL CONSTRUCTION PROJECTS (includes single family homes and apartments up to and including 4 stories),
HEAVY AND HIGHWAY CONSTRUCTION PROJECTS

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	Executive Order 14026 generally applies to the contract. The contractor must pay all covered workers at least $15.00 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2022.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	Executive Order 13658 generally applies to the contract. The contractor must pay all covered workers at least $11.25 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at https://www.dol.gov/agencies/whd/government-contracts.

Modification Number	Publication Date
0	01/07/2022
1	02/25/2022
2	03/25/2022
3	06/24/2022
4	07/08/2022
5	07/22/2022
6	08/05/2022

* ASBE0012-001 08/01/2021

	Rates	Fringes
Asbestos Workers/Insulator Includes application of all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems	$ 69.01	35.16
HAZARDOUS MATERIAL HANDLER	$ 40.50	15.95

BOIL0005-001 01/01/2021

	Rates	Fringes
BOILERMAKER	$ 63.38	33%+47.22+a

FOOTNOTE:

a. PAID HOLIDAYS: New Year's Day, Thanksgiving Day, Memorial Day, Independence Day, Labor Day and Good Friday, Friday after Thanksgiving, Christmas Eve Day and New Year's Eve

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BRNY0001-001 07/01/2020

	Rates	Fringes
BRICKLAYER	$ 62.54	29.40
MASON - STONE	$ 67.88	36.91

BRNY0001-002 07/01/2020

	Rates	Fringes
Pointer, cleaner and caulker	$ 55.97	29.64

BRNY0004-001 07/05/2021

	Rates	Fringes
MARBLE MASON	$ 61.73	37.91

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* BRNY0007-001 12/06/2021

	Rates	Fringes
TERRAZZO FINISHER	$ 55.21	36.97
TERRAZZO WORKER/SETTER	$ 61.44	35.13

BRNY0007-002 12/06/2021

	Rates	Fringes
TILE FINISHER	$ 47.56	32.71

BRNY0020-001 01/04/2021

	Rates	Fringes
MARBLE FINISHER	$ 48.27	35.40

BRNY0024-001 01/01/2021

	Rates	Fringes
BRICKLAYER		
MARBLE POLISHERS	$ 45.37	28.80

BRNY0052-001 12/06/2021

	Rates	Fringes
Tile Layer	$ 61.84	36.04

CARP0001-003 07/01/2021

	Rates	Fringes
CARPENTER (HEAVY & HIGHWAY)	$ 56.93	52.79

CARP0001-009 07/01/2021

	Rates	Fringes

CARPENTER (BUILDING &
RESIDENTIAL)
Carpenters.....$ 54.75 46.43
Soft Floor Layers.....$ 54.75 46.43

CARP0740-001 07/01/2021

Rates Fringes

MILLWRIGHT.....$ 57.00 54.06

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* CARP1556-006 07/01/2022

Rates Fringes

Dock Builder & Piledrivermen.....$ 58.16 53.56

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* CARP1556-007 07/01/2022

Rates Fringes

Diver Tender.....$ 52.57 53.56
Diver.....$ 73.03 53.56

CARP1556-011 07/01/2021

Rates Fringes

Carpenters:
TIMBERMEN.....$ 52.05 52.24

ELEC0003-001 04/11/2019

Rates Fringes

ELECTRICIAN
Electricians.....$ 56.00 76.725%+16.25
Jobbing, and maintenance
and repair work.....$ 28.50 51.243%+7.50+a

PAID HOLIDAYS:

a. New Years Day, Martin Luther King, Jr.'s Birthday,
Washington's Birthday, Memorial Day, Independence Day,
Labor Day, Columbus Day, Election Day, Thanksgiving Day,
the day after Thanksgiving Day, and Christmas Day

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* ELEC1049-001 04/03/2022

QUEENS COUNTY

Rates Fringes

Line Construction (Substation and Switching structures pipe type cable installation and maintenance jobs or projects; Railroad electrical distribution/transmission systems maintenance (when work is not performed by railroad employees) Overhead and Underground transmission/distribution line work. Fiber optic, telephone cable and equipment)

Groundman	$ 37.92	26.49
Heavy Equipment Operator	$ 50.56	30.51
Lineman and Cable Splicer	$ 63.20	34.52
Tree Trimmer	$ 30.09	14.12

ELEV0001-002 03/17/2022

	Rates	Fringes
ELEVATOR MECHANIC		
Elevator Constructor	$ 75.14	47.446+a+b
Modernization and Repair	$ 59.09	45.564+a+b

FOOTNOTE:

a. PAID HOLIDAYS: New Year's Day, Good Friday, President's Day, Memorial Day, Independence Day, Labor Day, Columbus Day, Veteran's Day, Thanksgiving Day, Friday after Thanksgiving, and Christmas Day.

b. PAID VACATION: An employee who has worked less than 5 years shall recieve vacation pay credit on the basis of 4% of his hourly rate for all hours worked; an employee who has worked 5 to 15 years shall receive vacation pay credit on the basis of 6% of his hourly rate for all hours worked; an employee who has worked 15 or more years shall receive vacation pay credit on the basis of 8% of his hourly rate for all hours worked.

ENGI0014-001 07/01/2021

	Rates	Fringes
POWER EQUIPMENT OPERATOR (HEAVY & HIGHWAY)		
GROUP 1	$ 107.75	34.60
GROUP 2	$ 89.05	34.60
GROUP 3	$ 91.89	34.60
GROUP 4	$ 89.70	34.60
GROUP 5	$ 87.94	34.60

GROUP 6.....$ 84.48 34.60
GROUP 7.....$ 86.05 34.60
GROUP 8.....$ 83.59 34.60
GROUP 9.....$ 81.85 34.60
GROUP 10.....$ 78.28 34.60
GROUP 11.....$ 73.21 34.60
GROUP 12.....$ 74.81 34.60
GROUP 13.....$ 75.36 34.60
GROUP 14.....$ 57.06 34.60
GROUP 15.....$ 53.11 34.60

POWER EQUIPMENT OPERATOR
(PAVEMENT-HEAVY & HIGHWAY)
Asphalt Plants.....$ 69.04 34.60
Asphalt roller.....$ 81.47 34.60
Asphalt spreader.....$ 83.59 34.60

POWER EQUIPMENT OPERATOR
(STEEL ERECTION)
Compressors, Welding
Machines.....$ 53.07 34.60
Cranes, Hydraulic Cranes,
2 drum derricks,
Forklifts, Boom Trucks.....$ 88.77 34.60
Three drum derricks.....$ 92.36 34.60

POWER EQUIPMENT OPERATOR
(UTILITY)
Horizontal Boring Rig.....$ 79.56 34.60
Off shift compressors.....$ 66.26 34.60
Utility Compressors.....$ 52.77 34.60

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Tower crane

GROUP 2: Rubber Tire Backhoes over 37,000 lbs, Track Backhoes, power shovel, Hydraulic clam shells, moles and machines of a similar type

GROUP 3: Mine hoists and crane, etc. used as mine hoists

GROUP 4: Gradalls, keystones, cranes (with digging buckets), bridge cranes, trenching machines, vermeer cutter and machines of a similar nature

GROUP 5: Piledrivers, derrick boats, tunnel shovels

GROUP 6: All drills, and machines of a similar nature

GROUP 7: Back filling machines, cranes, mucking machines, dual drum pavers

GROUP 8: Mixers (concrete w/loading attachments), concrete pavers, cableways, land derricks, power house (low pressure units), concrete pumps

GROUP 9: Concrete plants, well drilling machines, stone crushers double drum hoist, power house (other than above)

GROUP 10: Concrete mixers

GROUP 11: Elevators

GROUP 12: Concrete breaking machine, Hoists (single drum), load masters, locomotive and dinkies over 10 tons

GROUP 13: Vibratory console

GROUP 14: Compressors (portable 3 or more in battery), tugger machine (caissons), well point pumps, chum drill

GROUP 15: Boilers, (high pressure, compressors (portable, single, or 2 in battery, not over 100' apart), pumps (river cofferdam and welding machines (except where arc is operated by members of local 15) push button machines, all engines irrespective of power (power pac) used to drive auxilliary equipment, air, hydraulic etc.

PREMIUMS ON CRANES (Crawler or Truck):
100' to 149' boom - add .50
150' to 249' boom - add .75
250' to 349' boom - add 1.00
350' to 450' boom - add 1.50

Premiums for Cranes on Steel Erection:
100' to 149' boom - add 1.75
150' to 249' boom - add 2.00
250' to 349' boom - add 2.25
350' to 450' boom - add 2.75
Tower crane - add 2.00

FOOTNOTE:
a. Paid Holidays: New Year's Day; Lincoln's Birthday; Washington's Birthday; Memorial Day; Independence Day; Labor Day; Veterans Day; Columbus Day; Election Day; Thanksgiving Day; and Christmas Day; provided the employee works one day the payroll week in which the holiday occurs.

ENGI0014-002 07/01/2021

	Rates	Fringes
Power Equipment Operator		
BUILDING & RESIDENTIAL		
GROUP 1	$ 84.16	34.60
GROUP 2	$ 89.10	34.60
GROUP 3	$ 77.98	34.60
GROUP 4	$ 70.94	34.60
GROUP 5	$ 53.12	34.60

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Double drum

GROUP 2: Stone derrick, cranes, hydraulic cranes, boom trucks

GROUP 3: 4 pole Hoist, Single Drum Hoists

GROUP 4: Fork lift, house cars, plaster (platform machine), plaster bucket, concrete pump and all other equipment used for hoisting material

GROUP 5: Compressors, welding machines (cutting concrete work), paint spraying, sand blasting, pumps (with the exclusion of concrete pumps), house car (settlement basis only), all engines irrespective of power (power pac) used to drive auxiliary equipment, air, hydraulic, etc., boilers

Premiums for Cranes:
100'-149' boom - add 1.75
150'-249' boom - add 2.00
250'-349' boom - add 2.25
350'-450' boom - add 2.75
Tower cranes add 2.00

FOOTNOTE:
a. PAID HOLIDAYS: New Year's Day, Lincoln's Birthday, Memorial Day, Independence Day, Labor Day, Veteran's Day, Columbus Day, Election Day, Thanksgiving Day, and Christmas Day, provided the employee works one day in the payroll week in which the holiday occurs

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ENGI0015-001 07/01/2021

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
HEAVY AND HIGHWAY		
GROUP 1	$ 74.65	38.00
GROUP 2	$ 72.40	38.00
GROUP 3	$ 68.62	38.00
GROUP 4	$ 64.82	38.00
GROUP 5	$ 44.45	38.00

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Cherrypickers 20 tons and over and loaders (rubber-tired and/or tractor type with a manfufacturer's rated capacity of six cubic yards and over

GROUP 2: Rubber Tire Backhoes up to and including 37,000 lbs,

Basin Machines, Groover, Mechanical Sweepers, Bobcat, Boom Truck, Barrier Transport (Barrier Mover) and machines of a similar nature, Boat Captains, Boat Operators, operation of Churn Drills and machines of a similar nature, Stetco Silent Hoist and machines of a similar nature, Vac-alls, Meyers Machines, John Beam and machines of a similar nature, Ross Carriers and Travel Lifts and machines of a similar nature, Bulldozers, Scrapers, and Turn-a Pulls, Tugger Hoist (used exclusively for handling excavated material), Tractors with attachments, Hyster and Roustabout Cranes, Cherrypickers, Austin Western, Grove and machines of a similar nature, Scoopmobiles, Monorails, Conveyors, Trenchers, Loaders- Rubber-tired and Tractor, Barber Greene, Eimco Loaders and Eimco Backhoes, Mighty Midget and similar breakers and tampers, Curb and Gutter Pavers and Motor Patrol, Motor Graders and all machines of a similar nature, Locomotives ten (10) tons or under, Mini-Max, Break-Tech and machines of a similar nature, Milling Machines, robotic and demolition machines and machines of a similar nature including Bobcat, Pile Rig Rubber-tired Excavator (37,000 lbs. and under), 2 man auger
GROUP 3: Minor Equipment such as Tractors, Post Hole Diggers and Drivers, Ditch Witch (Walk Behind), Road Finishing Machines, Rollers (five (5) tons and under), Tugger Hoists, Dual Purpose Trucks, Fork Lifts and Dempsey Dumpsters

GROUP 4: Oilers for the following equipment: (all gasoline, electric, diesel, or air operated) gradalls and concrete pumps or similarly equipment manned by two-men

GROUP 5: Oilers for the following equipment: (all gasoline, electric, diesel, or air operated) shovels, cranes (draglines), backhoes, pavers, trenching machines, gunite machines, compressors (3 or more in battery)

Premiums for Cranes:
100'-149' boom - add 1.75
150'-249' boom - add 2.00
250'-349' boom - add 2.25
350'-450' boom - add 2.75
Tower cranes add 2.00

FOOTNOTE:
a. PAID HOLIDAYS: New Year's Day, Lincoln's Birthday, Memorial Day, Independence Day, Labor Day, Veteran's Day, Columbus Day, Election Day, Thanksgiving Day, and Christmas Day, provided the employee works one day in the payroll week in which the holiday occurs

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ENGI0015-002 07/01/2016

	Rates	Fringes

POWER EQUIPMENT OPERATOR
BUILDING
GROUP 1.....$ 65.94 32.95
GROUP 2.....$ 63.98 32.95
GROUP 3.....$ 57.42 32.95

POWER EQUIPMENT OPERATORS CLASSIFICATIONS
GROUP 1: Oiler
GROUP 2: Oilers on Crawler Cranes, Backhoes, Trenching machines, Gunite machines, Compressors (3 or more in Battery)
GROUP 3: Gradalls: Concrete Pumps, Power Houses - All equipment in same is manned by two (2) men only, Driving Truck Cranes
FOOTNOTE:
a. PAID HOLIDAYS: New Year's Day, Lincoln's Birthday, Memorial Day, Independence Day, Labor Day, Veteran's Day, Columbus Day, Election Day, Thanksgiving Day, and Christmas Day, provided the employee works one day in the payroll week in which the holiday occurs

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* IRON0040-002 07/01/2022

BRONX, NEW YORK, RICHMOND

	Rates	Fringes
IRONWORKER, STRUCTURAL	$ 55.70	84.79

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* IRON0046-003 07/01/2022

	Rates	Fringes
IRONWORKER		
METALLIC LATHERS AND REINFORCING IRONWORKERS	$ 56.90	27.80

IRON0197-001 07/01/2021

	Rates	Fringes
IRONWORKER		
STONE DERRICKMAN	$ 55.63	55.10

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* IRON0361-002 07/01/2022

KINGS, QUEENS

	Rates	Fringes
Ironworkers:		
(STRUCTURAL)	$ 55.70	84.79

IRON0580-001 07/01/2022

	Rates	Fringes
IRONWORKER, ORNAMENTAL	$ 46.65	61.62

LABO0006-001 07/01/2016

	Rates	Fringes
LABORER (Cement and Concrete Workers)	$ 42.48	17.35

LABO0029-001 07/01/2017

	Rates	Fringes
Laborers:		
Heavy		
Blasters (hydraulic trac drill)	$ 47.15	35.49
Blasters	$ 46.27	35.49
Hydraulic Trac Drill	$ 41.29	35.49
Jackhammers, Chippers, Spaders, Concrete Breakers, All Other Pneumatic Tools, Walk Behind Self-Propelled Hydraulic Asphalt and Concrete Breaker	$ 39.34	35.49
Powder Carriers	$ 35.17	35.49

LABO0078-001 09/01/2021

	Rates	Fringes
LABORERS		
BUILDING CONSTRUCTION		
ASBESTOS (Removal, Abatement, Encapsulation or Decontamination of asbestos); LEAD; & HAZARDOUS WASTE LABORERS (Hazardous Waste, Hazardous Materials, Biochemical and Mold Remediation, HVAC, Duct Cleaning, Re-spray Fireproofing, etc)	$ 38.05	19.35

LABO0079-001 07/01/2018

	Rates	Fringes

LABORER (Building
Construction)
Demolition Laborers
(Interior)
Tier A.....$ 37.44 23.60
Tier B.....$ 26.63 17.57
Mason Tender/General
Laborer.....$ 40.65 28.85

CLASSIFICATIONS

TIER A: Responsible for the removal of all interior petitions and structural petitions that can consist of sheet rock, block or masonry. Also, all structural slab openings for ducts, mechanical, shafts, elevators, slab openings and exterior walls where the building is not being completely demolitioned.

TIER B: Responsible for shoveling of debris into containers, pushing containers from the inside to the outside of the building.

LABO0147-001 07/01/2016

Rates Fringes

LABORERS (FREE AIR & TUNNEL).....$ 72.67 47.72

Maintenance Men, Inside Muck Lock Tenders, Pump Men, Electricians, Cement Finishers, Caulkers, Hydraulic Men, Shield Men, Monorail Operators, Motor Men, Conveyor Men, Powder Carriers, Pan Men, Riggers, Chuck Tenders, Track Men Painters, Nippers, Brakemen, Cable Men, Hose Men, Grout Men, Gravel Men, Form Workers, Concrete Workers, Tunnel Laborers, Mole Nipper (one (1) Mole Sipper per Working Shaft per Shift for up to and including Two (2) Moles

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* LABO0731-001 07/01/2022

Rates Fringes

LABORER
Building, Heavy and
Residential Construction
LABORER: (Asbestos, Lead,
Hazardous Waste Removal
(including
soil)/CEMENT/CONCRETE.....$ 44.00 48.48
UTILITY LABORER.....$ 43.85 48.48

Paid Holidays: Labor Day and Thanksgiving Day

LABO1010-001 07/01/2022

	Rates	Fringes
Laborers:		
HIGHWAY CONSTRUCTION		
Fence Installer & Repairer.	$ 44.48	49.34
FORMSETTERS	$ 48.35	49.34
LABORERS	$ 44.48	49.34
Landscape Planting & Maintenance	$ 44.48	49.34
Maintenance Safety Surface.	$ 44.48	49.34
Slurry/Sealcoater/Play Equipment Installer	$ 44.48	49.34
Small Equipment Operator (Not Operating Engineer)	$ 44.48	49.34
Small Power Tools Operator.	$ 44.48	49.34

FOOTNOTES:

a. PAID HOLIDAYS: Memorial Day, Fourth of July, Labor Day, Columbus Day, Election Day and Thanksgiving Day, provided the employee has worked one (1) day in the calendar week in which the said holiday occurs.

LABO1010-002 07/01/2022

	Rates	Fringes
Laborers-Asphalt Construction:		
Micro Paver	$ 48.95	49.34
Raker	$ 48.35	49.34
Screedperson	$ 48.95	49.34
Shoveler (Production Paving Only)	$ 44.48	49.34
Small Equipment Operator (Asphalt)	$ 44.48	49.34

PAIN0009-001 05/01/2022

	Rates	Fringes
GLAZIER	$ 46.55	49.47
PAINTER		
Painters, Drywall Finishers, Lead Abatement Worker	$ 43.00	38.11
Spray, Scaffold and Sandblasting	$ 46.00	38.11

PAIN0806-001 10/01/2021

	Rates	Fringes

Painters:
Structural Steel and Bridge.$ 53.00 51.23

PAIN1974-001 06/28/2022

Rates Fringes

Painters:
Drywall Tapers/Pointers.....$ 48.47 30.21

PLAS0262-001 08/01/2019

Rates Fringes

PLASTERER.....$ 45.73 30.37

PLAS0262-002 08/01/2019

KINGS AND QUEENS COUNTIES

Rates Fringes

PLASTERER.....$ 45.73 30.37

PLAS0780-001 07/01/2018

Rates Fringes

CEMENT MASON/CONCRETE FINISHER...$ 51.97 33.56

PLUM0001-001 07/01/2022

Rates Fringes

PLUMBER
MECHANICAL EQUIPMENT AND SERVICE
Any repair and/or replacement of the present plumbing system that does not change the existing roughing.....$ 46.60 19.96
PLUMBERS:.....$ 72.50 41.45

PLUM0638-001 07/01/2020

Rates Fringes

PLUMBER
SERVICE FITTERS.....$ 41.75 14.00
SPRINKLER FITTERS, STEAMFITTERS.....$ 59.05 58.34

Service Fitter work shall consist of all repair, service and maintenance work on domestic, commercial and industrial refrigeration, air conditioning and air cooling, stoker and oil burner apparatus and heating apparatus etc., including but not exclusively the charging, evacuation, leak testing and assembling for all machines for domestic, commercial and industrial refrigeration, air conditioning and heating apparatus. Also, work shall include adjusting, including capacity adjustments, checking and repairing or replacement of all controls and start up of all machines and repairing all defects that may develop on any system for domestic, commercial and industrial refrigeration and all air conditioning, air cooling, stoker and oil burner apparatus and heating apparatus regardless of size or type.

ROOF0008-003 05/01/2022

	Rates	Fringes
ROOFER	$ 45.25	37.62

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* SHEE0028-002 10/28/2021

	Rates	Fringes
SHEET METAL WORKER		
BUILDING CONSTRUCTION	$ 52.10	55.27
RESIDENTIAL CONSTRUCTION	$ 23.84	8.40

TEAM0282-001 07/01/2020

	Rates	Fringes
TRUCK DRIVER		
Asphalt	$ 42.68	46.9025+a
Euclids & Turnapulls	$ 45.62	50.5625+a
High Rise	$ 53.79	49.2025+a

FOOTNOTES:

PAID HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Columbus Day, Election Day, Veterans' Day (Armistice Day), Thanksgiving Day, Day after Thanksgiving and Christmas Day. Employees working two (2) days in the calendar week in which a holiday falls are to be paid for such holiday, provided that they shape each remaining workday during such calendar week.

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on

a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISIO"

NOTICE TO BIDDERS

This contract is subject to a new 2025 Project Labor Agreement

This contract is subject to the attached Project Labor Agreement ("PLA") entered into between the City and the Building and Construction Trades Council of Greater New York ("BCTC") affiliated Local Unions. By submitting a bid, the Contractor agrees that if awarded the Contract the PLA is binding on the Contractor and all subcontractors of all tiers.

The bidder to be awarded the contract will be required to execute a Letter of Assent prior to award. The Contractor shall include in any subcontract a requirement that the subcontractor, and sub-subcontractors of all tiers, become signatory to and bound to the PLA with respect to the subcontracted work. The Contractor will also be required to have all subcontractors of all tiers execute a Letter of Assent prior to such subcontractors performing any Program Work.

Bidders are advised that the City of New York and City agencies have entered into multiple PLAs. The terms of each PLA, while similar, are not identical. Please also note that there are revisions between the 2025 NYC Agency Citywide New Construction & Renovation PLA attached to this bid and the prior 2020 NYC Agency New Construction PLA, 2020 NYC Agency Renovation PLA, and 2021 DEP Renovation PLA.

All bidders are urged to review the entire 2025 NYC Agency Citywide New Construction & Renovation PLA prior to submitting a bid.

To the extent that the terms of the PLA conflict with any other terms of the invitation for bids, including the Standard Construction Contract, the terms of the PLA shall govern. For example, the PLA section that authorizes the scheduling of a four-day week, ten hours per day on straight time at the commencement of the job, PLA Article 12, Section 1(A), overrides the Standard Construction Contract's provision concerning a

five-day work week with a maximum of eight hours in a day, Standard Construction Contract Article 37.2.1. Where, however, the invitation for bids, including the Standard Construction Contract, requires the approval of the City/Department, the PLA does not supersede or eliminate that requirement.

This Contract is subject to the apprenticeship requirements of Labor Law § 222 and to apprenticeship requirements established by the Department pursuant to Labor Law § 816-b. Please be advised that the involved trades have apprenticeship programs that meet the statutory requirements of Labor Law § 222(e) and the requirements set by the Department pursuant to Labor Law § 816-b, and that Contractors and subcontractors who agree to perform the Work pursuant to the PLA are participating in such apprenticeship programs within the meaning of Labor Law § 222(e) and the Department's directives.

This Contract is subject to Community Hiring Construction Careers and its requirements pursuant to Chapter 79 of the New York City Charter and the Community Hiring Rules adopted as Title 74 of the Rules of the City of New York. The Contractor shall agree to make best efforts to meet the Community Hiring Goal for at least 30% of cumulative labor hours of Program Work to be worked by Residence-Based Community Hires. At least 30% of such Residence-Based Community Hires labor hours are to be worked by apprentices.

If this Contract is subject to the Minority-Owned and Women-Owned Business Enterprise ("M/WBE") program implemented pursuant to New York City Administrative Code § 6-129, the specific requirements of M/WBE participation for this Contract are set forth elsewhere in this bid package.

The local collective bargaining agreements (CBAs) that are incorporated into the PLA as PLA Schedule A Agreements are available from the Department's Agency Chief Contract Officer upon the request of any prospective bidder.

Please note that the “PLA Schedule A” is distinct from the Department’s Schedule A that is a part of this invitation for bids.

2025 Agency Citywide New Construction & Renovation PLA
Frequently Asked Questions

1. **Q.** Does a Contractor need to be signatory with the unions in the NYC Building and Construction Trades Council ("BCTC") in order to bid on projects under the PLA?

   A. No, any contractor may bid by signing and agreeing to the terms of the PLA. The contractor need not be signatory with these unions by any other labor agreement or for any other project.

2. **Q.** Does a Contractor agreeing to the PLA and signing the Letter of Assent create a labor agreement with these unions outside of the project covered by the PLA?

   A. No, the PLA applies only to those projects that the Contractor agrees to perform under the PLA and makes no labor agreement beyond those projects. Contractors do not need to sign any additional agreements (*e.g.*, a collective bargaining agreement) with a union aside from the Letter of Assent to work on a PLA project.

3. **Q.** Do the provisions of the PLA apply equally to subcontractors as well as contractors and how does the PLA affect the subcontractors that a bidder may utilize on the project?

   A. Yes, the PLA applies to subcontractors and all subcontractors performing Program Work must agree to become party to the PLA. Subject to the Agency's approval of subcontractors pursuant to Article 17 of the Standard Construction Contract, a Contractor may use any subcontractor, union or non-union, as long as the subcontractor signs the Letter of Assent. See PLA Article 2, Section 8.

4. **Q.** Are bidders required to submit Letters of Assent signed by proposed subcontractors with their bid in order to be found responsive?

   A. No, bidders do not have to submit signed Letters of Assent from their subcontractors with their bid. However, subcontractors performing Program Work will be required to sign the Letter of Assent prior to being approved by the Agency.

5. **Q.** Does the PLA contain special provisions for MWBE or DBE subcontractors?

   A. On contracts valued at $25,000,000 or more where participation goals are set forth in the contract, the PLA does not apply to up to 7% of the value of the construction work under the contract provided the construction work is performed by certified MWBE or DBE subcontractors and such MWBE or DBE subcontractor is not a signatory to any Schedule "A" agreement ("Exempt Work"). Such Exempt Work shall be no more than $500,000 or 20% (whichever is greater) of the value of the subcontracts for work in any particular union's jurisdiction under any prime contract. See PLA Article 3, Section 1.

6. **Q.** May a Contractor or subcontractor use any of its existing employees to perform this work?

   A. Generally, labor will be referred to the Contractor from the respective signatory local unions. However, Contractors and subcontractors may use up to 12% of their existing, qualifying labor force for this work. Certified M/WBEs for which participation goals are set pursuant to NYC Administrative Code § 6-129 that are not signatory to any Schedule A collective bargaining agreements ("CBAs") with subcontracts valued at or under two million dollars ($2,000,000) and where the first two or more workers are hired simultaneously, may request by name, and the Local Union will honor, referral of the first (1st), fourth (4th), sixth (6th), and eighth (8th) Core Employee. In any case where the first two or more employees are not hired simultaneously, the certified MWBEs or DBEs Core Employees may be the second (2nd), fourth (4th), sixth (6th), and eighth (8th) Core Employee. Any additional workers will be referred to the Contractor in accordance with the 12% referral requirements set forth in the PLA. See PLA Article 4, Section 2.

7. **Q.** Must the City set M/WBE participation goals for the particular project or contract in order for a certified M/WBE to utilize the provisions of PLA Article 4, Section 2(C)?

   A. No. PLA Article 4, Section 2(C) specifies what categories of M/WBEs are eligible to take advantage of this provision (i.e., those M/WBEs for which the City is authorized to set participation goals under § 6-129). For purposes of Article 4, Section 2(C), it is not necessary for the project to be subject to § 6-129 or for the City to have actually set participation goals for the particular contract or project. The result is the same where a project receives State funding and therefore is subject to the requirements of Article 15-A of the Executive Law.

8. **Q.** May a Contractor bring in union members from locals that are not signatory unions?

   A. Referrals will be from the respective signatory locals and/or locals listed in Schedule A of the PLA. Contractors may utilize 'traveler provisions' contained in the local CBAs where such provisions exist and/or in accordance with the provisions of PLA Article 4, Section 2.

9. **Q.** Does a non-union employee working under the PLA automatically become a union member?

   A. No, the non-union employee does not automatically become a union member by working on a project covered by the PLA and nothing in the PLA requires employees to join a union or pay dues or fees to a union as a condition of working on the covered project. This Agreement is not, however, intended to supersede independent requirements in applicable local union agreements as to contractors that are otherwise signatory to those agreements and as to employees of such employers performing covered work. Non-union employees will be enrolled in the appropriate benefit plans and earn credit toward various union benefit programs except in certain circumstances as set forth in the PLA. See PLA Article 4, Section 6 and Article 11.

10. **Q.** Are all Contractors and subcontractors working under the PLA, including non-union Contractors and Contractors signatory to CBAs with locals other than those that are signatories to the PLA, required to make contributions to designated employee benefit funds?

    A. Except in certain circumstances, as described in the following paragraph, Contractors and subcontractors working under the PLA will be required to contribute on behalf of all employees covered by the PLA to established jointly trusteed employee benefit funds designated in the Schedule A CBAs and required to be paid on public works under any applicable prevailing wage law. The Agency may withhold from amounts due the Contractor any amounts required to be paid, but not actually paid into any such fund by the Contractor or a subcontractor. See PLA Article 11, Section 2.

    Non-union Contractors with bona fide private benefit plans that satisfy the requirements of Labor Law 220 will not be required to pay into union benefit funds for their employees working pursuant to Article 4, Section 2 (B) and (C) ("Core Employees") who are already covered under their bona fide private benefit plans. Supplemental benefit funds in excess of the annualized value of the private benefit plans will be paid directly to workers as additional wages in compliance with Labor Law § 220. At the time of contract award, the Contractor shall make available to the contracting Agency a complete set of plan documents for each private benefit plan into which contributions will be made and/or coverage provided. The Contractor shall also provide certification from a certified public accountant as to the annualized hourly value of such benefits consistent with the requirements of Labor Law § 220. See PLA Article 11, Section 2.

11. **Q.** When do Core Employees become eligible for union benefits?

    A. Union benefit plans have their own plan documents that determine eligibility, and workers will become eligible for certain benefits at different points in time. Contractors who will have Core Employees should speak with the respective union(s) as to benefit eligibility thresholds. Employees that may remain unaffiliated with any local union at the completion of their employment may apply for any distributions to which they may be entitled from the funds in accordance with the applicable rules and governing documents of the unions and the employee benefit funds.

12. **Q.** What happens if a Contractor or subcontractor fails to make a required payment to a designated employee benefit fund?

    A. The PLA sets forth a process for unions to address a Contractor or a subcontractor's failure to make required payments. The process includes potentially the direct payment by the City to the benefit fund of monies owed and the corresponding withholding of payments to the Contractor. See PLA Article 11, Section 2.

    Upon notification by a union or fringe benefit fund that a Contractor is delinquent in its payment of benefits and a determination by the Agency that the union or fund has submitted appropriate documentation of such delinquency, the Agency will thereafter require the Contractor to submit cancelled checks or other equivalent proof of payment of

benefit contributions with certified payroll reports for work covered by this PLA on which the Contractor is engaged.

The City strongly advises Contractors to read these provisions carefully and to include appropriate provisions in subcontracts addressing these possibilities.

13. **Q.** Does signing on to the PLA satisfy the Apprenticeship Directive Requirements established for this bid?

A. Yes. By agreeing to perform the Work subject to the PLA, the bidder demonstrates compliance with the apprenticeship requirements imposed by this Invitation for Bids.

14. **Q.** Who decides on the number of workers needed?

A. Except as expressly limited by a specific provision of the PLA, a Contractor retains full and exclusive authority for the management of their operations, including the determination as to the number of employees to be hired and the qualifications therefore and the promotion, transfer, and layoff of its employees. See PLA Article 6, Section 1.

15. **Q.** What happens if a union does not provide a worker within 48 hours from the request (Saturdays, Sundays, and holidays excepted)?

A. In the event that a Local Union does not fill any request for qualified employees within a 48-hour period after such requisition is made by a Contractor (Saturdays, Sundays and holidays excepted), a Contractor may employ qualified applicants from any other available source.

16. **Q.** May a Contractor discharge a union referral for lack of productivity?

A. Except as expressly limited by a specific provision of the PLA, a Contractor retains full and exclusive authority for the management of their operations, including the right to discipline or discharge for just cause its employees. See PLA Article 6, Section 1.

17. **Q.** May a contractor assign a management person to site?

A. Yes. Managers are not subject to the provisions of the PLA, so there is no restriction on management and/or other non-trade personnel, as long as such personnel do not perform trade functions. See Article 3, Section 3.

18. **Q.** What type of work can Stewards perform?

A. All Stewards must be working Stewards (*i.e.*, they must be performing Program Work). In addition, Stewards may perform other tasks such as receiving complaints or grievances from other employees of the Steward's trade. Stewards may not determine

when overtime is worked. Stewards are entitled to the same wages as other employees of that trade. See PLA Article 5, Sections 2 and 3.

19. **Q.** Can a Contractor utilize apprentices?

A. Contractors are permitted to utilize apprentices so long as the ratios between journeyperson and apprentice do not exceed the allowable ratios set by the New York State Department of Labor ("NYSDOL"). Should a Contractor request that apprentices be provided for Program Work, the referring Local Union shall comply with that request so long as it is consistent with the maximum ratios permitted by NYSDOL.

20. **Q.** What is Community Hiring Construction Careers?

A. As authorized under Section 3502 of the New York City Charter, Community Hiring Construction Careers is an initiative (superseding HireNYC Construction Careers) to advance career opportunities within the construction industry for those from economically disadvantaged communities. The initiative has a target goal of 30% of all hours worked on PLA projects to be performed by workers who reside in NYCHA housing or ZIP codes where 15% or more of the population lives below the poverty threshold, also know as "Residence-Based Community Hires." When a Contractor requests employees, the trades will take into account the target goals when they refer additional workers. To further encourage recruitment of new workers, Community Hiring Construction Careers has a goal that at least 30% of those hours are to be performed by apprentices who are Residence-Based Community Hires.

21. **Q.** Does the PLA provide a standard workday across all the signatory trades?

A. Yes, all signatory trades will work an eight (8) hour day, Monday through Friday with a day shift at straight time as the standard work week. For renovation and rehabilitation projects only, the PLA also permits a Contractor to schedule a four-day (within Monday through Friday) work week, ten (10) hours per day at straight time if announced at the commencement of the job. See PLA Article 12, Section 1. This is an example where the terms of the PLA override provisions of the Standard Construction Contract (compare with section 37.2 of the Standard Construction Contract). For renovation and rehabilitation projects only, the standard work week may be reduced to 35 or 37 ½ hours of work in those limited circumstances where the City states in the bid documents that the Contractor will not be given access to the site to accommodate an 8-hour day. The 8 hour, 7 ½ hour or 7-hour workday must be established at the commencement of the renovation and rehabilitation project by the Agency and may not be altered by the Contractor.

22. **Q.** Does the PLA create a common holiday schedule for all the signatory trades?

A. Yes, the PLA recognizes nine common holidays. See PLA Article 12, Section 4.

23. **Q.** Are workers entitled to holiday pay if they do not work on the holiday?

A. No. Workers are only entitled to pay if they work on the holiday. See PLA Article 12, Section 4.

24. **Q.** Does the PLA provide for a standard policy for 'shift work' across all signatory trades?

A. Yes, for second and third shift work on work performed Monday – Friday on renovation and rehabilitation projects, there shall be a 5% shift premium, or the rate required by applicable prevailing wage laws, whichever is less. For second shift work on work performed Monday – Friday on new construction projects, there shall be a 10% shift premium, or the rate required by applicable prevailing wage laws, whichever is less. For third shift work on work performed Monday – Friday on new construction projects, there shall be a 15% shift premium, or the rate required by applicable prevailing wage laws, whichever is less. No other premium or other payments for such work shall be required unless such work is in excess of the employee's regularly scheduled work week. See PLA Article 12, Section 3.

25. **Q.** May the Contractor schedule overtime work, including work on a weekend?

A. Yes, the PLA permits the Contractor to schedule overtime work, including work on weekends. See PLA Article 12, Sections 2, 3, and 5. To the extent that the Agency's approval is required before a Contractor may schedule or be paid for overtime, that approval is still required notwithstanding the PLA language.

26. **Q.** Are overtime payments affected by the PLA?

A. Yes, all overtime pay incurred Monday through Saturday will be at time and one half (1 ½). There will be no stacking or pyramiding of overtime pay under any circumstances. See PLA Article 12, Section 2. Sunday and holiday overtime will be paid according to each trade's CBA.

27. **Q.** Are there special provisions for Saturday work when a day is 'lost' during the week due to weather, power failure or other emergency?

A. Yes, when this occurs the Contractor may schedule Saturday work at weekday rates. See PLA Article 12, Section 5.

28. **Q.** Does the PLA contain special provisions for the staffing of temporary services?

A. Yes. Where temporary services are required by specific request of the Agency or construction manager, they shall be provided by the Contractor's existing employees during working hours in which a shift is scheduled for employees of the Contractor. The need for temporary services during non-working hours will be determined by the Agency or construction manager. There will be no stacking of trades on temporary services. See PLA Article 15.

29. **Q.** What do the workers get paid when work is terminated early in a day due to inclement weather or otherwise cut short of 8 hours?

A. The PLA provides that employees who report to work pursuant to regular schedule and not given work will be paid two hours of straight time. Work terminated early for severe weather or emergency conditions will be paid only for time actually worked. In other instances where work is terminated early, the worker will be paid for a full shift. See PLA Article 12, Sections 6 and 8. The usual reporting pay requirement of two hours for employees who report to their work location pursuant to their regular schedule does not apply when the National Weather Service issues a Weather Advisory and the Contractor speaks to the employee at least four hours before their shift starting time. See PLA Article 12, Section 6.

30. **Q.** Should a local collective bargaining agreement of a signatory union expire during the project will a work stoppage occur on a project subject to the PLA?

A. No. All the signatory unions are bound by the 'no strike' agreement as to the PLA work. Work will continue under the PLA and the otherwise expired local CBA(s) until the new local CBA(s) are negotiated and in effect. See PLA Articles 7 and 19.

31. **Q.** May a Contractor working under the PLA be subject to a strike or other boycott activity by a signatory union at another site while the Contractor is a signatory to the PLA?

A. Yes. The PLA applies ONLY to work under the PLA and does not regulate labor relations at other sites even if those sites are in close proximity to PLA work.

32. **Q.** If a Contractor has worked under other PLAs in the New York City area, are the provisions in this PLA generally the same as the others?

A. While PLAs often look similar to each other, and particular clauses are often used in multiple agreements, each PLA is a unique document and should be examined accordingly.

33. **Q.** What happens if a dispute occurs between the Contractor and an employee during the project?

A. The PLA contains a grievance and arbitration process to resolve disputes between the Contractor and the employees. See PLA Article 9.

34. **Q.** What happens if there is a dispute between locals as to which local gets to provide employees for a particular project or a particular aspect of a project?

A. The PLA provides for jurisdictional disputes to be resolved in accordance with the NY Plan. A copy of the NY Plan is available upon request from the Agency. The PLA provides that work is not to be disrupted or interrupted pending the resolution of any jurisdictional dispute. The work proceeds as assigned by the Contractor until the dispute is resolved. See PLA Article 10.

35. **Q.** How do the referral rules work for Operating Engineers Locals 14 and 15?

A. If there is Program Work within the jurisdiction of Operating Engineers Locals 14 or 15, the contractor shall request labor from the appropriate local union. If the locals provide labor consistent with the referral provisions outlined in Article 4, Section 2, the terms of the Local 14 CBA or Local 15 CBA will apply to that work. However, if the locals do not provide labor for that work, the terms of the PLA will apply to such work.

PROJECT LABOR AGREEMENT
COVERING SPECIFIED NEW CONSTRUCTION, RENOVATION & REHABILITATION OF NEW YORK CITY OWNED BUILDINGS AND STRUCTURES

2025 – 2028

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PROJECT LABOR AGREEMENT COVERING SPECIFIED NEW CONSTRUCTION, RENOVATION & REHABILITATION OF NEW YORK CITY OWNED BUILDINGS & STRUCTURES

ARTICLE 1 - PREAMBLE

WHEREAS, the City of New York desires to provide for the cost efficient, safe, quality, and timely completion of certain new construction, rehabilitation and renovation work ("Program Work," as defined in Article 3) in a manner designed to afford the lowest costs to the Agencies covered by this Agreement, and the public it represents, and the advancement of permissible statutory objectives;

WHEREAS, this Project Labor Agreement will foster the achievement of these goals, inter alia, by:

(1) providing a mechanism for responding to the unique construction needs associated with this Program Work and achieving the most cost-effective means of construction, including direct labor cost savings, by the Building and Construction Trades Council of Greater New York and Vicinity and the signatory Local Unions and their members waiving various shift and other hourly premiums and other work and pay practices which would otherwise apply to Program Work;

(2) expediting the construction process and otherwise minimizing the disruption to the covered Agencies' ongoing operations at the facilities that are the subject of the Agreement;

(3) avoiding the costly delays of potential strikes, slowdowns, walkouts, picketing and other disruptions arising from work disputes, reducing jobsite friction on common situs worksites, and promoting labor harmony and peace for the duration of the Program Work;

(4) standardizing the terms and conditions governing the employment of labor on Program Work;

(5) permitting wide flexibility in work scheduling and shift hours and times to allow maximum work to be done during off hours yet at affordable pay rates;

(6) permitting adjustments to work rules and staffing requirements from those which otherwise might obtain;

(7) providing comprehensive and standardized mechanisms for the settlement of work disputes, including those relating to jurisdiction;

(8) fostering increased participation by Minority and Women-owned Business Enterprises ("MWBEs") and/or Disadvantaged Business Enterprises ("DBEs");

(9) encouraging the development of pathways to construction careers through Community Hiring;

(10) ensuring a reliable source of skilled and experienced labor; and

(11) securing applicable New York State Labor Law exemptions.

WHEREAS, the Building and Construction Trades Council of Greater New York and Vicinity, its participating affiliated Local Unions and their members, desire to assist the City in meeting these operational needs and objectives as well as to provide for stability, security and work opportunities which are afforded by this Project Labor Agreement; and

WHEREAS, the Parties desire to maximize Program Work safety conditions for both workers and the community in the project area.

NOW, THEREFORE, the Parties enter into this Agreement:

SECTION 1. PARTIES TO THE AGREEMENT

This is a Project Labor Agreement ("Agreement") entered into by the City of New York ("City"), acting by and through the Agencies covered herein, including in their capacity as construction manager of covered projects and/or on behalf of any third party construction manager which may be utilized, and the Building and Construction Trades Council of Greater New York and Vicinity ("Council" or "BCTC") (on behalf of itself) and the signatory affiliated Local Unions ("Unions" or "Local Unions"). The Council and each signatory Local Union hereby warrant and represent that it has been duly authorized to enter into this Agreement.

ARTICLE 2 - GENERAL CONDITIONS

SECTION 1. DEFINITIONS

A. The term "Agency" means each of the following New York City agencies, individually or collectively as applicable: the Department for the Aging ("DFTA"), Administration

for Children's Services ("ACS"), Department of Citywide Administrative Services ("DCAS"), Department of Correction ("DOC"), Department of Design and Construction ("DDC"), Fire Department ("FDNY"), Department of Homeless Services ("DHS"), Human Resources Administration ("HRA"), Department of Health and Mental Hygiene ("DOHMH"), Department of Parks and Recreation ("DPR"), Police Department ("NYPD"), Department of Sanitation ("DSNY"); Department of Transportation ("DOT"), Department of Buildings ("DOB"), and Department of Environmental Protection ("DEP"); with respect to Program Work as defined in Article 3, the New York City agency that awards a particular contract subject to this Agreement may be referred to hereafter as the "Agency";

B. The term "Agreement" means this project labor agreement ("PLA"), the applicable Collective Bargaining Agreements (each a "CBA") identified in Schedule "A", and each Exhibit hereto;

C. The term "BCTC" refers to the Building and Construction Trades Council of Greater New York and Vicinity. The terms "BCTC" and "Council" are used interchangeably;

D. The term "City" refers to the City of New York;

E. The term "Community Hiring Construction Careers" refers to the PLA initiative to advance career opportunities for Residence-Based Community Hires;

F. The term "Contractor(s)" shall include any Construction Manager, General Contractor and all other contractors, and subcontractors of all tiers engaged in Program Work within the scope of this Agreement as defined in Article 3;

G. The term "Core Employee" means an employee that has been on a contractor's payroll consistent with Article 4, Section 2(B) and (C);

H. The term "DBEs" means Disadvantaged Business Enterprises as defined in 49 C.F.R. Part 26;

I. The term "Economically Disadvantaged Region" means an area, represented by its five-digit ZIP code, in which at least fifteen percent of residents have household incomes below the federal poverty threshold;

J. The term "Minor Repair" means routine repair, service, or maintenance that is recurrent, day to day, periodic scheduled or routine work required to preserve or restore a building, facility or system to working order. Such work shall qualify as "Minor Repair" if; i) a wage and benefit rate applicable to the work is listed on the New York City Comptroller's ("NYC Comptroller") prevailing wage schedule as repair work and is lower than the Schedule A rate; and ii) the work satisfies the definition and criteria established by the NYC Comptroller for application of that lower rate for the work being performed.

K. The term "MWBEs" means Minority and Women Owned Business Enterprises as the entities are defined in NYC Charter 1304;

L. The term "Program Work" is the work covered by this Agreement as defined in Article 3;

M. The term "Residence-Based Community Hire" means an individual who is: (1) a resident of an address within an Economically Disadvantaged Region; (2) a resident of a building that is: (i) owned or operated by the New York City Housing Authority; and (ii) subject to section nine of the United States Housing Act of nineteen hundred thirty-seven, as amended; or (3) a resident of a dwelling unit that is: (i) subject to a regulatory agreement with a federal, state or local government agency requiring that occupancy of such unit be restricted based on the income of the

occupants; and (ii) located in a building that was previously operated by the New York City Housing Authority, was previously subject to section nine of the United States Housing Act of nineteen hundred thirty-seven, as amended, and is subject to section eight of such act; and

N. The term "Union(s)" or "Local Union(s)" refers to the various participating unions affiliated with the BCTC, singularly and collectively.

SECTION 2. CONDITIONS FOR AGREEMENT TO BECOME EFFECTIVE

This Agreement shall not become effective unless each of the following conditions are met: the Agreement is executed by (1) the Council, on behalf of itself, (2) the participating affiliated Local Unions; and (3) the mayor of the City of New York or their designee.

SECTION 3. ENTITIES BOUND & ADMINISTRATION OF AGREEMENT

This Agreement shall be binding on all participating Unions and their affiliates, the Construction Manager (in its capacity as such) and all Contractors of all tiers performing Program Work, as defined in Article 3. The Contractors shall include in any subcontract that they let for performance during the term of this Agreement a requirement that their subcontractors, of all tiers, become signatory and bound by this Agreement with respect to that subcontracted work falling within the scope of Article 3 and all Contractors (including subcontractors) performing Program Work shall be required to sign a "Letter of Assent" in the form annexed hereto as Exhibit "A". This Agreement shall be administered by the applicable Agency or a Construction Manager or such other designee as may be named by the Agency or Construction Manager, on behalf of all Contractors. When the Agency manages Program Work without a Construction Manager, unless otherwise provided, it has the rights and obligations of a Construction Manager in addition to the rights and obligations of an Agency, if applicable. The City shall provide BCTC with the contact

information of the Agency Chief Contracting Officer for each Agency and BCTC shall provide the City with the contact information of a representative for each Local Union.

SECTION 4. SUPREMACY CLAUSE

This Agreement, together with the local Collective Bargaining Agreements (each a "CBA") appended hereto as Schedule "A", represents the complete understanding of all signatories and supersedes any national agreement, local agreement or other CBA of any type which would otherwise apply to this Program Work, in whole or in part, except: 1) to the extent applicable, work performed that may fall under the NTL Articles of Agreement, the National Stack/Chimney Agreement, the National Cooling Tower Agreement, all instrument calibration work and loop checking which shall be performed under the UA/IBEW Joint National Agreement for Instrument and Control Systems Technicians, and the National Agreement of the International Union of Elevator Constructors, with the exception of Article 2, Section 7, and Articles 7, 9 and 10 of this Agreement, which shall apply to such work; and 2) Program Work which falls within the jurisdiction of the Operating Engineers Locals 14 and 15. If Program Work falling within the jurisdiction of Operating Engineers Locals 14 and 15 is accepted by and performed by said locals, only then will such work be performed under the terms and conditions set out in the Schedule "A" agreements of Operating Engineers Locals 14 and 15. The CBAs of the affiliated local unions that cover the particular type of construction work to be performed by the contractor, and as set forth in the Schedule "A" list of agreements, shall be deemed the Schedule "A" Collective Bargaining Agreements ("Schedule 'A' CBA") under this Agreement. Where association and independent CBAs for a particular type of construction work are both set forth in Schedule "A", association members shall treat the applicable association agreement as the Schedule "A" CBA and independent contractors shall treat the applicable independent agreement as the Schedule "A"

CBA. Subject to the foregoing, where a subject covered by the provisions of this project labor agreement is also covered by a Schedule "A" CBA, the provisions of this project labor agreement shall prevail. It is further understood that no Contractor shall be required to sign any other agreement as a condition of performing Program Work. No practice, understanding or agreement between a Contractor and a Local Union which is not set forth in this Agreement shall be binding with respect to Program Work unless endorsed in writing by the Construction Manager or such other designee as may be designated by the Agency. Nothing in this Agreement requires employees to join a union or pay dues or fees to a union as a condition of working on the Program Work. This Agreement is not, however, intended to supersede independent requirements in applicable local union agreements as to contractors that are otherwise signatory to those agreements and as to employees of such employers performing Program Work.

SECTION 5. LIABILITY

The liability of any Contractor and the liability of any Union under this Agreement shall be several and not joint. The Construction Manager and any Contractor shall not be liable for any violations of this Agreement by any other Contractor; and the Council and Local Unions shall not be liable for any violations of this Agreement by any other Union.

SECTION 6. THE AGENCY

The Agency (or Construction Manager where applicable) shall require in its bid specifications for all Program Work within the scope of Article 3 that all successful bidders, and their subcontractors of all tiers, become bound by, and signatory to, this Agreement. The Agency (or Construction Manager) shall not be liable for any violation of this Agreement by any Contractor. It is understood that nothing in this Agreement shall be construed as limiting the sole discretion of the Agency or Construction Manager in determining which Contractors shall be

awarded contracts for Program Work. It is further understood that the Agency or Construction Manager has sole discretion at any time to terminate, delay or suspend the Program Work, in whole or part, on any project.

SECTION 7. AVAILABILITY AND APPLICABILITY TO ALL SUCCESSFUL BIDDERS

The Unions agree that this Agreement will be made available to, and will fully apply to, any successful bidder for (or subcontractor of) Program Work who becomes signatory thereto, without regard to whether that successful bidder (or subcontractor) performs work at other sites on either a union or non-union basis and without regard to whether employees of such successful bidder (or subcontractor) are, or are not, members of any unions. This Agreement shall not apply to the work of any Contractor which is performed at any location other than the site of Program Work.

SECTION 8. SUBCONTRACTING

Contractors will subcontract Program Work only to a person, firm or corporation who is or agrees to become party to this Agreement.

ARTICLE 3 - SCOPE OF THE AGREEMENT

SECTION 1. WORK COVERED

A. Program Work shall be limited to designated new construction, rehabilitation and renovation construction contracts bid and let by an Agency (or its Construction Manager where applicable) after the effective date of this Agreement with respect to new construction, rehabilitation and renovation work performed for an Agency on City-owned property under contracts advertised for public solicitation prior to December 31, 2028. Subject to the foregoing, and the exclusions below, such Program Work shall mean:

1. For Renovation and Rehabilitation Projects: any and all contracts that predominantly involve the demolition, reconstruction, renovation, alteration, repair, rehabilitation or expansion of an existing City-owned building, pier, marina, or structure within the five boroughs of the City. Examples of Program Work include, but are not limited to, the renovation, repair, alteration and rehabilitation of an existing temporary or permanent structure, or an expansion of above ground structures located in the City on a City-owned building, Wastewater Resource Recovery Facility, a water filtration plant, or a pumping station. Program Work shall also include job order contracts ("JOCS"), demolition work, painting services. Low voltage work, site work, elevator work, mold, asbestos and lead abatement, carpentry services, and carpet removal and installation shall be included as Program Work only when incidental to such building renovation and/or rehabilitation of City-owned buildings or structures and included in a contract that predominantly involves such renovation and/or rehabilitation. Program Work shall also include the installing and removing of centrifuges on City-owned property, but not any other work under such contracts, in connection with contracts that involve the maintenance or repair of centrifuges, in accordance with Exhibit "D". Program Work shall also include contracts bid and let by the DEP for the rehabilitation and upgrade of wells and well stations located in Southeast Queens as part of the Queens Groundwater Project, including the renovation and rehabilitation of buildings and other above or below-ground structures, the installation of equipment, piping and drainage structures including subsurface installations, the installation of water treatment system elements, control systems, plumbing, electrical, HVAC and site and road work required for the construction, operation or maintenance of the wells and other related facilities.

2. For New Construction Projects: new construction, including a construction of an entirely new park exceeding $10,000,000 if the Project also involves construction of a new above-

ground building such as a restroom, field house, garage or maintenance facility, for which an addendum has been approved by an agency of the City of New York and by the BCTC on behalf of itself and its affiliated Local Unions. Each Project-specific addendum is to outline a description of the project being undertaken, the project's location, and the general findings of the feasibility analysis used as the basis of the determination to utilize a PLA on the project.

B. It is understood that, except where the City specifically applies this Agreement to such work in its bid documents, Program Work does not include, and this Agreement shall not apply to, any other work, including:

1. Contracts that are let under a different project labor agreement with an Agency, and/or other entities that have entered separate PLAs, such as NYCHA, H+H and SCA;

2. Contracts let and work performed in connection with projects carried over, recycled from, or performed under bids or rebids relating to work that were bid prior to the effective date of this Agreement or after December 31, 2028;

3. Contracts procured on an emergency basis;

4. Prime contracts that do not exceed $3,000,000;

5. Contracts for work on streets and bridges and for the closing or environmental remediation of landfills;

6. Contracts with not-for-profit corporations where the City is not awarding or performing the work performed for that entity;

7. Contracts with governmental entities where the City is not awarding or performing the work performed for that entity;

8. Contracts with electric utilities, gas utilities, telephone companies, and railroads, except that it is understood and agreed that these entities may only install their work to

a demarcation point, *e.g.*, a telephone closet or utility vault, the location of which is determined prior to construction and employees of such entities shall not be used to replace employees performing Program Work pursuant to this Agreement;

9. Contracts for installation of information technology that are not otherwise Program Work;

10. Task Orders or Work Orders issued under JOCS or Requirements Contracts that do not exceed $250,000, and JOCS or Requirements Contracts where the monetary value of such contracts predominantly involves such Task Orders or Work Orders;

11. Contracts that predominantly involve Minor Repair work, as defined in Article 2, Section 1(J) above. Such work is to be paid under the applicable prevailing wage law, if any, for service or maintenance work;

12. Up to 7% of work set aside to be performed by certified MWBE or DBE subcontractors ("Exempt Work") on prime contracts that are valued at $25,000,000 or more where participation goals are set forth in the contract to be performed by MWBEs or DBEs; and provided that: (i) the prime contractor shall first work in good faith with the relevant Local Unions, to identify one or more MWBE or DBE subcontractors who are a signatory to a Schedule "A" CBA or who will sign a Letter of Assent (Exhibit "A") as required under Article 2, Section 3 above to meet the 7% prior to such work being set aside; and (ii) if the prime contractor nevertheless fails to identify one or more MWBE or DBE subcontractors who are a signatory to a Schedule "A" CBA or who will sign a Letter of Assent (Exhibit "A") as required under Article 2, Section 3 above, then the amount of Exempt Work allowed to be set aside pursuant to this paragraph on a given project shall only be the difference between 7% of the prime contract value and the percentage of work awarded pursuant to this paragraph. Performance of a portion of the Exempt

Work performed by the certified MWBE or DBE subcontractors does not preclude the contractor from employing one or more MWBE or DBE subcontractor who is a signatory on another portion of the Exempt Work. Such Exempt Work shall be no more than $500,000 or 20% (whichever is greater) of the value of the subcontracts for work in any particular union's jurisdiction under any prime contract; and

13. On-site work performed on purchased equipment, which is required by the manufacturer to be performed by its staff or by its selected contractors as a condition of the continued effectiveness of the equipment warranty.

SECTION 2. TIME LIMITATIONS

In addition to falling within the scope of Article 3, Section 1, to be covered by this Agreement, Program Work must be (1) advertised and let for bid after the effective date of this Agreement, and (2) let for bid prior to December 31, 2028, the expiration date of this Agreement. It is understood that this Agreement, together with all of its provisions, shall remain in effect for all such Program Work until completion, even if not completed by the expiration date of the Agreement. If Program Work otherwise falling within the scope of Article 3, Section 1 is not let for bid by the expiration date of this Agreement, this Agreement may be extended to that work by mutual agreement of the parties.

SECTION 3. EXCLUDED EMPLOYEES

The following persons are not subject to the provisions of this Agreement, even though performing Program Work:

A. Superintendents, supervisors (except field surveyors on construction contracts, general and forepersons specifically covered by a craft's Schedule "A" CBA are included), engineers, professional engineers and/or licensed architects engaged in inspection and testing,

quality control/assurance personnel, timekeepers, mail carriers, clerks, office workers, messengers, guards, technicians, non-manual employees, and all professional, engineering, administrative and management persons;

B. Employees of the City, or any other municipal or State agency, authority or entity, or employees of any other public employer, even though working on the project site while covered Program Work is underway;

C. Employees and entities engaged in off-site manufacture, modifications, repair, maintenance, assembly, painting, handling or fabrication of project components, materials, equipment or machinery, or involved in deliveries to and from the Program site, except to the extent they are lawfully included in the bargaining unit of a Schedule "A" CBA;

D. Employees of the Construction Manager (except that in the event the Agency engages a Contractor to serve as Construction Manager, then those employees of the Construction Manager performing manual, on site construction labor will be covered by this Agreement);

E. Employees engaged in on-site equipment warranty work including installation, repair or maintenance unless employees are already working on the site and are certified to perform warranty work;

F. Employees engaged in geophysical testing other than boring for core samples;

G. Employees engaged in laboratory, specialty testing, or inspections, pursuant to a professional services agreement between the Agency, or any of the Agency's other professional consultants, and such laboratory, testing, inspection or surveying firms;

H. Employees engaged in on-site maintenance of installed equipment or systems which maintenance is awarded as part of a contract that includes Program Work, but which

maintenance occurs after installation of such equipment or system and is not directly related to construction services; and

I. Employees who perform work classified as Minor Repairs, provided that such workers are paid at the applicable prevailing wage, if any, for the work being performed.

SECTION 4. NON-APPLICATION TO CERTAIN ENTITIES

This Agreement shall not apply to those parents, affiliates, subsidiaries, or other joint or sole ventures of any Contractor which do not perform Program Work. It is agreed that this Agreement does not have the effect of creating any joint employment, single employer or alter ego status among the Agency or any Contractor. The Agreement shall further not apply to any New York City or other municipal or State agency, authority, or entity other than a listed Agency and nothing contained herein shall be construed to prohibit or restrict the Agency or its employees, or any State, New York City or other municipal or State authority, agency or entity and its employees, from performing on or off-site work related to Program Work.

As the contracts involving Program Work are completed and accepted, the Agreement shall not have further force or effect on such items or areas except where inspections, additions, repairs, modifications, check-out and/or warranty work are assigned in writing (copy to Local Union involved) by the Agency (or Construction Manager) for performance under the terms of this Agreement.

ARTICLE 4 - UNION RECOGNITION AND EMPLOYMENT

SECTION 1. PRE-HIRE RECOGNITION

The Contractors recognize the signatory Unions as the sole and exclusive bargaining representatives of all employees who are performing on-site Program Work, with respect to that work.

SECTION 2. UNION REFERRAL

A. The Contractors agree to request, employ and hire craft employees, including Residence-Based Community Hires as defined in Article 2, Section 1(M), for Program Work covered by this Agreement through the job referral systems and hiring halls established in the Local Unions' area CBAs set forth in Schedule "A". Notwithstanding this, Contractors shall have sole right to determine the competency of all referrals; to determine the number of employees required; to select employees for layoff (subject to Article 5, Section 3); and the sole right to reject any applicant referred by a Local Union, subject to the show-up payments. In the event that a Local Union does not fill any request for qualified employees within a 48-hour period after such requisition is made by a Contractor (Saturdays, Sundays and holidays excepted), a Contractor may employ qualified applicants from any other available source. In the event that the Local Union does not have a job referral system, the Contractor shall give the Local Union first preference to refer applicants, subject to the other provisions of this Article. The Contractor shall notify the Local Union of craft employees hired for Program Work within its jurisdiction from any source other than referral by the Union. Any employee hired by a Contractor because a Local Union does not fill a request for qualified employees within a 48 hour period (Saturdays, Sundays and holidays excepted) are not covered by this Agreement for purposes of Article 11, Section 2, unless they are or become a member of an affiliated Union.

B. A Contractor may request by name, and the Local Union will honor, referral of persons who have applied to the Local Union for Program Work ("Core Employees") and who meet the following qualifications:

1. possess any license required by New York State law for the Program Work to be performed;
2. have worked a total of at least 1000 hours in the Construction field during the prior 3 years; and

3. were on the Contractor's active payroll for at least 60 out of the 180 calendar days prior to the contract award.

No more than twelve per centum (12%) of the employees covered by this Agreement, per Contractor by craft, shall be hired through the special provisions above. Under this provision, name referrals begin with the eighth employee needed and continue on that same basis.

C. Notwithstanding Section 2(B), above, certified MWBE contractors for which participation goals are set forth in New York City Administrative Code §6-129, or DBE contractors for which participation goals are established, that are not signatory to any Schedule "A" CBAs, with subcontracts valued at or under two-million dollars ($2,000,000), and where the first two or more workers are hired simultaneously, may request by name, and the Local Union will honor, referral of the first (1st), fourth (4th), sixth (6th), and eighth (8th) Core Employee. In any case where the first two or more employees are not hired simultaneously, the certified MWBE's or DBE's Core Employees may be the second (2nd), fourth (4th), sixth (6th), and eighth (8th) Core Employee. All such Core Employees must have applied to the Local Union for Program Work and meet the following qualifications:

1. possess any license required by New York State law for the Program Work to be performed;
2. have worked a total of at least 1000 hours in the Construction field during the prior 3 years; and
3. were on the Contractor's active payroll for at least 60 out of the 365 calendar days prior to the contract award.

D. Where a certified MWBE or DBE Contractor voluntarily enters into a CBA with a BCTC Union, the employees of such Contractor at the time the CBA is executed shall be allowed to join the Union for the applicable trade subject to satisfying the Union's basic standards of proficiency for admission.

SECTION 3. NON-DISCRIMINATION IN REFERRALS

The Council represents that each Local Union hiring hall and referral system will be operated in a non-discriminatory manner and in full compliance with all applicable federal, state and local laws and regulations which require equal employment opportunities. Referrals shall not be affected in any way by the rules, regulations, bylaws, constitutional provisions or any other aspects or obligations of union membership, policies or requirements and shall be subject to such other conditions as are established in this Article. No employment applicant shall be discriminated against by any referral system or hiring hall because of the applicant's union membership, or lack thereof.

SECTION 4. MINORITY, FEMALE, LOCAL AND SECTION 3 REFERRALS

In the event a Local Union either fails, or is unable to refer qualified Residence-Based Community Hires, minority or female applicants in percentages equaling the workforce participation goals adopted by the City and set forth in the Agency's (or, if applicable, Construction Manager's) bid specifications, within 48 hours of the request for same, the Contractor may employ qualified Residence-Based Community Hires, minority or female applicants from any other available source.

The Local Unions agree to prioritize the referral of Residence-Based Community Hires in accordance with Article 13 and to the extent consistent with the law, rules applicable to the union referral systems and joint apprentice programs. Those unions that do not currently provide for Residence-Based Community Hire preferences in their referral systems will undertake to implement such preferences consistent with this Agreement and their governing documents. Please see Exhibit "C" for a non-exhaustive list of the Economically Disadvantaged Regions. Residence-Based Community Hires who are already on a Contractor's workforce, including Core

Employees, and referral of apprentices, in accordance with Article 13, Section 1(A) below, shall count towards the referral goals of this Section.

For any Program Work that may become subject to requirements under Section 3 of the Housing and Urban Development Act of 1968, as amended by the Housing and Community Development Act of 1992, and any rules, including new or revised rules, that may be published thereunder, the Local Unions acknowledge the Section 3 obligations of the Construction Manager or Contractor, as applicable, and agree to the preferences for Residence-Based Community Hires described above to help implement this Article in a manner that would allow the Construction Manager or Contractor to meet its Section 3 obligations to the greatest extent feasible, and to post any required notices in the manner required by Section 3. The parties also acknowledge that the Construction Manager and Contractor(s) may also fulfill its Section 3 requirements on Program Work by promoting opportunities for excluded employees, as defined by Article 3, Section 3 of this Agreement, on Program Work and, to the extent permitted by Section 3, by promoting opportunities for craft and other employees on non-Program Work.

SECTION 5. CROSS AND QUALIFIED REFERRALS

The Local Unions shall not knowingly refer to a Contractor an employee then employed by another Contractor working under this Agreement. The Local Unions will exert their utmost efforts to recruit sufficient numbers of skilled and qualified crafts employees to fulfill the requirements of the Contractor.

SECTION 6. CRAFT FOREPERSONS AND GENERAL FOREPERSONS

The selection of craft forepersons and/or general forepersons and the number of forepersons required shall be solely the responsibility of the Contractor except where otherwise provided by specific provisions of an applicable Schedule "A" CBA, and provided that all craft

forepersons shall be experienced and qualified journeypersons in their trade as determined by the appropriate Local Union. All forepersons shall take orders exclusively from the designated Contractor representatives. Craft forepersons shall be designated as working forepersons at the request of the Contractor, except when an existing local CBA prohibits a foreperson from working when the craft persons, they are leading exceed a specified number.

SECTION 7. ON CALL REPAIR REFERRALS

A. When an Agency awards a contract under this Agreement that requires the Contractor to have employees available on short notice to make time-sensitive repairs with such contract requiring the Contractor to respond within as little as two hours from the time the Contractor is contacted by the Agency ("On Call, Repair Contract"), the Contractor will, within ten (10) days of being awarded an On Call, Repair Contract subject to this Agreement, notify the appropriate affiliated Union that would perform the work for a contractor that the Contractor has been awarded such a contract and immediately enter into good faith negotiations with such relevant affiliated Union to establish a procedure to receive time sensitive referrals from such affiliated Union(s).

B. In the event the Contractor and the relevant affiliated Union(s) are unable to negotiate a specific, mutually agreeable procedure for on call repair referral procedure within twenty (20) days of commencement of negotiations or prior to commencement of performance of the contract, whichever is earlier, the Contractor and the relevant affiliated Unions will follow the following procedure:

1. Upon notification by a Contractor that it has been awarded an On Call, Repair Contract pursuant to paragraph A above, each relevant affiliate Union shall provide the

Contractor with the name and twenty-four (24) hour contact information of an On Call, Repair Contract contact person for urgent on call repair referrals.

2. The relevant affiliated Unions shall prepare a list of individuals eligible and prepared for referral on an immediate basis to respond to the on call repair contractor, which may include the affiliated Unions' service, repair and maintenance division workers where appropriate for repairs that can be made within 24 to 48 hours and paid at the appropriate prevailing wage rates for service and repair or maintenance work. Such list shall be provided to and in the possession of the designated-on call repair contact person for the affiliated Union and available for immediate reference.

3. Individuals on such list must be able to comply with the Contractor's response time pursuant to contract requirements.

4. The Union's On Call, Repair Contract contact person shall respond to a contractor's request for referrals within a reasonable time of the request so that compliance with the contract shall be possible.

C. In the event that the Contractor makes a request for an on call referral that is compliant with this procedure and a Union is not able to respond to the request, that Union will be deemed to have waived the forty-eight (48) hour referral rule contained in Section 2 above and the Contractor may employ qualified applicants from any other available source that can meet contract requirements for that time-sensitive on call repair work only; provided, however, that any work related to the repair work that is not of a time sensitive nature under the contract shall comply with Section 2. If a Union fails to timely refer a worker and the Contractor employs other workers, the Contractor will email the Agency within 72 hours and the Agency will forward that email to the designated Labor Management Committee contacts.

ARTICLE 5 - UNION REPRESENTATION

SECTION 1. LOCAL UNION REPRESENTATIVE

Each Local Union representing on-site employees shall be entitled to designate in writing (copy to Contractor involved and Construction Manager) one representative, and/or the Business Manager, who shall be afforded access to the Program Work site during such time as bargaining unit work is occurring and subject to otherwise applicable policies pertaining to visitors to the site.

SECTION 2. STEWARDS

A. Each affiliated Union shall have the sole discretion to designate any journey person as a Steward and an alternate Steward. The Union shall notify the Owner and/or Construction Manager as well as the Contractor of the identity of the designated Steward (and alternate) prior to the assumption of such duties. Stewards shall not exercise supervisory functions and will receive the regular rate of pay for their craft classifications. All Stewards shall be working Stewards.

B. In addition to their work as an employee, the Steward shall have the right to receive complaints or grievances and to discuss and assist in their adjustment with the Contractor's appropriate supervisor. Each Steward shall be concerned with the employees of the Steward's trade and, if applicable, subcontractors of their Contractor, but not with the employees of any other trade Contractor. No Contractor shall discriminate against the Steward in the proper performance of Union duties.

C. The Stewards shall not have the right to determine when overtime shall be worked, or who shall work overtime except pursuant to a Schedule "A" CBA provision providing procedures for the equitable distribution of overtime.

SECTION 3. LAYOFF OF A STEWARD

Contractors agree to notify the appropriate Union 24 hours prior to the layoff of a Steward, except in cases of discipline or discharge for just cause. If a Steward is protected against layoff by a Schedule "A" CBA provision, such provision shall be recognized to the extent the Steward possesses the necessary qualifications to perform the work required, except in cases of discipline or discharge for just cause. In any case in which a Steward is discharged or disciplined for just cause, the Local Union involved shall be notified immediately by the Contractor.

ARTICLE 6 - MANAGEMENT'S RIGHTS

SECTION 1. RESERVATION OF RIGHTS

Except as expressly limited by a specific provision of this Agreement, Contractors retain full and exclusive authority for the management of their operations including, but not limited to, the right to: direct the workforce, including determination as to the number of employees to be hired and the qualifications therefore; the promotion, transfer, layoff of its employees; require compliance with the directives of the Agency including standard restrictions related to security and access to the site that are equally applicable to Agency employees, guests, or vendors; or the discipline or discharge for just cause of its employees; assign and schedule work; promulgate reasonable Program Work rules that are not inconsistent with this Agreement or rules common in the industry and are reasonably related to the nature of work; and, the requirement, timing and number of employees to be utilized for overtime work. No rules, customs, or practices which limit or restrict productivity or efficiency of the individual, as determined by the Contractor, Agency and/or Construction Manager and/or joint working efforts with other employees shall be permitted or observed.

SECTION 2. MATERIALS, METHODS & EQUIPMENT

There shall be no limitation or restriction upon the Contractor's choice of materials, techniques, methods, technology or design, or, regardless of source or location, upon the use and installation of equipment, machinery, package units, pre-cast, pre-fabricated, pre-finished, or pre-assembled materials or products, tools, or other labor-saving devices. Contractors may, without restriction, install or use materials, supplies or equipment regardless of their source; provided, however, that where there is a Schedule "A" CBA that includes a lawful union standards and practices clauses, then such clause as set forth in Schedule "A" CBA will be complied with, unless there is a lawful Agency specification (or specification issued by a Construction Manager which would be lawful if issued by the Agency directly) that would specifically limit or restrict the Contractor's choice of materials, techniques, methods, technology or design, or, regardless of source or location, upon the use and installation of equipment, machinery, package units, pre-cast, pre-fabricated, pre-finished, or pre-assembled materials or products, tools, or other labor-saving devices, and which would prevent compliance with such Schedule "A" CBA clause. The on-site installation or application of such items shall be performed by the craft having jurisdiction over such work; provided, however, it is recognized that other personnel having special qualifications may participate, in a supervisory capacity, in the installation, check-off or testing of specialized or unusual equipment or facilities as designated by the Contractor. There shall be no restrictions as to work which is performed off-site for Program Work.

ARTICLE 7 - WORK STOPPAGES AND LOCKOUTS

SECTION 1. NO STRIKES-NO LOCK OUT

There shall be no strikes, sympathy strikes, picketing, work stoppages, slowdowns, hand billing, demonstrations or other similar disruptive activity at the Program Work site for any reason by any Union or employee against any Contractor or employer. There shall be no other Union or

concerted or employee activity which disrupts or interferes with the operation of the Program Work or the objectives of the Agency at any Program Work site. In addition, failure of any Union or employee to cross any picket line established by any Union, signatory or non-signatory to this Agreement, or the picket or demonstration line of any other organization, at or in proximity to a Program Work site where the failure to cross disrupts or interferes with the operation of Program Work is a violation of this Article. Should any employees breach this provision, the Unions will use their best efforts to try to immediately end that breach and return all employees to work. There shall be no lockout at a Program Work site by any signatory Contractor, Agency or Construction Manager.

SECTION 2. DISCHARGE FOR VIOLATION

A Contractor may discharge any employee violating Section 1, above, and any such employee will not be eligible thereafter for referral under this Agreement for a period of 100 days.

SECTION 3. NOTIFICATION

If a Contractor contends that any Union has violated this Article, it will notify the Local Union involved advising of such fact, with copies of the notification to the Council. The Local Union shall instruct and order, the Council shall request, and each shall otherwise use their best efforts to cause, the employees (and where necessary the Council shall use its best efforts to cause the Local Union), to immediately cease and desist from any violation of this Article. If the Council complies with these obligations, it shall not be liable for the unauthorized acts of a Local Union or its members. Similarly, a Local Union and its members will not be liable for any unauthorized acts of the Council. Failure of a Contractor or the Construction Manager to give any notification set forth in this Article shall not excuse any violation of Section 1 of this Article.

SECTION 4. EXPEDITED ARBITRATION

Any Contractor or Union alleging a violation of Section 1 of this Article may utilize the expedited procedure set forth below (in lieu of, or in addition to, any actions at law or equity that may be brought).

A. A party invoking this procedure shall notify J.J. Pierson and Gayle Gavin; who shall alternate (beginning with Arbitrator J.J. Pierson) as Arbitrator under this expedited arbitration procedure. If the Arbitrator next on the list is not available to hear the matter within 24 hours of notice, the next Arbitrator on the list shall be called. Copies of such notification will be simultaneously sent to the alleged violator and Council.

B. The Arbitrator shall thereupon, after notice as to time and place to the Contractor, the Local Union involved, the Council, Agency and the Construction Manager, hold a hearing within 48 hours of receipt of the notice invoking the procedure if it is contended that the violation still exists. The hearing will not, however, be scheduled for less than 24 hours after the notice required by Section 3, above.

C. All notices pursuant to this Article may be provided by telephone, telegraph, hand delivery, or fax, confirmed by overnight delivery, to the Arbitrator, Contractor, Agency, Construction Manager and Local Union involved. The hearing may be held on any day including Saturdays or Sundays. The hearing shall be completed in one session, which shall not exceed 8 hours duration (no more than 4 hours being allowed to either side to present their case and conduct their cross examination) unless otherwise agreed. A failure of any Union or Contractor to attend the hearing shall not delay the hearing of evidence by those present or the issuance of an award by the Arbitrator.

D. The sole issue at the hearing shall be whether a violation of Section 1, above, occurred. If a violation is found to have occurred, the Arbitrator shall issue a Cease and Desist Award restraining such violation and serve copies on the Contractor and Union involved. The Arbitrator shall have no authority to consider any matter in justification, explanation or mitigation of such violation or to award damages (any damages issue is reserved solely for court proceedings, if any). The Award shall be issued in writing within 3 hours after the close of the hearing and may be issued without an Opinion. If any involved party desires an Opinion, one shall be issued within 15 calendar days, but its issuance shall not delay compliance with, or enforcement of, the Award.

E. The Agency and Construction Manager (or such other designee of the Agency) may participate in full in all proceedings under this Article.

F. An Award issued under this procedure may be enforced by any court of competent jurisdiction upon the filing of this Agreement together with the Award. Notice of the filing of such enforcement proceedings shall be given to the Union or Contractor involved, and the Agency and Construction Manager.

G. Any rights created by statute or law governing arbitration proceedings which are inconsistent with the procedure set forth in this Article, or which interfere with compliance thereto, are hereby waived by the Contractors and Unions to whom they accrue.

H. The fees and expenses of the Arbitrator shall be equally divided between the involved Contractor and Union.

SECTION 5. ARBITRATION OF DISCHARGES FOR VIOLATION

Procedures contained in Article 9 shall not be applicable to any alleged violation of this Article, with the single exception that an employee discharged for violation of Section 1, above, may have recourse to the procedures of Article 9 to determine only if the employee did, in fact,

violate the provisions of Section 1 of this Article; but not for the purpose of modifying the discipline imposed where a violation is found to have occurred.

ARTICLE 8 - LABOR MANAGEMENT COMMITTEE

SECTION 1. SUBJECTS

The Program Labor Management Committee (the "LMC") will meet on a regular basis to: 1) promote harmonious relations among the Contractors and Unions; 2) enhance safety awareness, cost effectiveness and productivity of construction operations; 3) protect the public interests; 4) discuss matters relating to staffing and scheduling with safety and productivity as considerations; and 5) review efforts to meet applicable participation goals for MWBEs or DBEs and workforce participation goals for Residence-Based Community Hires, minority and female employees.

SECTION 2. COMPOSITION

The LMC shall be jointly chaired by a designee of the Agency and the President of the Council. It may include representatives of the Local Unions and Contractors involved in the issues being discussed. The parties shall mutually designate a Community Hiring Construction Careers, MWBE or DBE representative to participate in appropriate LMC discussions. The LMC may conduct business through mutually agreed upon sub-committees.

ARTICLE 9 - GRIEVANCE & ARBITRATION PROCEDURE

SECTION 1. PROCEDURE FOR RESOLUTION OF GRIEVANCES

Any question, dispute or claim arising out of, or involving the interpretation or application of this Agreement (other than jurisdictional disputes or alleged violations of Article 7, Section 1) shall be considered a grievance and shall be resolved pursuant to the exclusive procedure of the steps described below, provided, in all cases, that the question, dispute or claim arose during the term of this Agreement. Grievances shall include the City contract number and the Program Work

address; such information is posted at the work site if already commenced and is available in the City Record and Notice to Proceed for projects not already commenced.

Local Union grievances as to whether a scope of work is included or excluded from this Agreement shall be submitted to the LMC in the first instance rather than Step 1 below. To be timely, such notice must be given no later than five days prior to the bid opening date advertised in the City Record and bid documents for that contract, or any adjourned date publicly noticed if the grievance is challenging a determination by an Agency that the contract is not subject to this Agreement. Compliance with this limit shall operate as a statute of limitations and shall be a condition precedent to arbitration. For other grievances as to contractor and/or subcontractor scope of work issues, notice of such challenges shall be submitted to the LMC within 7 calendar days after the act, occurrence or event giving rise to the grievance. If the scope of work grievance is not resolved within 21 days of its submission to the LMC, then the grievance may proceed directly to Step 3 below.

Step 1:

(a) When any employee covered by this Agreement feels aggrieved by a claimed violation of this Agreement, the employee shall, through the Local Union business representative or job steward give notice of the claimed violation to the work site representative of the involved Contractor and the Construction Manager. To be timely, such notice of the grievance must be given within 7 calendar days after the act, occurrence or event giving rise to the grievance. The business representative of the Local Union or the job steward and the work site representative of the involved Contractor shall meet and endeavor to adjust the matter within 7 calendar days after timely notice has been given. If they fail to resolve the matter within the prescribed period, the grieving party, may, within 7 calendar days thereafter, pursue Step 2 of the grievance procedure

by serving the involved Contractor with written copies of the grievance setting forth a description of the claimed violation, the date on which the grievance occurred, and the provisions of the Agreement alleged to have been violated. Grievances and disputes settled at Step 1 are non-precedential except as to the specific Local Union, employee and Contractor directly involved unless the settlement is accepted in writing by the Agency (or designee) as creating a precedent.

(b) Should any signatory to this Agreement have a dispute (excepting jurisdictional disputes or alleged violations of Article 7, Section 1) with any other signatory to this Agreement and, if after conferring, a settlement is not reached within 7 calendar days, the dispute shall be reduced to writing and proceed to Step 2 in the same manner as outlined in subparagraph (a) for the adjustment of employee grievances.

Step 2:

A Step 2 grievance shall be filed with the Agency, the BCTC, the Contractor, and, if the grievance is against a subcontractor, the subcontractor. The Business Manager or designee of the involved Local Union, together with representatives of the involved Contractor and/or a contractor association representative where appropriate, Council, the Construction Manager or designee (if they elect to do so), the Agency or designee (if they elect to do so), and, if the grievance is against a subcontractor, the subcontractor, shall meet in Step 2 within 7 calendar days of service of the written grievance to arrive at a satisfactory settlement. The BCTC shall schedule the Step 2 meeting.

Step 3:

(a) If the grievance shall have been submitted but not resolved in Step 2, any of the participating Step 2 entities may, within 21 calendar days after the initial Step 2 meeting, submit the grievance in writing (copies to other participants, including the Construction Manager or

designee and the Agency or designee) to the BCTC. In the event the matter is not resolved at Step 2, either J.J. Pierson or Gayle Gavin, who shall act, alternately (beginning with Arbitrator J.J. Pierson), as the Arbitrator under this procedure, shall be designated at the Step 2 hearing and the BCTC will notify the arbitrator of his designation. After such notification by the BCTC, the local demanding arbitration shall within a reasonable time request the arbitrator to schedule the matter for an arbitration hearing date. The Labor Arbitration Rules of the American Arbitration Association shall govern the conduct of the arbitration hearing, at which all Step 2 participants shall be parties. The decision of the Arbitrator shall be final and binding on the involved Contractor, Local Union and employees and the fees and expenses of such arbitrations shall be borne equally by the involved Contractor and Local Union.

(b) Failure of the grieving party to adhere to the time limits set forth in this Article shall render the grievance null and void. These time limits may be extended only by written consent of the Agency (or designee), involved Contractor and involved Local Union at the particular step where the extension is agreed upon. The Arbitrator shall have authority to make decisions only on the issues presented to him and shall not have the authority to change, add to, delete or modify any provision of this Agreement.

SECTION 2. LIMITATION AS TO RETROACTIVITY

No arbitration decision or award, with the exception of those related to compliance with requirements to pay prevailing wages and supplements in accordance with federal or State law, may provide retroactivity of any kind exceeding 60 calendar days prior to the date of service of the written grievance on the Construction Manager and the involved Contractor or Local Union.

SECTION 3. PARTICIPATION BY AGENCY AND/OR CONSTRUCTION MANAGER

The Agency and Construction Manager (or such other designee of the Agency) shall be notified by the involved Contractor of all actions at Steps 2 and 3 and, at its election, may participate in full in all proceedings at these Steps, including Step 3 arbitration.

ARTICLE 10 - JURISDICTIONAL DISPUTES

SECTION 1. NO DISRUPTIONS

There will be no strikes, sympathy strikes, work stoppages, slowdowns, picketing or other disruptive activity of any kind arising out of any jurisdictional dispute. Pending the resolution of the dispute, the work shall continue uninterrupted and as assigned by the Contractor. No jurisdictional dispute shall excuse a violation of Article 7.

SECTION 2. ASSIGNMENT

All Program Work assignments shall be made by the Contractor to unions affiliated with the BCTC consistent with the New York Plan for the Settlement of Jurisdictional Disputes ("New York Plan") and its Greenbook decisions, if any. Where there are no applicable Greenbook decisions, assignments shall be made in accordance with the provisions of the New York Plan and local industry practice.

SECTION 3. NO INTERFERENCE WITH WORK

There shall be no interference or interruption of any kind with the Program Work while any jurisdictional dispute is being resolved. The work shall proceed as assigned by the Contractor until finally resolved under the applicable procedure of this Article. The award shall be confirmed in writing to the involved parties. There shall be no strike, work stoppage or interruption in protest of any such award.

ARTICLE 11 - WAGES AND BENEFITS

SECTION 1. CLASSIFICATION AND BASE HOURLY RATE

All employees covered by this Agreement shall be classified in accordance with the work performed and paid the hourly wage rates applicable for those classifications as required by the applicable prevailing wage laws.

SECTION 2. EMPLOYEE BENEFITS

A. The Contractors agree to pay on a timely basis contributions on behalf of all employees covered by this Agreement to those established jointly trusteed employee benefit funds designated in the applicable Schedule "A" CBA (in the appropriate Schedule "A" amounts), provided that such benefits are required to be paid on public works under any applicable prevailing wage law. Bona fide jointly trusteed fringe benefit plans established or negotiated through collective bargaining during the life of this Agreement may be added if similarly required under applicable prevailing wage law. Contractors, not otherwise contractually bound to do so, shall not be required to contribute to benefits, trusts or plans of any kind which are not required by the prevailing wage law provided, however, that this provision does not relieve Contractor's signatory to local collective bargaining agreement with any affiliated union from complying with the fringe benefit requirements for all funds contained in the CBA. Furthermore, employees that may remain unaffiliated with any local union at the completion of their employment under the terms of this Agreement may apply for any distributions to which they may be entitled from the funds in accordance with the applicable rules and governing documents of the unions and the employee benefit funds that they have participated in under the terms of this Agreement.

B. 1. Notwithstanding Section 2 (A) above, and subject to 2 (B)(2) below, Contractors who designate Core Employees pursuant to Article 4, Section 2 (B) and (C) that are not signatory to a Schedule "A" CBA and who maintain bona fide private benefit plans that satisfy

the requirements of Section 220 of the New York State Labor Law, may satisfy the above benefit obligation with respect to those employees by providing those employees with coverage under their private benefit plans (to the extent consistent with Section 220). The total benefit payments to be made on behalf of each such employee must be equal to the total Section 220 supplement amount and any shortfall must be paid by cash supplement to the employee.

2. A contractor that will satisfy its Section 220 obligations in accordance with subsection 2(B)(1) above shall make available to the Agency at the time of contract award a complete set of plan documents for each non-Schedule "A" benefit plan into which contributions will be made and/or coverage provided pursuant to the provisions of Section 2(B)(l) above. The Contractor shall also provide certification from a certified public accountant as to the annualized hourly value of such benefits consistent with the requirements of Section 220.

3. The City shall verify that the alternate benefit plan(s), together with any cash supplement to the employee, is compliant with Section 220 prior to awarding the Contractor a contract covered by this Agreement. In the event the Contractor's alternate benefit plan(s), together with any cash supplement to the employee, is determined to be compliant with Section 220 and will be utilized by the Contractor on behalf of Article 4, Section 2(B) and (C) Core Employees, the Local Unions have no duty to enforce the Contractor's obligations on the alternate benefit plan(s) as they are not party to the alternate plan(s) or privy to the terms and conditions of the plan obligations. In the event the City determines the alternate benefit plan(s), together with any cash supplement to the employee, is not compliant with Section 220, the Contractor may, upon executing a Letter of Assent, satisfy its obligations for all employees, including Core Employees, by contributing to the Schedule "A" benefit plans in accordance with the terms of the Schedule "A" CBAs.

C. The Contractors agree to be bound by the written terms of the legally established jointly trusteed Trust Agreements specifying the detailed basis on which payments are to be paid into, and benefits paid out of, such Trust Funds but only with regard to Program Work done under this Agreement and only for those employees to whom this Agreement requires such benefit payments.

D. 1. To the extent consistent with New York City's Procurement Policy Board Rules with respect to prompt payment, as published at www.nyc.gov/ppb, §4-06(e), and in consideration of the unions' waiver of their rights to withhold labor from a contractor or subcontractor delinquent in the payment of fringe benefits contributions ("Delinquent Contractor"); the Agency agrees that where any such union and/or fringe benefit fund shall notify the Agency, the General Contractor, and the Delinquent Contractor in writing with back-up documentation that the Delinquent Contractor has failed to make fringe benefit contributions to it as provided herein and the Delinquent Contractor shall fail, within ten (10) calendar days after receipt of such notice, to furnish either proof of such payment or notice that the amount claimed by the union and/or fringe benefit fund is in dispute, the Agency shall withhold from amounts then or thereafter becoming due and payable to the General Contractor an amount equal to that portion of such payment due to the General Contractor that relates solely to the work performed by the Delinquent Contractor which the union or fringe benefit fund claims to be due it, and shall remit the amount when and so withheld to the fringe benefit fund and deduct such payment from the amounts then otherwise due and payable to the General Contractor, which payment shall, as between the General Contractor and the Agency, be deemed a payment by the Agency to the General Contractor; provided however, that in any month, such withholding shall not exceed the amount contained in the General Contractor's monthly invoice for work performed by the Delinquent Contractor. The union or its

employee benefit funds shall include in its notification of delinquent payment of fringe benefits only such amount it asserts the Delinquent Contractor failed to pay on the specific project against which the claim is made and the union or its employee benefit funds may not include in such notification any amount such Delinquent Contractor may have failed to pay on any other City or non-City project.

2. In addition, where a union or employee benefit fund gives notice to the City that a Contractor is Delinquent as defined in subsection 2(D)(1) above and the City determines that the notice includes appropriate back-up documentation that the Contractor is delinquent, the City will promptly, but not later than twenty (20) days after receipt of the notice, provide a copy of said notice to City Agencies. In the event the City determines there is insufficient back-up documentation, it will notify the appropriate union and/or fringe benefit fund promptly, but not later than twenty (20) days after receipt of the Delinquency Notice, and shall include notice of what additional documentation is requested. Any determination by the City that there is insufficient back-up must be reasonable. This provision is intended to enhance compliance with the prevailing wage law and this Agreement with respect to the payment of fringe benefits and is not intended as a substitute for the resolution of a disputed claim pursuant to any applicable law or agreement.

The City and the relevant Agency(s) will thereafter require the Delinquent Contractor to provide cancelled checks or other equivalent proof of payment of benefit contributions that have come due, to be submitted with certified payroll reports for all Program Work covered by this Agreement on which the Delinquent Contractor is engaged, for at least a one-year period or such earlier period if the Contractor is ultimately determined not to be a Delinquent Contractor. Such proof of payment when required is a condition of payment of the Delinquent Contractor's invoices

by any entity, including, but not limited to, the City, the relevant Agency(s), Construction Manager, General Contractor, the prime or higher level subcontractor, as is appropriate under the Delinquent Contractor's engagement. The union and the funds shall upon request receive copies of the certified payrolls, cancelled checks, or other proof of payment from the City and/or the relevant Agency(s).

E. In the event the General Contractor or Delinquent Contractor shall notify the Agency as above provided that the claim of the union or fringe benefit fund is in dispute, the Agency shall withhold from amounts then or thereafter becoming due and payable to the General Contractor an amount equal to that portion of such payment due to the General Contractor that relates solely to the work performed by the Delinquent Contractor that the union and/or fringe benefit fund claims to be due it, pending resolution of the dispute pursuant to the union's Schedule "A" CBA, and the amount shall be paid to the party or parties ultimately determined to be entitled thereto, or held until the Delinquent Contractor and union or employee benefit fund shall otherwise agree as to the disposition thereof; provided however, that such withholding shall not exceed the amount contained in the General Contractor's monthly invoice for work performed by the Delinquent Contractor. In the event the Agency shall be required to withhold amounts from a General Contractor for the benefit of more than one fringe benefit fund, the amounts so withheld in the manner and amount prescribed above shall be applied to or for such fund in the order in which the written notices of nonpayment have been received by the Agency, and if more than one such notice was received on the same day, proportionately based upon the amount of the union and/or fringe benefit fund claims received on such day. Nothing herein contained shall prevent the Agency from commencing an interpleader action to determine entitlement to a disputed

payment in accordance with section one thousand six of the civil practice law and rules or any successor provision thereto.

F. Payment to a fringe benefit fund under this provision shall not relieve the General Contractor or Delinquent Contractor from responsibility for the work covered by the payment. Except as otherwise provided, nothing contained herein shall create any obligation on the part of the Agency to pay any union or fringe benefit fund, nor shall anything provided herein serve to create any relationship in contract or otherwise, implied or expressed, between the union/fund and/or fringe benefit and the Agency.

ARTICLE 12 - HOURS OF WORK, PREMIUM PAYMENTS, SHIFTS AND HOLIDAYS

SECTION 1. WORK WEEK AND WORKDAY

A. The standard work week shall consist of 40 hours of work at straight time rates, Monday through Friday, 8 hours per day, plus ½ hour unpaid lunch period. For renovation and rehabilitation projects only, the standard work week may be reduced to 35 or 37 ½ hours of work at straight time rates, Monday to Friday, 7 or 7 ½ hours per day, plus ½ hour unpaid lunch period in those limited circumstances where the City states in the bid documents that the Contractor will not be given access to the site to accommodate an 8 hour day. The 8 hour, 7 ½ hour or 7-hour workday must be established at the commencement of the renovation and rehabilitation project and may not be altered by the Contractor.

B. In accordance with project needs, there shall be flexible start times with advance notice from Contractor to the Union. The Day Shift shall commence between the hours of 6:00 a.m. and 9:00 a.m. and shall end between the hours of 2:30 p.m. and 5:30 p.m., for an 8-hour day, and up to 7:30 p.m. for a 10-hour day. The Evening Shift shall commence between the hours of 3:00 p.m. and 6:00 p.m., unless different times are necessitated by the Agency's phasing plans on specific projects. The Night Shift shall commence between the hours of 11:00 p.m. and 2:00 a.m.,

unless different times are necessitated by the Agency's phasing plans on specific projects. Subject to the foregoing, starting and quitting times shall occur at the Program Work site designated by the Contractor.

C. Scheduling - Except as provided above, Monday through Friday is the standard work week; 8 hours of work plus ½ hour unpaid lunch. Notwithstanding any other provision of this Agreement, a Contractor may, for renovation and rehabilitation projects only, schedule a four-day work week, 10 hours per day ("4/10") at straight time rates, plus a ½ hour unpaid lunch, at the commencement of the job.

D. Notice - Contractors shall provide not less than 5 days prior notice to the Local Union involved as to the work week and work hour schedules to be worked or such lesser notice as may be mutually agreed upon.

SECTION 2. OVERTIME

Overtime shall be paid for any work exceeding either (i) an employee's regularly scheduled work day, i.e., work over eight (8) hours in a day where 5/8s is scheduled, work over ten (10) hours in a day where 4/10s is scheduled, or work over seven (7) or seven and one half (7½) hours where such hours are scheduled pursuant to Article 12, section 1(A); or (ii) an employee's regularly scheduled work week, i.e., over forty (40) hours in a week, or over thirty five (35) or thirty seven and one-half (37 ½) where such hours are scheduled pursuant to Article 12, Section 1(A). Overtime shall be paid at time and one half (1½) Monday through Saturday. All overtime work performed on Sunday and Holidays will be paid pursuant to the applicable Schedule "A" CBA. There shall be no stacking or pyramiding of overtime pay under any circumstances. There will be no restriction upon the Contractor's scheduling of overtime or the nondiscriminatory designation of employees who shall be worked, including the use of employees, other than those who have

worked the regular or scheduled work week, at straight time rates. The Contractor shall have the right to schedule work so as to minimize overtime or schedule overtime as to some, but not all, of the crafts and whether or not of a continuous nature.

SECTION 3. SHIFTS

A. Flexible Schedules - Scheduling of shift work, including Saturday and Sunday work, shall be within the discretion of the Contractor in order to meet Program Work schedules and existing Program Work conditions including the minimization of interference with the mission of the Agency. It is not necessary to work a day shift in order to schedule a second or third shift, or a second shift in order to schedule a third shift, or to schedule all of the crafts when only certain crafts or employees are needed. Shifts must have prior approval of the Agency or Construction Manager and must be scheduled with not less than five workdays' notice to the Local Union or such lesser notice as may be mutually agreed upon.

B. Second and/or Third Shifts - The second shift shall start between 3 p.m. and 6 p.m. and the third shift shall start between 11 p.m. and 2 a.m., subject to different times necessitated by the Agency phasing plans on specific projects. There shall be no reduction in shift hour work. With respect to second and third shift work performed Monday—Friday on renovation and rehabilitation projects, there shall be a 5% shift premium, or the rate required by the applicable prevailing wage laws, whichever is less. With respect to second shift work performed Monday – Friday on new construction projects, there shall be a 10% shift premium, or the rate required by applicable prevailing wage laws, whichever is less. With respect to third shift work on work performed Monday – Friday on new construction projects, there shall be a 15% shift premium, or the rate required by applicable prevailing wage laws, whichever is less. No other premium or other payments for such work shall be required unless such work is in excess of the employee's regularly

scheduled work week, i.e., forty (40) hours in the week or thirty-five (35) or thirty-seven and one half (37 ½) pursuant to Article 12, Section 1(A). All employees within the same classification performing Program Work will be paid at the same wage rate regardless of the shift or work, subject only to the foregoing provisions.

C. Flexible Starting Times - Shift starting times will be adjusted by the Contractor as necessary to fulfill Program Work requirements subject to the notice requirements of paragraph A.

SECTION 4. HOLIDAYS

A. Schedule - There shall be nine (9) recognized holidays on the project:

New Year's Day	
Martin Luther King Day	President's Day
Memorial Day	Veteran's Day
Labor Day	Thanksgiving Day
Independence Day	Christmas Day

All said holidays shall be observed on the calendar date except those holidays which occur on Saturday shall be observed on the previous Friday and those that occur on Sunday shall be observed on the following Monday.

B. Payment - Regular holiday pay, if any, for work performed on such a PLA recognized holiday shall be in accordance with the applicable Schedule "A" for work performed on a holiday, even where the PLA holiday differs from the CBA holidays.

C. Exclusivity - No holidays other than those listed in Section 4(A) above shall be recognized or observed.

SECTION 5. MAKE-UP DAYS

When severe weather, power failure, fire or natural disaster or other similar circumstances beyond the control of the Contractor prevent work from being performed on a regularly scheduled weekday, the Contractor may schedule a Saturday make-up day (or Friday make-up day in the case of a 4/10 schedule) and such time shall be scheduled and paid as if performed on a weekday. Any other Saturday work shall be paid at time and one-half (1½). The Contractor shall notify the Local Union on the missed day or as soon thereafter as practicable if such a make-up day is to be worked.

SECTION 6. REPORTING PAY

A. Employees who report to the work location pursuant to their regular schedule and who are not provided with work shall be paid two hours reporting pay at straight time rates. An employee whose work is terminated early by a Contractor due to severe weather, power failure, fire or natural disaster of for similar circumstances beyond the Contractor's control, shall receive pay only for such time as is actually worked. In other instances, in which an employee's work is terminated early (unless provided otherwise elsewhere in this Agreement), the employee shall be paid for their full shift. Contractors shall not be permitted to call, text or email or voicemail employees in advance of their regularly scheduled shift starting time to avoid reporting pay. Notwithstanding the above, in the event that the National Weather Service issues a weather advisory for the area in which the work location is situated, and the entire project is shut down as a result of the Weather Advisory, the Contractor shall be permitted to speak to employees no less than four (4) hours in advance of their shift starting time, unless the Local Union consents to a shorter notice in writing, to advise them not to report to work due to the National Weather Service advisory, and employees who are so notified shall not receive two (2) hours reporting pay if they report to the work location. The Contractor shall make every effort to notify each employee

directly and confirm that notification has been received. Voice, text, and email messages left for employees without confirmation of delivery and receipt by employee do not constitute sufficient notice under this provision.

B. When an employee, who has completed their scheduled shift and left the Program Work site, is "called out" to perform special work of a casual, incidental or irregular nature, the employee shall receive overtime pay at the rate of time and one-half of the employee's straight time rate for hours actually worked.

C. When an employee leaves the job or work location of their own volition or is discharged for cause or is not working as a result of the Contractor's invocation of Section 7 below, they shall be paid only for the actual time worked.

D. Except as specifically set forth in this Article there shall be no premiums, bonuses, hazardous duty, high time or other special premium payments or reduction in shift hours of any kind.

E. There shall be no pay for time not actually worked except as specifically set forth in this Article and except where an applicable Schedule "A" CBA requires a full weeks' pay for forepersons.

SECTION 7. PAYMENT OF WAGES

A. Termination - Employees who are laid off or discharged for cause shall be paid in full for that which is due them at the time of termination. The Contractor shall also provide the employee with a written statement setting forth the date of layoff or discharge.

SECTION 8. EMERGENCY WORK SUSPENSION

A Contractor may, if considered necessary for the protection of life and/or safety of employees or others, suspend all or a portion of Program Work. In such instances, employees will

be paid for actual time worked, except that when a Contractor requests that employees remain at the job site available for work, employees will be paid for that time at their hourly rate of pay.

SECTION 9. INJURY/DISABILITY

An employee who, after commencing work, suffers a work-related injury or disability while performing work duties, shall receive no less than a full day's pay in accordance with the employee's regularly scheduled workday under Article 12, Section (1)(A). Further, the employee shall be rehired at such time as able to return to duties provided there is still Program Work available for which the employee is qualified and able to perform.

SECTION 10. TIME KEEPING

A Contractor may utilize systems to check employees in and out. Each employee must check in and out and sign a daily sign-in sheet, or other attendance methodology approved in writing by the Agency(s). The Contractor will provide adequate facilities for checking in and out in an expeditious manner.

SECTION 11. MEAL PERIOD

A Contractor shall schedule an unpaid period of not more than 1/2-hour duration at the work location between the 3rd and 5th hour of the scheduled shift. A Contractor may, for efficiency of operation, establish a schedule which coordinates the meal periods of two or more crafts, or which provides for staggered lunch periods within a craft or trade. If an employee is required to work through the meal period, the employee shall be compensated in a manner established in the applicable Schedule "A" CBA.

SECTION 12. BREAK PERIODS

There will be no rest periods, organized coffee breaks or other non-working time established during working hours. Individual coffee containers will be permitted at the employee's

work location. Where 4/10s are being worked, there shall be a morning and an afternoon coffee break.

ARTICLE 13 - APPRENTICES AND WORKFORCE DEVELOPMENT

SECTION 1. APPRENTICE RATIOS AND REFERRALS

A. Recognizing the need to maintain continuing supportive programs designed to develop adequate numbers of competent workers in the construction industry and to provide craft entry opportunities for minorities, women and economically disadvantaged non-minority males, Contractors will employ apprentices in their respective crafts to perform such work as is within their capabilities and which is customarily performed by the craft in which they are indentured. Contractors may utilize apprentices and such other appropriate classifications in the maximum ratio permitted by the New York State Department of Labor ("NYSDOL"), or the maximum allowed per trade. Apprentices and such other classifications as are appropriate shall be employed in a manner consistent with the provisions of the appropriate Schedule "A" CBA. The parties encourage, as an appropriate source of apprentice recruitment consistent with the rules and operations of the affiliated unions' apprentice-programs, the use of the Edward J. Malloy Initiative for Construction Skills, Non-Traditional Employment for Women, New York Helmets to Hardhats, and Pathways to Apprenticeship (P2A). Should a Contractor request that apprentices be provided for Program Work, the referring Local Union shall comply with that request so long as it is consistent with the maximum ratios permitted by NYSDOL. Where the Agency sets forth goals regarding Residence-Based Community Hire apprentices, the Contractor shall request such Residence-Based Community Hire apprentices from the Local Union so long as it is consistent with the maximum ratios permitted by NYSDOL.

SECTION 2. WORKFORCE DEVELOPMENT

A. The parties to this Agreement recognize the mutual interest in increasing training

and career opportunities for Residence-Based Community Hires. The parties are committed to (i) increasing opportunities for Residence-Based Community Hires in pre-apprenticeship and apprenticeship programs, and (ii) using the work opportunities provided by this Agreement to increase the career opportunities for qualified Residence-Based Community Hires, and (iii) assuring the continued availability of a skilled and qualified, readily available construction workforce for this program and future work.

B. Specifically, the parties have established an initiative entitled Community Hiring Construction Careers, which is an initiative to advance career opportunities for Residence-Based Community Hires.

C. The Community Hiring Construction Careers initiative will work with the Office of Talent and Workforce Development ("NYC Talent") and the City's Workforce1 Centers to recruit Residence-Based Community Hires interested in employment in the construction industry.

D. Community Hiring Construction Careers intends to capitalize on the work opportunities presented by this Agreement to create a pathway to career opportunities in the construction workforce. To this end the Community Hiring Construction Careers initiative includes a workforce goal of at least 30% of all hours worked under this Agreement, including by subcontractors pursuant to Article 3, Section 1(b)(12) and Article 4, Sections 2(B) and (C), to be worked by Residence-Based Community Hires. Where the Agency sets forth workforce goals in its solicitation, Contractors shall request Residence-Based Community Hires from the Local Unions to achieve the required workforce goal.

E. In order to encourage recruitment of new workers, Community Hiring Construction Careers has established a goal that at least 30% of all of those hours are to be worked

by apprentices who are Residence-Based Community Hires.

F. The Contractors and Unions agree to cooperate and participate in the implementation of Community Hiring Construction Careers to assist Residence-Based Community Hires with educational and training opportunities related to access to pre-apprenticeship, apprenticeship, and Program Work as set forth in this Agreement.

G. Reporting Requirements:

i. The Contractors shall report the residence zip code information on all certified payroll reports and any additional information regarding Residence-Based Community Hires that may be required by rule or law.

ii. The Local Unions, their referral systems, the affiliated pre-apprentice programs, and Contractors shall cooperate with any protocol developed for monitoring the Community Hiring Construction Careers initiative.

H. The City and BCTC agree that no less than annually, the LMC shall review the implementation of Community Hiring Construction Careers, as well as Residence-Based Community Hire opportunities afforded as a result of the initiative. The City and BCTC will collaborate to develop monitoring protocol for the purpose of measuring the success of Community Hiring Construction Careers. The City and BCTC may, on mutual consent, modify the goals, procedures and protocols, as necessary to afford continued opportunity to Residence-Based Community Hires.

I. To facilitate the commitments set forth in this Agreement, each Local Union shall designate a Community Hiring Construction Careers lead representative to work in partnership with NYC Talent to implement these workforce and apprenticeship provisions within the union

and across City construction contracts.

ARTICLE 14 - SAFETY PROTECTION OF PERSON AND PROPERTY

SECTION 1. SAFETY REQUIREMENTS

Each Contractor will ensure that applicable OSHA and safety requirements are at all times maintained on the Program Work site and the employees and Unions agree to cooperate fully with these efforts to the extent consistent with their rights and obligations under the law. Employees will cooperate with employer safety policies and will perform their work at all times in a safe manner and protect themselves and the property of the Contractor and Agency from injury or harm, to the extent consistent with their rights and obligations under the law. Failure to do so will be grounds for discipline, including discharge. The Construction Manager and/or Contractor may adopt, and the Unions shall agree to, the Drug and Alcohol Testing Policy attached as Schedule "B".

SECTION 2. CONTRACTOR RULES

Employees covered by this Agreement shall at all times be bound by the reasonable safety, security, and visitor rules as established by the Contractors and the Construction Manager for Program Work. Such rules will be published and posted in conspicuous places throughout the Program Work sites. Any site security and access policies established by the Construction Manager or General Contractor intended for specific application to the construction workforce for Program Work and that are not established pursuant to an Agency directive shall be implemented only after notice to the BCTC and its affiliates and an opportunity for negotiation and resolution by the Labor Management Committee.

SECTION 3. INSPECTIONS

The Contractors and Construction Manager retain the right to inspect incoming shipments of equipment, apparatus, machinery and construction materials of every kind.

ARTICLE 15 - TEMPORARY SERVICES

SECTION 1.

Temporary services, i.e. all temporary heat, climate control, water, power and light, shall only be required upon the determination of the Agency or Construction Manager, and when used shall be staffed and assigned to the appropriate trade(s) with jurisdiction. Temporary services shall be provided by the appropriate Contractors' existing employees during working hours in which a shift is scheduled for employees of the Contractor. The Agency or Construction Manager may determine the need for temporary services requirements during non-working hours, and when used shall be staffed and assigned to the appropriate trades(s), and which may be limited to one person per applicable trade where practicable. There shall be no stacking of trades on temporary services, provided this does not constitute a waiver of primary trade jurisdiction. In the event a temporary system component is claimed by multiple trades, the matter shall be resolved through the New York Plan for Jurisdictional Disputes.

ARTICLE 16 - NO DISCRIMINATION

SECTION 1. COOPERATIVE EFFORTS

The Contractors and Unions agree that they will not discriminate against any employee or applicant for employment because of creed, race, color, religion, sex, sexual orientation, national origin, marital status, citizenship status, disability, gender identity, age or any other status provided by law, in any manner prohibited by law or regulation.

SECTION 2. LANGUAGE OF AGREEMENT

Any words signifying any gender shall be interpreted to mean any or all gender identities.

ARTICLE 17 - GENERAL TERMS

SECTION 1. PROJECT RULES

A. The Construction Manager and the Contractors shall establish such reasonable Program Work rules that are not inconsistent with this Agreement or rules common in the industry and are reasonably related to the nature of work. These rules will be explained at the pre-job conference and posted at the Program Work sites and may be amended thereafter as necessary. Notice of amendments will be provided to the appropriate Local Union. Failure of an employee to observe these rules and regulations shall be grounds for discipline, including discharge. The fact that no order was posted prohibiting a certain type of misconduct shall not be a defense to an employee disciplined or discharged for such misconduct when the action taken is for cause.

B. The parties adopt and incorporate the BCTC's Standards of Excellence as annexed hereto as Exhibit "B".

SECTION 2. TOOLS OF THE TRADE

The welding/cutting torch and chain fall are tools of the trade having jurisdiction over the work performed. Employees using these tools shall perform any of the work of the trade. There shall be no restrictions on the emergency use of any tools or equipment by any qualified employee or on the use of any tools or equipment for the performance of work within the employee's jurisdiction.

SECTION 3. SUPERVISION

Employees shall work under the supervision of the craft foreperson or general foreperson.

SECTION 4. TRAVEL ALLOWANCES

There shall be no payments for travel expenses, travel time, subsistence allowance or other such reimbursements or special pay except as expressly set forth in this Agreement.

SECTION 5. FULL WORKDAY

Employees shall be at their work area at the starting time established by the Contractor, provided they are provided access to the work area. The signatories reaffirm their policy of a fair day's work for a fair day's wage.

SECTION 6. COOPERATION AND WAIVER

The Construction Manager, Contractors and the Unions will cooperate in seeking any NYSDOL, or any other government, approvals that may be needed for implementation of any terms of this Agreement. In addition, the Council, on their own behalf and on behalf of its participating affiliated Local Unions and their individual members, intend the provisions of this Agreement to control to the greatest extent permitted by law, notwithstanding contrary provisions of any applicable prevailing wage, or other, law and intend this Agreement to constitute a waiver of any such prevailing wage, or other, law to the greatest extent permissible only for work within the scope of this Agreement, including specifically, but not limited to those provisions relating to shift, night, and similar differentials and premiums. This Agreement does not, however, constitute a waiver or modification of the prevailing wage schedules applicable to work not covered by this Agreement.

ARTICLE 18 - SAVINGS AND SEPARABILITY

SECTION 1. THIS AGREEMENT

In the event that the application of any provision of this Agreement is enjoined, on either an interlocutory or permanent basis, or is otherwise determined to be in violation of law, or if such application may cause the loss of project funding or any New York State Labor Law exemption for all or any part of the Program Work, the provision or provisions involved (and/or its application to particular Program Work, as necessary) shall be rendered, temporarily or permanently, null and void, but where practicable the remainder of the Agreement shall remain in full force and effect to

the extent allowed by law (and to the extent no funding or exemption is lost), unless the part or parts so found to be in violation of law or to cause such loss are wholly inseparable from the remaining portions of the Agreement and/or are material to the purposes of the Agreement. In the event a court of competent jurisdiction finds any portion of the Agreement to trigger the foregoing, the parties will immediately enter into negotiations concerning the substance affected by such decision for the purpose of achieving conformity with the court determination and the intent of the parties hereto for contracts to be let in the future.

SECTION 2. THE BID SPECIFICATIONS

In the event that the Agency's (or Construction Manager's) bid specifications, or other action, requiring that a successful bidder (and subcontractor) become signatory to this Agreement is enjoined, on either an interlocutory or permanent basis, or is otherwise determined to be in violation of law, or may cause the loss of project funding or any New York State Labor Law exemption for all or any part of the Program Work, such requirement (and/or its application to particular Program Work, as necessary) shall be rendered, temporarily or permanently, null and void, but where practicable the Agreement shall remain in full force and effect to the extent allowed by law and to the extent no funding or exemption is lost. In such event, the Agreement shall remain in effect for contracts already bid and awarded or in construction only where the Agency and Contractor voluntarily accepts the Agreement. The parties will enter into negotiations as to modifications to the Agreement to reflect the court or other action taken and the intent of the parties for contracts to be let in the future.

SECTION 3. NON-LIABILITY

In the event of an occurrence referenced in Section 1 or Section 2 of this Article, neither the Agency, the Construction Manager, any Contractor, nor any Union shall be liable, directly or

indirectly, for any action taken, or not taken, to comply with any court order or injunction, other determination, or in order to maintain funding or a New York State Labor Law exemption for Program Work. Bid specifications will be issued in conformance with court orders then in effect and no retroactive payments or other action will be required if the original court determination is ultimately reversed.

SECTION 4. NON-WAIVER

Nothing in this Article shall be construed as waiving the prohibitions of Article 7 as to signatory Contractors and signatory Unions.

ARTICLE 19 - FUTURE CHANGES IN SCHEDULE "A" AREA CONTRACTS

SECTION 1. CHANGES TO AREA CONTRACTS

A. Schedule "A" to this Agreement shall continue in full force and effect until the Contractor and/or Union parties to the Area CBAs that are the basis for the Schedule "A" notify the Mayor's Office of Contract Services ("MOCS"), Agency and Construction Manager in writing by providing a copy of the updated CBA(s) incorporating the changes agreed to in that Area CBA which are applicable to work covered by this Agreement and their effective dates.

B. It is agreed that any provisions negotiated into Schedule "A" CBAs will not apply to work under this Agreement if such provisions are less favorable to those uniformly required of contractors for construction work normally covered by those agreements; nor shall any provision be recognized or applied on Program Work if it may be construed to apply exclusively, or predominantly, to work covered by this Agreement.

C. Any disagreement between signatories to this Agreement over the incorporation into Schedule "A" of provisions agreed upon in the renegotiation of Area CBAs shall be resolved in accordance with the procedure set forth in Article 9 of this Agreement.

SECTION 2. LABOR DISPUTES DURING AREA CONTRACT NEGOTIATIONS

The Unions agree that there will be no strikes, work stoppages, sympathy actions, picketing, slowdowns or other disruptive activity or other violations of Article 7 affecting the Program Work by any Local Union involved in the renegotiation of Area Local CBAs nor shall there be any lock-out on such Program Work affecting a Local Union during the course of such renegotiations.

ARTICLE 20 - WORKERS' COMPENSATION ADR

SECTION 1.

A. An Alternative Dispute Resolution ("ADR") program may be instituted by a Contractor and participation in such an ADR program will be optional by trade.

B. The BCTC acknowledges that there may be some instances where an Agency seeks to institute an ADR program for disputes regarding Workers' Compensation claims for work performed under certain Contracts performed under this Agreement. Where an Agency seeks to utilize an ADR program for a project it shall notify the BCTC and the BCTC and the City shall enter into negotiations over the terms and conditions of such ADR program. No such program shall be instituted without the full and complete agreement of the BCTC, and the City, including the applicable Agency. If an ADR program is agreed to by the BCTC and the City, including the applicable Agency, for a project performed under this Agreement, all Contractors shall require their employees to participate.

ARTICLE 21 - HELMETS TO HARDHATS

SECTION 1.

The Contractors and the Unions recognize a desire to facilitate the entry into the building and construction trades of veterans who are interested in careers in the building and construction industry. The Contractors and Unions agree to utilize the services of the New York City Helmets

to Hardhats Program ("H2H") to serve as a resource for preliminary orientation, assessment of construction aptitude, referral to apprenticeship programs or hiring halls, counseling and mentoring, support network, employment opportunities and other needs as identified by the parties.

SECTION 2.

The Unions and Contractors agree to coordinate with H2H to create and maintain an integrated database of veterans interested in working on this project and of apprenticeship and employment opportunities for this project. To the extent permitted by law, the Unions will give credit to such veterans for bona fide, provable past experience.

[THIS SPACE INTENTIONALLY LEFT BLANK]

IN WITNESS WHEREOF the parties have caused this Agreement to be executed and effective as of the ___ day of_____, _____.

FOR BUILDING AND CONSTRUCTION TRADES COUNCIL
OF GREATER NEW YORK AND VICINITY

BY: _____
Gary LaBarbera
President

FOR NEW YORK CITY

BY: _____
First Deputy Mayor
Randy Mastro

APPROVED AS TO FORM:

KF

_____
ACTING CORPORATION
COUNSEL NEW YORK CITY

Date: 11/5/2025

LIST OF SIGNATORY UNIONS
International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers, AFL-CIO, Local Lodge No.5
Bricklayers and Allied Craftworkers, Local Union No. 1
Building Concrete & Excavating Laborers, Local Union No. 731
N.Y.C. and Vicinity District Council of Carpenters
Cement Masons, Local Union No. 780
Concrete Workers District Council No. 16
Asbestos, Lead & Hazardous Waste, Laborers Local Union No. 78
Construction & General Building Laborers Local Union No. 79
Derrickmen and Riggers Local Union No. 197
International Brotherhood of Electrical Workers, Local Union No. 3
International Union of Elevator Constructors, Local Union No. 1
Heat & Frost Insulators & Allied Workers, Local Union No. 12
Heat & Frost Insulators & Allied Workers, Local Union No. 12A
Pavers & Road Builders, Laborers Local Union No. 1010
New York State Iron Workers District Council
Structural Iron Workers, Local Union No. 40
Structural Iron Workers, Local Union No. 361
Mason Tenders District Council
Metallic Lathers & Reinforcing Ironworkers, Local No. 46
Ornamental Iron Workers, Local Union No. 580
Glaziers No. 1087, District Council 9
Painters, District Council No. 9
Metal Polishers, Local Union No. 8A-28A; District Council No. 9
Drywall Tapers Local Union No 1974, District Council 9
Bridge & Structural Steel Painters, Local Union No. 806, District Council 9
Operative Plasterers Local Union No. 262
UA Plumbers Local Union No. 1
Private Sanitation, Teamsters Local Union No. 813
Roofers & Waterproofers, Local Union No. 8
Sheet Metal Workers, Local Union No. 28
Sheet Metal Workers, Local Union No. 137
UA Steamfitters, Local Union No. 638
Teamsters, Local Union No. 282
Tile, Marble & Terrazzo, B.A.C. Local Union No. 7

SCHEDULE "A" - CBAS

Union	Current Agreement w/
Architectural and Ornamental Iron Workers Local Union 580, AFL-CIO	Allied Building Metal Industries, Inc.
Building, Concrete, Excavating & Common Laborers Local 731	Independent
Building, Concrete, Excavating & Common Laborers Local 731	Members of the General Contractors Association of New York, Inc.
Bricklayers Local 1 of the International Union of Bricklayers and Allied Craftworkers	Independent
District Council No. 9, I.U.P.A.T Glaziers Local 1087	Window and Plate Glass Dealers Association
Drywall Tapers and Painters Local 1974, affiliated with International Union of Painters & Allied Trades and Drywall Taping Contractor's Association & Association of Wall-Ceiling & Carpentry Industries NY, Inc.	Independent
Enterprise Association of Steamfitters and Apprentices Local 638	Mechanical Contractors Association of NY, Inc.
Enterprise Association of Steamfitters and Apprentices Local 638	Independent
Elevator Constructors Local 1 of NY and NJ	ThyssenKrupp Elevator Corporation
Elevator Constructors Local 1 of NY and NJ	Independent
Highway Road and Street Laborers Local Union 1010 of the District Council of Pavers and Road Builders of the Laborers' International Union of North America AFL-CIO	Independent
Highway Road and Street Laborers Local Union 1010 of the District Council of Pavers and Road Builders of the Laborers' International Union of North America AFL-CIO	Member of the General Contractors Association of New York, Inc.
International Association of Heat and Frost Insulators and Allied Workers Local No. 12 of New York City	Independent

International Association of Heat and Frost Insulators and Allied Workers Local No. 12 of New York City	The Insulation Contractors Association of New York City, Inc.
International Association of Heat and Frost Insulators and Allied Workers Local No. 12A of New York City	Independent
International Association of Heat and Frost Insulators and Allied Workers Local No. 12A of New York City	Environmental Contractors Association, Inc.
International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers, AFL-CIO, Local Lodge No. 5	Boilermakers Association of Greater New York
Local Union No. 3 International Brotherhood of Electrical Workers, AFL-CIO	New York Electrical Contractors Association
International Brotherhood of Teamsters, Local 282, High Rise Contract	Building Contractors Association & Independents
International Brotherhood of Teamsters, Local 282, High Rise Contract	General Contractors Association
Local 46 Metallic Lathers Union and Reinforcing Iron Workers of NY and Vicinity of the International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers	General Contractors Association
Local 46 Metallic Lathers Union and Reinforcing Iron Workers of NY and Vicinity of the International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers	Independent
Local 8 Roofers, Waterproofers & Allied Workers	Roofing and Waterproofing Contractors Association of New York and Vicinity
Local Union 1 of the United Association of Journeymen and Apprentices of the Pipe Fitting Industry of the United States and Canada	Association of Contracting Plumbers of the City of New York
Local Union 1 of the United Association of Journeymen and Apprentices of the Pipe Fitting Industry of the United States and Canada	Independent
Local Union Number 40 & 361 of Bridge, Structural Ornamental and Reinforcing Iron Workers AFL-CIO	Independent

Mason Tenders DC & Laborers' International Union – Local 78 & 79	Building Contractors Association
Mason Tenders DC & Laborers' International Union – Local 78 & 79	Interior Demolition Contractors Association
Mason Tenders DC & Laborers' International Union – Local 78 & 79	Independent
Mason Tenders DC & Laborers' International Union – Local 78 & 79	NYCDCA
Mason Tenders DC & Laborers' International Union – Local 78 & 79	Environmental Contractors Association
Mason Tenders DC & Laborers' International Union – Local 78 & 79	ABMC
Operative Plasterers' and Cement Masons' International Association Local No. 262	Independent
Painters and Allied Trades AFL-CIO, District Council No. 9 (Painting and Protective Coatings CBA)	Independent
Painters and Allied Trades AFL-CIO, District Council No. 9 (Painting and Protective Coatings CBA)	The Association of Master Painters & Decorators of NY, Inc. and The Association of Wall, Ceiling & Carpentry Industries of NY, Inc. and The Window and Plate Glass Dealers Association
Sheet Metal Workers' International Association, Local 28	Sheet Metal & Air Conditioning Contractors Association of New York City, Inc.
Sheet Metal Workers' International Association, Local 137	The Greater New York Sign Association
Structural Steel and Bridge Painters Local 806, DC 9 International Union of Painters and Allied Trades, AFL-CIO	New York Structural Steel Painting Contractors Association
Teamsters Local 813	Independent
Teamsters Local 813	IESI NY Corporation
The Cement Masons' Union, Local 780	Cement League
The District Council of Cement and Concrete Workers (comprised of Local 6A; Local 18A and Local 20)	Cement League

The District Council of Cement and Concrete Workers (comprised of Local 6A; Local 18A and Local 20)	Independent
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Heavy Carpenters	GCA
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Dockbuilders Local No. 1556	Concrete Contractors of NY
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Dockbuilders Local 1556	Independent
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Millwright Local 740	Independent
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Timbermen Local 1556	Independent
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Timbermen Local 1556	GCA
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Heavy Carpenters	Independent
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Carpenters	Manufacturing Woodworkers Association of Greater New York Incorporated
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America	The Hoisting Trade Association of New York, Inc.
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America	The Test Boring Association
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America	Building Contractors Association

The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America	The Association of Wall-Ceiling & Carpentry Industries of New York, Incorporated
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners	The Cement League
The District Council of NYC and Vicinity of the United Brotherhood of Carpenters and Joiners of America	New York City Millwright Association
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners	Greater New York Floor Covering Association
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Carpenters	Association of Architectural Metal & Glass
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Carpenters	Concrete Contractors of NY
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Building Construction Carpenters	Independent
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Local 2287	Independent
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Shop Carpenters	Independent
The Tile Setters and Tile Finishers Union of New York and New Jersey, Local 7 of the International Bricklayers and Allied Craftworkers	The Greater New York and New Jersey Contractors Association
United Derrickmen & Riggers Association, Local 197 of NY, LI, Westchester & Vicinity	Contracting Stonesetters Association Inc.
United Derrickmen & Riggers Association Local 197 of NY, LI, Westchester and Vicinity	Building Stone and Pre-cast Contractors Association

Exhibit A

Project Labor Agreement - Letter of Assent

Dear: _____

The undersigned party confirms that it agrees to be a party to and be bound by the New York Agency, Project Labor Agreement as such Agreement may, from time to time, be amended by the parties or interpreted pursuant to its terms. The terms of the Project Labor Agreement, its Schedules, Addenda and Exhibits are hereby incorporated by reference herein.

The undersigned, as a Contractor or Subcontractor (hereinafter Contractor) on the Project known as the 2025 NYC Agency Citywide Renovation & New Construction PLA and located at _____ (hereinafter PROJECT), for and in consideration of the award to it of a contract to perform work on said PROJECT, and in further consideration of the mutual promises made in the Project Labor Agreement, a copy of which was received and is acknowledged, hereby:

(1) Accepts and agrees to be bound by the terms and conditions of the Agreement, together with any and all schedules; amendments and supplements now existing or which are later made thereto:

(2) Agrees to be bound by the legally established collective bargaining agreements; local trust agreements for employee benefit funds; and trust documents for joint apprentice programs as well as apprentice program rules and procedures but only to the extent of Program Work and as required by the PLA.

(3) Authorizes the parties to such local trust agreements to appoint trustees and successor trustees to administer the trust funds and hereby ratifies and accepts the trustees so appointed as if made by the Contractor but only to the extent of Program Work as required by the PLA.

(4) Certifies that it has no commitments or agreements that would preclude its full and complete compliance with the terms and conditions of said Agreement. The Contractor agrees to employ labor that can work in harmony with all other labor on the Project and shall require labor harmony from every lower tier subcontractor it has engaged or may engage to work on the Project. Labor harmony disputes/issues shall be subject to the Labor Management Committee provisions.

(5) Agrees to secure from any Contractor(s) (as defined in said Agreement) which is or becomes a Subcontractor (of any tier), to it, a duly executed Agreement to be Bound in from identical to this document.

Provide description of the Work, identify craft jurisdiction(s) and all contract numbers below:

Local Union: _____

Description of Work: _____

_____

Contract Number(s): _____

Dated: _____

_____
(Name of Contractor or Subcontractor)

_____
(Name of CM; GC; Contractor or Higher Level Subcontractor)

_____
(Authorized Officer & Title)

_____
(Address)

_____
(Signature)

_____
(Phone) (Fax)

Contractor's State License #_____

Sworn to before me this
____ day of _____,

_____
Notary Public

Exhibit B

NEW YORK CITY BUILDING AND CONSTRUCTION TRADES COUNCIL STANDARDS OF EXCELLENCE

The purpose of this Standard of Excellence is to reinforce the pride of every construction worker and the commitment to be the most skilled, most productive and safest workforce available to construction employers and users in the City of New York. It is the commitment of every affiliated local union to use our training and skills to produce the highest quality work and to exercise safe and productive work practices.

The rank and file members represented by the affiliated local unions acknowledge and adopt the following standards:

- ***Provide a full day's work for a full days pay;***
- ***Safely work towards the timely completion of the job;***
- ***Arrive to work on time and work until the contractual quitting time;***
- ***Adhere to contractual lunch and break times;***
- ***Promote a drug and alcohol free work site;***
- ***Work in accordance with all applicable safety rules and procedures;***
- ***Allow union representatives to handle job site disputes and grievances without resort to slowdowns, or unlawful job disruptions;***
- ***Respect management directives that are safe, reasonable and legitimate;***
- ***Respect the rights of co-workers;***
- ***Respect the property rights of the owner, management and contractors.***

The Unions affiliated with the New York City Building and Construction Trades Council will expect the signatory contractors to safely and efficiently manage their jobs and the unions see this as a corresponding obligation of the contractors under this Standard of Excellence. The affiliated unions will expect the following from its signatory contractors:

- ***Management adherence to the collective bargaining agreements;***
- ***Communication and cooperation with the trade foremen and stewards;***
- ***Efficient, safe and sanitary management of the job site;***
- ***Efficient job scheduling to mitigate and minimize unproductive time;***
- ***Efficient and adequate staffing by properly trained employees by trade;***
- ***Efficient delivery schedules and availability of equipment and tools to ensure efficient job progress;***
- ***Ensure proper blueprints, specifications and layout instructions and material are available in a timely manner***
- ***Promote job site dispute resolution and leadership skills to mitigate such disputes;***
- ***Treatment of all employees in a respectful and dignified manner acknowledging their contributions to a successful project.***

The affiliated unions and their signatory contractors shall ensure that both the rank and file members and the management staff shall be properly trained in the obligations undertaken in the Standard of Excellence.

Exhibit "C" – Community Hiring Construction Careers

Non-exhaustive list of ZIP codes where at least 15% of the population lives below the federal poverty threshold (ZIP codes within ~100 mile radius of NYC)

Zip Code	State	County

The Office of Community Hiring and Workforce Development maintains and publishes the list of Economically Disadvantaged Regions in accordance with Section 3502(b) of the New York City Charter. The list of Economically Disadvantaged Regions within a 100-mi. radius of the city, in a format similar to the above, will be provided for each fiscal year.

EXHIBIT "D" – Centrifuge Division of Labor Document

Division of Labor DEP Centrifuge Contract

BLACK= Union Millwright

RED= Centrifuge Technicians

I. Scheduled Preventative Maintenance of The Centrifuge System

1. Preliminary centrifuge monitoring, operation and readings before scheduled PM

i. As part of the centrifuge system evaluation to produce a PM report and while still in operation, take vibration, temperature readings, monitor torque and back-drive conditions prior to shutdown of the centrifuge system. In addition, evaluate the operation and condition of the pneumatic knife gate and cake cross conveyor. Queries are made with plant operations and maintenance staff asking for a history with operation of the system, mechanical, electrical and issues of the centrifuge system in general.

ii. If necessary, based on the results of monitoring differential while process sludge, a pressure test is performed on the Rexroth hydraulic pump and or the Rotodiff hydraulic motor to determine if there are internal mechanical issues that require replacement of said components

2. Remove and prepare rotating assembly for yearly maintenance

i. Shut down centrifuge system and coordinate with the owner for lock out tag out of system

ii. Remove belt guards and frame case top

iii. Remove hoses, drive belts and disconnect RTD wiring associated with the rotating assembly Remove the Rotodiff (hydraulic motor)

iv. Remove the rotating assembly from the base using overhead crane

3. Disassembly/Assembly of the rotating assembly:

i. Remove the liquid headwall

ii. Remove the scroll

iii. Mechanical de-scaling of rotating assembly rotor, headwall and scroll with a needle gun.

iv. Inspect all components. Check critical dimensions with instruments and verify to print key components or components that appear worn and or damaged.

v. Inspect internal bowl strips that run the length of the bowl. Change bushings wear liners & wear shoes. If necessary, remove the bowl strip welds with a grinder and weld new strips. Weld minor repairs on scroll when necessary. If necessary, repair the hard-face protection on the conveyor blades with addition of hard surface. Clean return tubes on the conveyor.

vi. Replace o-rings, seals and scroll bearings. Bearings are installed using factory procedure that specifies heat tolerances for bearing inner race and proper placement of bearing race on fit surfaces.

vii. Prime paint bare steel components

viii. Assemble and check stack-up dimension of scroll bearings
ix. Install scroll into outer bowl assembly using conveyor extractor tool, overhead crane.
x. Check conveyor stack-up dimension
xi. Assemble headwall
xii. Check for scroll clearance by rotating scroll with spline shaft
xiii. Install stellite wear shoes with epoxy adhesive.

4. **Service and repair of centrifuge frame top and bottom**
   i. Scrape process material from frame bottom and top
   ii. Mechanical de-scaling of the inside frame bottom and top using a needle gun
   iii. If required, welding repair panels on the outer and internal portions of the frame top and bottom. Also, replacing baffles with stainless steel baffles; requiring flame burning off old baffles, grinding to fit and welding new baffles
   iv. Checking case bottom threaded holes and repairing with thread inserts
   v. Painting case top and bottom: prime and applying two part epoxy paint

5. **Back –Drive and Main Bearing Lubrication System Maintenance**
   i. Drain back-drive oil and bearing lubrication oil reservoirs
   ii. Scrape clean reservoirs internally
   iii. When required, replace heat exchangers, dials, solenoids or fittings
   iv. Replace filters
   v. When required, replace hoses
   vi. Replenish reservoirs with new oil

6. **Service main drive and back-drive motors**
   a) Remove covers and clean cooling fan
   b) Check run-out and condition of drive end bearing on the main drive motor. If there is an internal problem with the motor, it is sent to a motor repair center for service.
   c) Grease bearings
   d) Check condition of bearing RTD and replace if necessary

7. **Service the Voith fluid coupling**
   i. Clean fluid coupling exterior surface
   ii. Drain and change the ATF fluid. Inspect condition of the drained fluid for possible internal mechanical issues.
   iii. Remove the fluid coupling with a factory pulling device from the main drive motor shaft.
   iv. Remove the sheave and bearing housing from the fluid coupling.
   v. Remove the old grease from the bearing housing, clean the bearing with rags and solvent.
   vi. Repack the bearing housing with grease
   vii. Install the fluid coupling on the motor shaft
   viii. Replenish fluid to the factory level.
   ix. Verify the Voith BTS proximity sensor gap. Adjust necessary
   x. Verify the milliamp signal at the BTS junction box terminal. Adjust the gap accordingly to bring the milliamp reading to factory specifications. If this adjustment cannot be done to

bring it to factory specification, then the switching element and or the initiator may have to be replaced.

8. After evaluation, and when necessary, rebuild the pneumatic knife gate

i. Assemble custom scaffolding under the centrifuge on the lower level
ii. Disassemble all knife gate components
iii. Replace all components
iv. Test operation of knife gate and adjust if necessary

9. After evaluation, and when necessary, rebuild the cake cross conveyor system

i. Assemble staging and scaffolding
ii. Disassemble all cross conveyor components
iii. Replace all mechanical and electrical components
iv. Check electrical and pneumatic connections
v. Test operation of cross conveyor in manual mode, troubleshoot and adjust if necessary
vi. Verify operation of cross conveyor while the centrifuge produces cake.

10. After evaluation, and when necessary, replace the hydraulic pump and or the Roto-diff hydraulic motor

i. Remove the components: hydraulic pump and or Rotodiff
ii. Install the hydraulic pump: check drive alignment, test units and adjust for mechanical base RPM and squash plate indicator. Verify by monitoring the Viscotherm differential indicator. Also, the RPM can be monitored and checked by verifying the pulse count on the Viscotherm 400 card.
iii. Install the Rotodiff: torque to specification, verify rotation plate position, and use a dial indicator to verify factory specifications for eccentricity. Shim accordingly if needed to adjust the eccentricity to factory specifications.

11. Install rotating assembly on centrifuge frame

i. Wipe down main bearing machined surface with solvent. Use a honing stone to remove high spots on the machines surface.
ii. Prepare the frame machined portion that accepts the pillow blocks; wipe down machined surface with solvent. Use a honing stone to remove high spots on the machines surface.
iii. Rig the rotating assembly for lifting and lowering with slings and a factory spreader lifting device – making sure that the rotating assembly is precisely balanced horizontally. Lower the rotating assembly on the centrifuge frame.
iv. Center the rotating assembly so there is proper clearance for the frame baffles.
v. Perform a preliminary check of the main bearing alignment using double dial indicators, 180 degrees apart. Check for alignment at the 9 & 3 o'clock positions and at the 12 & six o'clock positions. All alignments must be within factory specifications.
vi. Torque the main bearing fasteners to factory specifications using a torque multiplier.
vii. Check the rotating assembly stem run-out for eccentricity using a dial indicator. Note and record the readings.

viii. Install the sheave and gear flange; Heat the components to 275 degrees making sure not to overheat the components. Install fasteners to factory torque specifications.
ix. Install the main drive belts
x. Verify alignment of the motor sheave to rotating sheave alignment. Adjust the motor base as necessary to align the sheaves.
xi. Install the Rotodiff as outlined previously
xii. Grease the internal scroll bearings. Purge the grease until all traces of air bubbles are eliminated.
xiii. Inspect the Rotodiff and belt guards. If cracked, bevel-grind the crack area and weld with a MIG welder. Paint the guards with safety yellow.
xiv. Flush the supply and return lines of the main bearing lubrication system.
xv. Terminate wires for the main bearing RTD
xvi. Run the back-drive on local (manual) to ensure that the hydraulic pump is primed. Prime the pump if necessary.

12. Test the centrifuge system.

In addition to testing the mechanical and electrical components as a centrifuge system, this portion of the scheduled PM work entails monitoring, evaluation, and adjustment of the centrifuge system components which is an Andritz specific, technical process. This process will produce de-watered municipal sludge to exacting specifications in: cake dryness, capture of solids and polymer dose.

i. Remove the electrical and mechanical lock-out tag-outs.
ii. Verify the centrifuge control panel powers up correctly, verify electrical components conditions:
    I. Verify that the PLC processor board does not have a fault condition
    II. Verify that there are LED indications of both the input and out modules of the PLC
    III. Press the "test light" button to acknowledge all indicator lamps work
    IV. Verify that the proportional amplifier card of the Viscotherm controller does not have fault indications
    V. Verify that there is bar, bowl rpm & differential indication of the Viscotherm controller
    VI. Verify that the main bearing temperature and vibration monitor are reading ambient temperature and zero in/sec respectively. If necessary, calibrate the instrument with a 4-20 milliamp signal generator to factory specifications.
    VII. Verify that there are no fault indications present of the PLC *(if so, troubleshoot the cause of the fault – see Service, diagnostic section)*
    VIII. Verify that there are no fault conditions on the main drive monitor screen – Eaton MP-3000. *(if so, troubleshoot the cause of the fault – see Service, diagnostic section).*
iii. Start and test the centrifuge system:
    I. Monitor and verify operation of the main drive bearing lubrication panel:

- Check flow to each bearing, adjust to factory specifications
- Purge air from the system by switching filters
- Check pressure of the oil flow to verify that it is within factory specification

II. Monitor and verify operation of the back-drive system.
- Verify that the Viscotherm controller displays the minimum differential as adjusted in the hydraulic pump replacement section.
- Check for unusual noises, vibration and leaks.

III. Monitor and verify the time to achieve the full speed of the bowl.
- The time to full speed is determined by the Voith fluid coupling ATF level. If necessary, shut down the centrifuge system and adjust the TF level accordingly to increase or decrease the time to full bowl speed.
- Monitor the main drive motor amperage and bearing temperature.

IV. Monitor the rotating assembly main bearing temperature and centrifuge vibration. Allow the unit to reach full operating temperature and begin vibration readings of the centrifuge frame and rotating assembly. These readings are then taken with flush water and then while sludge is fed into the centrifuge. Readings are taken with factory authorized vibration instruments:
- Observe and record horizontal readings of the frame at the centrifuge frame vibration switch, axially at the main drive bearing pillow block, horizontal and vertical readings of the main bearing pillow block. Panel vibration readings are also recorded.

V. In conjunction with DEP operations, the centrifuge is then fed polymer and sludge to begin dewatering operations of sludge.
- The polymer and sludge pump flows are monitored for proper flow and operation. If a polymer or sludge feed alarm is present during this portion of testing, then the centrifuge system is diagnosed for issues with wiring or component failure. If necessary, and as an aide to troubleshoot an alarm, the PLC program is monitored using PLC factory application software and a laptop computer plugged into the PLC.
- The Viscotherm controller is then monitored for: bowl speed, bar pressure and differential. Differential monitoring is simultaneously checked with bar pressure to ensure that the back-drive system is working correctly under automatic control. If necessary, there may have to be adjustments made with the: squash plate indicator, base mechanical speed of the hydraulic pump, electronic base speed of the analog 500 card, boost pressure and base speed. While the Viscotherm controller is in auto control, the 600 card is the adjusted for ramp up speed and base differential.
- The bar pressure/torque on automatic control is then adjusted to produce the driest cake possible while using the lowest amount of polymer and still have acceptable solids in the effluent stream. In

addition to this, adjustments in sludge flow and or polymer flow may have to be adjusted to achieve the desired product cake dryness and or effluent capture of solids.

iv. The centrifuge is released to DEP operations for operation. The scheduled preventative maintenance is completed with a full report and recorded readings. This is followed by completion of the DEP issued work orders entailing recorded work hours and an itemized list of parts installed.

II. Service and repair of the centrifuge system: Mechanical and Electrical

Mechanical repair and or corrective action of the centrifuge system: including the centrifuge rotating assembly, centrifuge frame and cover, back-drive system, lube oil panel system, Voith fluid coupling, pneumatic knife gate and cross conveyor

I. Diagnose, inspect, repair or replace defective mechanical components of the centrifuge system or component systems

II. Perform a visual inspection of the failed or failing component while in operation or if necessary, remove and inspect. If necessary, refer to a factory print to verify that critical dimensions are within tolerance. Replace or repair the component as necessary.

III. If applicable, repair the component or part that may include weld repairs but limited to machining. If machining is necessary, the component would have to be sent to our service center for machining.

Electrical repair of the centrifuge system: including centrifuge system control panel components, motor starter panel components, back-drive system electrical components, lube oil panel system electrical components, Voith BTS circuit, pneumatic knife gate electrical components and cross conveyor electrical components.

I. Monitor, diagnose, troubleshoot electrical and software issues of the centrifuge system using electrical prints. Replace components as required to repair the electrical issue. When required, make adjustments and or calibrate sub components as specified by individual manufacturers; e.g. Viscotherm 500, 600 cards. Red Lion frequency converters, Newport Digital Displays, Voith BTS circuit, etc.

- When required, monitor the PLC program while the centrifuge system is in operation to determine, on a program level, if there is a problem with field devices or the program itself. There are two PLC systems currently in use at NYC DEP centrifuge system installation: Siemens TI Soft Rockwell Automation RS Logix 5000. This requires the licensed program, the application software, a laptop

computer; factory wired serial port connectors and a computer port adapter. Competent knowledge of the PLC application software and basic programming knowledge is necessary for this portion of the electrical diagnostics. In addition and when necessary, downloading of the program software may be necessary if the loaded program was deleted.

III. Evaluation, diagnostics and remedy of process performance as it relates to the centrifuge system

1. Evaluation to determine if the centrifuge system or sludge process conditions will need changes to produce require cake dryness and or solids capture in the effluent stream. In some instances, diagnose total upset in dewatering.

i. Query DEP operations to determine if there is an upset in process condition: e.g. polymer solution makeup, stratification of sludge holding tanks that would allow supernatant to be fed into the centrifuge (low feed solids), etc.

ii. If process conditions are within normal plant parameters, determine if the centrifuge system has to be diagnosed:

   I. Monitor the Viscotherm controller to evaluate minimum differential and regulation of the back-drive.
      - Determine if there is a mechanical or electrical issue with the regulation of the back-drive while under automatic control
      - If electrical, determine if the problem is with the proportional amplifier or with the automatic card, 600.
      - Verify proper adjustment of the squash plate indicator and mechanical base differential of the hydraulic pump.

   II. If a mechanical issue is suspected with regulation of the back-drive, perform a factory pressure test of the hydraulic pump and or Rotodiff. Replace component/s if necessary

iii. Determine if there is a regulation issue with sludge feed and or polymer feed.

   I. Adjust the Siemens PID process controller for sludge feed and or polymer feed. If necessary, replace the controller

iv. Monitor process conditions after adjustments and or replacement of components to determine if cake dryness and or effluent solids capture are acceptable.

Rig rotating assembly onto flatbed truck from centrifuge room floor.
Rig rotating assembly off of flatbed truck onto centrifuge room floor.

SCHEDULE "B" - DRUG AND ALCOHOL POLICY

PREAMBLE

WHEREAS, [CONSTRUCTION MANAGER] ("Construction Manager"), for the construction project located at [PROJECT ADDRESS] ("Project") desires to provide for a safe, drug and alcohol-free work site for the Project;

WHEREAS, the parties have entered into a separate Project Labor Agreement for the Project and have agreed to negotiate in good faith a Project Drug & Alcohol Testing Policy;

WHEREAS, this Testing Policy is collectively negotiated between the Construction Manager and the New York City Building and Construction Trades Council ("Council") (the Construction Manager and BCTC are collectively referred to hereafter as the "Parties");

WHEREAS, the Parties each currently have respective drug and alcohol policies, including the Projects' Zero-Tolerance policy;

WHEREAS, the Parties desire to maximize project safety conditions for the Project personnel and public, as well as deter violations of the Parties' respective drug and alcohol policies;

NOW, THEREFORE, the Parties agree to this Policy as of the date hereof,

ARTICLE 1 - PARTIES

This Drug & Alcohol Testing Policy ("Policy") is hereby established by the Construction Manager and the Council, on behalf of itself and its affiliated local union members, and the signatory local unions on behalf of themselves and their members.

ARTICLE 2-GENERAL CONDITIONS

SECTION 2.1 - SUMMARY

In order to reinforce the Parties' respective drug and alcohol policies, including the Projects' zero tolerance policy regarding the prohibition of the use of drugs and alcohol, and to deter Project personnel from violating those policies, the Parties agree that all Project Personnel (defined later) will be required to submit to drug and/or alcohol testing randomly, post-accident, and for reasonable suspicion provided such testing is in accordance with applicable state and/or federal law, including the limitations in NYS Labor Law 201-d applicable to the lawful use of marijuana.

Any individual on site that violates this Policy is subject to disciplinary action, including, without limitation, loss of site access privileges.

SECTION 2.2 - REVOCATION OF PROJECT ACCESS PRIVILEGES

Any one of the following occurrences will result in the immediate revocation of a Project Personnel's project access privileges:

1. An individual is found selling or using drugs or alcohol, or otherwise is under the influence of drugs or alcohol, subject to the other terms of this Policy, on a Project Site;
2. An individual has been convicted under any criminal drug or alcohol statute for a violation occurring in the workplace within the past two years;
3. An individual who refuses to abide by the Projects' drug and alcohol policy, or refuses to submit to a test in accordance with this Policy;
4. An individual who switches, adulterates, or in any way tampers with a specimen required to be submitted in accordance with this Policy.

SECTION 2.3 - DEFINITIONS

Confirmed Positive Test: The presence of drugs, drug metabolites, or alcohol in a person's body that equals or exceeds the established cut off levels as defined in Exhibit 1. For drugs, the sample will have undergone Laboratory screening and confirmation testing and must have been verified as positive by a Medical Review Officer. A positive test result for alcohol obtained through Evidential Breath Testing is considered a Confirmed Positive Test.

Employee Assistance Program (EAP): An EAP is generally considered a workplace-based, confidential program designed to help employees deal effectively with a variety of personal problems, and, of relevance to this policy, substance abuse problems. The EAP promotes assessments and short-term counseling. An EAP shall also include any similar education or rehabilitation program provided by the Councilor its respective members. The Project Personnel that are required to participate in the EAP shall be responsible for the cost of their consultation with an EAP and/or participation in any education or rehabilitation program.

Evidential Breath Testing Device (EBT): A device that is used to measure alcohol in the breath and which meets National Highway Traffic Safety Administration's specifications for precision and accuracy.

Laboratory: A laboratory that is SAMHSA (Substance Abuse and Mental Health Services Administration) certified for the testing of drugs.

Medical Review Officer (MRO): A licensed physician responsible for receiving laboratory results generated by an employer's drug testing plan who has knowledge of substance abuse disorders and medical training to interpret and evaluate a donor's confirmed positive test result together with his/her medical history and all other relevant information.

Previous Worker: All individuals whose employment relationship with the contractor, company or organization no longer exists.

Project Site: The construction area for respective Project.

Reasonable Suspicion: When a qualified trade contractor, the Developer or Construction Manager as set forth in Section 3.7, reasonably believes that an individual has violated this Policy. Reasonable suspicion is based upon (1) specific, current, behavioral or performance indicators, (2) the possible manufacture, distribution, consumption or possession of unauthorized drugs, drug paraphernalia, or alcohol, or (3) documented investigation by an agency retained by, or otherwise independent from, the Developer or Construction

Manager.

SECTION 2.4 - INCLUDED SUBJECTS

This Policy shall cover all employees of the Owner, Construction Manager and Project trade contractors, their subcontractors and any other of their respective personnel at any level that are performing any activity at a Project Site, inclusive of managers, superintendents and supervisors, except as specifically excluded by Section 2.5 of this Policy (collectively and singularly, "Project Personnel").

SECTION 2.5 - EXCLUDED SUBJECTS

The following persons are not subject to the provisions of this Policy:

A. Employees and entities engaged in off-site manufacture, modifications, repair, maintenance, assembly, painting, handling or fabrication of components, materials, equipment or machinery;

B. Vendors and employees of vendors engaged on a Project Site in equipment testing, inspection, training, warranty work, or engaged in corrections of defective or nonconforming work, unless such employees are expressly included in the bargaining unit of a local signatory to this Agreement;

C. Employees engaged in ancillary work on a Project which is performed by third parties, such as electric utilities, gas utilities, telephone companies, and railroads, or any other work not constituting Project work;

D. Employees of any governmental authority (state, local or otherwise);

E. Employees and contractors engaged in work on the Project Site as part of due diligence or monitoring, which work is ancillary to Project work; and

F. Emergency responders.

SECTION 2.6 - PRESCRIPTION AND NON-PRESCRIPTION DRUGS

The use of prescription drugs not prescribed directly to Project Personnel is prohibited, including the use of drugs prescribed to a spouse or domestic partner. The use of non-prescription drugs that are sold outside the United States and that contain substances that are illegal or require a prescription in the United States are prohibited, unless prescribed by a licensed physician.

SECTION 2.7 - SEARCHES

In order for the Construction Manager to ensure the safety of Project Personnel and for the Construction Manager to protect its assets, the Construction Manager shall have the right upon good cause (such as reasonable suspicion of a violation of this Policy) to conduct reasonable searches for alcohol, drugs and related paraphernalia anywhere within the boundaries of a Project Site. A search may include any assets owned or leased by any Project Personnel that is on a Project Site, including without limitation, vehicles, lockers, gang boxes, desks and personal property brought onto a Project Site, but excluding personal body searches or physical contact with employees.

ARTICLE 3 - DRUG & ALCOHOL TESTING

SECTION 3.1 - COLLECTION PROCESS

As of the execution date of this PLA, Project Personnel may be required to submit urine samples ("Preliminary Drug Screening") for the purpose of detecting the presence of drugs as part of the random, post-accident or reasonable suspicion testing, in accordance with chain of custody protocols as established by Substance Abuse and Mental Health Services Administration (SAMHSA), utilizing an instant result test cup for Preliminary Drug Screenings, such testing is to be performed on-site by an independent service provider. The results from the instant result test cup will be considered preliminary. The sample will be sent to a SAMHSA certified testing laboratory for confirmation.

As of the date hereof, all Project Personnel will be required to submit to an Evidential Breath Test (EBT) for the purpose of detecting the presence of alcohol when submitting to random, post-accident or reasonable suspicion testing. Alcohol testing will not be conducted for pre-access testing.

SECTION 3.2 - NEGATIVE PRELIMINARY DRUG SCREENING

Project Personnel with a negative Preliminary Drug Screening will be considered conditionally accepted for Project site access, pending confirming laboratory results. Site access privileges will be revoked if the subsequent laboratory results determine that the sample has tested positive for drugs or that the sample has been adulterated.

SECTION 3.3 POSITIVE PRELIMINARY DRUG SCREENING

If the Preliminary Drug Screening indicates a positive result, the individual will not be allowed access to the Project Site. The sample will be sent to the certified laboratory for analysis and, if applicable, reviewed by the Medical Review Officer (MRO). If the laboratory confirmation results are also positive, the individual will be considered in violation of this Policy and their site access will be revoked for at least 30 days. If the laboratory confirmation results are negative, the Project Personnel's site access will not be revoked.

SECTION 3.4 CONFIRMED POSITIVE TEST RESULTS

A. POSITIVE DRUG TEST

A drug test is considered positive if the test results exceed the limits shown in Exhibit 1, which is attached hereto and incorporated herein by reference. The test will be confirmed through a second analysis process and reviewed by an MRO before results are reported. Project Personnel with confirmed positive drug test results will have their site access revoked. In case of a "false positive" result, any such Personnel shall be entitled to the reimbursement of any wages lost during the suspension caused by any such false positive result.

B. POSITIVE EBT

An EBT is considered positive if the test results exceed .04 BrAC, or as otherwise set forth in Exhibit 1. Project Personnel with a positive alcohol test result will be subject to the remedies set forth in Exhibit 1.

C. REINSTATEMENT OF SITE ACCESS PRIVILEGES

(a) Subject to section 3.4(C)(a) immediately below, if the site access of a Project Personnel has been revoked pursuant to this Policy, then any such person may request that their site

access be reinstated after 30 days, provided that all of the following conditions are met to the reasonable satisfaction of the Construction Manager. :

1. The individual has provided proof of wellness from an accredited rehabilitation facility or has provided proof that treatment isn't needed as attested to by a licensed health care provider specializing in the diagnosis and treatment of alcohol and drug abuse.
2. A current drug and alcohol test is obtained within three (3) days of the request for re-access to the site and proof of a negative test result has been received; and
3. The individual agrees to submit to multiple testing for two (2) full years from the date of gaining re-access to the project, the scheduling of which will be determined at the sole discretion of the Construction Manager. If all of these conditions have been met, the Construction Manager agrees that it will not unreasonably withhold their consent to any such request.

(b) Unlawful possession, concealment, use, purchase, sale, manufacture, dispensation or distribution of illegal drugs or un-prescribed controlled substances on the Project site will subject the Project Personnel Employee to immediate removal from the Project site and shall bar such Project Personnel Employee from returning for a minimum of three (3) months, which return shall, in any event, be subject to the reasonable approval by Construction Manager.

(c) All of the Parties agree that any such Project Personnel will only be entitled to any such reinstatement of site access privileges one time and that any subsequent violation of this Policy will result in the permanent termination of access to the Project Site.

SECTION 3.5 - RANDOM TESTING

A third-party provider designated by the Construction Manager will randomly select by an objective criteria a testing pool for random drug and/or alcohol testing from all Project Personnel with site access cards. Any individual selected for a random drug and/or alcohol test will be required to submit to an Evidential Breath Test (EBT) and/or drug test. Individuals may be tested more than once during any given time period. The Parties acknowledge and agree that an EBT may be required without a drug test and that a drug test may be required without an EBT, as solely determined by the Construction Manager.

If an individual is unable to attend the first scheduled random drug test as a result of being involved in a work-related task, such drug test will be rescheduled and will be completed at or before the conclusion of such employee's then current work shift. If the second drug test is missed for any reason, the incident will be reviewed by the Construction Manager, who shall have the right to terminate the site access privileges of any such Project Personnel until such time as that Project Personnel has complied with this Policy. If the individual refuses to take the test, their access privileges will be immediately terminated for cause.

SECTION 3.6 - POST ACCIDENT TESTING

After each work-related incident or injury requiring the services of a licensed health care provider, all Project Personnel involved with the incident will be required to submit to a drug and/or alcohol test immediately following the incident. In instances where emergency care is necessary, the drug and/or alcohol test shall be obtained by the care facility, if

possible, within 24 hours after treatment is rendered. If more than 48 hours have passed before an injury is reported and treated by a licensed health care provider, an alcohol test will not be required.

In addition, any Project Personnel involved in a non-injury related incident at a Project Site with damages at or in excess of $200 will be required to submit to a drug and/or alcohol test unless:

A. It is determined, after conducting an investigation and interviewing all employees involved and any witnesses, that the employee's performance can be completely discounted as a contributing factor to the incident; or
B. It is determined, after conducting an incident investigation and interviewing all employees and any witnesses that the incident was caused by inadequate equipment or system design, and/or premature failure of equipment or system components.

SECTION 3.7 - REASONABLE SUSPICION TESTING

All Project Personnel will be required to submit to a drug and/or alcohol test when there is reasonable suspicion the individual has violated this policy.

Reasonable suspicion includes, without limitation, the following:

A. Violent or irrational behavior;
B. Emotional or physical unsteadiness;
C. Sensory or motor-skill malfunctions;
D. Slurred speech;
E. The odor of alcohol or drugs on clothing or breath in conjunction with other indicators;
F. Possession of alcohol, unauthorized drugs or drug paraphernalia; or
G. Documented evidence of an independent investigation regarding Project Personnel's consumption of what is reasonably believed to be an alcoholic beverage or drugs in violation of the Project's policies and/or this Policy.

Reasonable suspicion testing may only be ordered by supervisory personnel that: (a) have been trained to recognize the above referenced factors; or (b) have received credible documentary evidence from an independent investigator that a Project Personnel has violated a drug and/or alcohol policy. It is agreed that any certified training program shall satisfy the training requirement.

SECTION 3.8 - PRIVACY CONSIDERATIONS

The Parties agree to use reasonable efforts to conduct any testing pursuant to this Policy in accordance with the privacy concerns of Project Personnel. To address these concerns, the Parties agree that:

1. The testing station(s) shall be screened off, or otherwise closed off from public view.
2. All documents and information regarding the testing, including test results, shall be maintained by the respective custodian(s) of record in accordance with

their respective privacy policies, which any Project Personnel shall be entitled to review upon timely request.

3. The Parties agree to make a good faith effort to resolve any other privacy concern of Project Personnel regarding this Policy, provided that any such concerns do not interfere with the purpose of this Policy.

ARTICLE 4 – GRIEVANCE

SECTION 4.1 - REPRESENTED WORKERS

Nothing in this Policy shall restrict a member of a signatory local union from filing a grievance in accordance with the member's collective bargaining agreement or a Project Labor Agreement, provided that the grievance shall be limited to whether the removal of a member for violation of this Policy was conducted in compliance with the terms and conditions set forth herein.

SECTION 4.2 - HOLD HARMLESS

The Construction Manager agrees to hold harmless and indemnify the Union/Council and its representatives from any liability that may be incurred as a result of the Company's Drug and Alcohol Policy to the extent caused by the negligence or intentional misconduct of the Construction Manager.

IN WITNESS WHEREOF the parties have agreed to this Policy as of _____, 20___.

FOR [CONSTRUCTION MANAGER]

By: _____

Name: [INSERT NAME]_____

Title: [INSERT TITLE]_____

FOR GREATER NEW YORK CITY BUILDING TRADES COUNCIL

By: _____

Name: Gary LaBarbera _____

Title: President

EXHIBIT 1

CLASS OF DRUGS TESTED AND THEIR RESPECTIVE CUT-OFF LIMITS

The cut-off limits established are those recommended by the U.S. Department of Health and Human Services in their mandatory Guidelines for Federal Workplace Drug Testing Programs.

Drug Class	Screening Cut-Off Limit (ng/ml)	Confirmation Cut-off Limit (ng/ml)
Amphetamines	1000	500
Benzoylecgonine (Cocaine Metabolite)	300	150
Cannabinoids (THC)	50	15
*Opiates	2000	10
Phencyclidine (PCP)	25	25

Confirmation screening is done by means of GC/MS analysis.

*The GC/MS confirmation for opiates will be for both codeine and morphine separately. If morphine is equal to or greater than 2,000ng/ml then the GC/MS confirmation analysis for 6- acetylmorphine (6-MAM) is at a cut-off level of 10ng/ml.

Alcohol Screening

All Project Personnel will be required to submit to an EBT under the random, post-accident, and reasonable suspicion test arenas, for the purpose of detecting presence of alcohol. If this test supports a positive result for presence of alcohol, the Project Personnel will be considered in violation of this Policy.

If the results of the EBT are:

1. Above 0.001 BrAC, but at or below 0.020 BrAC, a second test will be conducted within approximately 15 minutes.
    - If the second BrAC test is less than the first BrAC, the results will be deemed negative and the Project Personnel may return to work, if there are no other outstanding issues.
- If the second BrAC is increasing, but below 0.04 BrAC, the results will be deemed negative, but the Project Personnel will be sent home for the day and the Construction Manager shall be notified. If a Project Personnel is sent home two times within a six-month period pursuant to this Section I, then any such Project Personnel shall be deemed to have tested positive and will be subject to the applicable remedies set forth in Section 2 below.

2. Above 0.02 BrAC, but below 0.06 BrAC, a second test will be conducted after approximately 15 minutes.

- Notwithstanding anything set forth above to the contrary, a Project Personnel may elect to voluntarily go home for the day instead of taking a second test and the results will be deemed negative, provided that any such Project Personnel may not voluntarily go home more than once within a twelve month period.
- If the second BrAC test is at or below 0.02 BrAC, the results will be deemed negative and the Project Personnel may return to work if there are no other outstanding issues.
- If the second BrAC test is above 0.020, but below 0.06, the results will be deemed positive, the Project Personnel will be sent home for the day and their site access will be revoked for at least five [5] calendar days and until such time as the Project Personnel has been evaluated by an EAP professional skilled in substance abuse and confirmed fit for duty.
- Any Project Personnel who is deemed positive two times within two years pursuant to this Section 2 will have their site access privileges terminated and will be entitled to the limited relief set forth in Section 3 .4(c) of the Policy.

3. At or above .06 BrAC, the Project Personnel will have their site access privileges terminated, after which they will be entitled to the limited relief set forth in Section 3.4(C) of the Policy.

SECTION 01 11 00 – SUMMARY OF WORK
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section provides a summary of Work for Contract CSO FC-DF-Construction of Disinfection Facilities.

B. Section Includes:

1. Location and Description of Work
2. Work Included in the Contract
3. Related Construction Contracts
4. Inspection before Bidding
5. Site Characterization Reports and Information
6. Hazardous Soils Investigation
7. Datum Plane

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. All Contract Documents, including all other specifications sections in the Contract, will apply to this Section.

1.04 REFERENCES

A. Abbreviations / Acronyms:

1. CSO – Combined Sewer Overflow
2. DEP – Department of Environmental Protection
3. DPR – Department of Parks and Recreation
4. DC-5 – Diversion/Bulkhead Chamber No. 5
5. FB CSO – Flushing Bay CSO Retention Facility
6. NYC – New York City
7. TI-010 – Tallman Island Outfall No. 10
8. TI-010C – TI-010 Chlorination Facility (at existing FB CSO)
9. TI-010D – TI-010 Dechlorination Facility
10. TI-011 – Tallman Island Outfall No. 11/ TI-011 Disinfection Facility
11. TI-R09 – Tallman Island Regulator No. 9

1.05 DESCRIPTION

A. Location of Work

1. Work is to be performed under this Contract at the following Site(s):

a. Site #1: FB CSO at 131-50 Fowler Avenue, Flushing, NY and adjacent maintenance yard of the NYC DPR Al Oerter Recreation Facility (at 131-40 Fowler Avenue).

1) Site Boundaries: The site is bounded to the north by Fowler Avenue, to the east by College Point Boulevard, to the west by the NYC DPR Al Oerter Recreation Facility (at 131-40 Fowler Avenue), and to the south by Flushing Meadows Corona Park (DPR property).

2) Work Access to the Site: Via the DEP access driveway from College Point Boulevard, just south of the corner of Fowler Avenue, opposite Blossom Avenue.

b. Site #2: TI-010D Dechlorination Facility at 131-35 Avery Avenue, Flushing, NY.

1) Site Boundaries: The site is bounded to the east by Home Depot, USA (at 131-35 Avery Avenue), to the north by the Long Island Railroad (LIRR) tracks, and to the south and west by Flushing Meadows Corona Park (DPR property).

2) Work Access to the Site: Via the driveway and roadcut along East Road within Flushing Meadows Corona Park.

c. Site #3: TI-011 Disinfection Facility at 32-15 College Point Boulevard, Flushing, NY.

1) Site Boundaries: The site is bounded to the north and east by the Whitestone Expressway North service road, to the south by 32nd Avenue, and to the west by College Point Boulevard.

2) Work Access to the Site: Via 32nd Avenue and Whitestone Expressway North Service Road.

d. Site #5: Regulator TI-R09 and streetbed of 32nd Avenue, Flushing, NY.

1) Site Boundaries: Corner of 32nd Avenue and Linden Place, and westward along 32nd Avenue to College Point Boulevard.

2) Work Access to the Site: Via rights-of-way and streets adjacent to 32nd Avenue, College Point Boulevard, and Linden Place.

e. Site #6: Diversion/Bulkhead Chamber No. 5 (DC-5), adjacent to 132-29 Blossom Avenue, Flushing, NY, and Lawrence and Peck Pumping Station (located adjacent to DC-5 at 50-01 College Point Boulevard), rights-of way and streetbed of Blossom Avenue and College Point Boulevard.

1) Site Boundaries: The site is bounded to the west by College Point Boulevard, to the north by NYC DPR property and Avery Avenue, to the east by a private residence, and to the south by Blossom Avenue.

2) Work Access to the Site: Via existing DEP access driveway to Lawrence and Peck Pumping Station on Blossom Avenue and College Point Boulevard.

f. Site #7: TI-010 Outfall Tide Gates, and beneath East Road, Flushing, NY.

1) Site Boundaries: The site is located within Flushing Meadows Corona Park along East Road, adjacent to the NYC DPR Allied Building, within a DPR parking area.

2) Work Access to the Site: Via East Road within Flushing Meadows Corona Park.

B. Work Included in the Contract.

1. Contract Name: CSO FC-DF

2. Work Description: Construction of chlorination and dechlorination facilities, systems, and equipment for the existing CSO outfalls TI-010 and TI-011.

3. TI-010C Chlorination Principal Items of Work:

a. Overall Work Description: Construction of chlorination systems related to the CSO Outfall TI-010, which includes Work at the existing FB CSO and existing DC-5.

b. Civil Work:

1) FB CSO and DPR Maintenance Yard (at the Al Oerter Recreation Facility): Replacement of the sodium hypochlorite fill station and buried sodium hypochlorite fill and containment piping; demolition of the abandoned sodium hydroxide fill station and buried fill and containment piping; replacement of the fill station drainage piping and valve; select replacement and repair of the existing fill station concrete pad; partial replacement of the city water line within the areas of excavation; installation of a new tepid water line to the emergency eyewash shower; construction of new access manholes to below-grade Channels 1 and 2 at the FB CSO storage tanks.

2) DC-5: Construction of sodium hypochlorite carrier and containment piping, manholes, leak detection system, and accessories to the dosing points at DC-5; restoration of disturbed areas.

c. Architectural and Structural Work (FB CSO Only): Cleaning of existing Chemical Area floors and surfaces; construction of a new FRP platform over the existing sodium hypochlorite containment area; construction of new ladders and platforms to provide access to the top of the existing sodium hypochlorite chemical storage tanks; connection of the new access manholes to the existing Channels 1 and 2 at the FB CSO; modifications to existing access stairs and railings into the sodium hypochlorite containment area; construction of new concrete equipment pads; replacement of chemical resistance coating of the sodium hypochlorite

containment area; concrete rehabilitation within the existing FB CSO Facility chemical containment area.

d. Process Mechanical Work:

1) FB CSO: Salvage of the existing sodium hypochlorite pumps; demolition of the existing sodium hypochlorite piping, valves and accessories; select demolition of the existing sodium hydroxide piping, valves, and accessories; modifications to the existing sodium hypochlorite tanks, including the cleaning, construction of new side manway access, replacement of gaskets, replacement of level sight gauges, and installation of new tank liners; replacement of fill, drain, and overflow piping, valves and accessories associated with the sodium hypochlorite tanks; construction of sodium hypochlorite metering pumps and piping, including valves and accessories, to the dosing points within the FB CSO (Channels 1 and 2) and DC-5; construction of chemical diffusers at Channels 1 and 2; construction of sodium hypochlorite transfer pumps, piping, valves, and accessories; replacement and construction of new service water connections to the new facilities; construction of new CSO sample lines and pump with automatic strainers.

2) DC-5: Construction of sodium hypochlorite piping, valves, and accessories; construction of chemical diffusers at Barrels 1, 2, and 3.

e. HVAC Work:

1) FB CSO: Cleaning of the existing ductwork serving the FB CSO Chemical Area.

2) DC-5: Replacement in-kind of the existing exhaust fan and flexible boot connector at DC-5.

f. Plumbing Work (FB CSO Only): Construction of a new hot water heater and valve mixing system to provide tepid water to the emergency eyewash showers. Replacement of and the installation of additional new emergency eyewash showers within the Chemical Storage Area and at the fill station including the provision of tepid water.

g. Fire Protection Work: Not applicable.

h. Electrical Work:

1) FB CSO: Replacement of the existing MCC bucket to provide a circuit breaker for the new chlorination system equipment; Construction of a Distribution Panelboard; construction of variable frequency drives (VFDs), starters,

and local control stations for the sodium hypochlorite metering and transfer pumps; replacement of lighting fixtures within the chemical storage area with LED fixtures; construction of emergency lighting; Provision of new portable generator, docking station and automatic transfer switch; construction of conduit and wire required for power and communications to field instruments and equipment; demolition of existing conduit, wire, junction boxes, and appurtenances as required for installation of new equipment and systems.

2) DC-5: Construction of conduit and wire to new field instruments and equipment; replacement of lighting fixtures with LED fixtures; disconnection and reconnection of power to the exhaust fan.

3) Lawrence and Peck Pumping Station: Construction of a new dead-front enclosure to house the control panel and other related items; construction of conduit and wire and duct bank from instrumentation and control panels, enclosures and transmitters to new field instruments and equipment located within DC-5.

i. Instrumentation and Control Work:

1) FB CSO: Replacement of the sodium hypochlorite chemical fill panel and containment drain valve controls; construction of a PLC-based Main Control Panel and cellular modem; replacement of the sodium hypochlorite storage tank ultrasonic level sensors; replacement of the sodium hypochlorite storage tank overflow flow switches; construction of pressure gauges and pressure switches on the sodium hypochlorite metering and transfer pump piping; construction of flow meters and flow switches on sodium hypochlorite metering pump piping; construction of non-contact flow meters for Channels 1 and 2; construction of pressure transducers for Storage Cells No. 7 and 15; construction of sample pumps, piping and conditioning equipment, automatic strainers, and total chlorine residual (TRC) analyzers for Storage Cells No. 7 and 15.

2) DC-5: Construction of non-contact flow meters for Barrels 1, 2, and 3.

3) Lawrence and Peck Pumping Station: Construction of a PLC-based Control Panel with cellular modem, flow meters and transmitters and intrinsically safe barriers for new field instruments and equipment located within DC-5.

4. TI-010D Dechlorination Principal Items of Work:

   a. Overall Work Description: Construction of dechlorination systems related to TI-010, which includes the construction of the new TI-010 Dechlorination Facility and Work at the existing TI-010 Outfall Tide Gates.

   b. Civil Work:

      1) TI-010D Dechlorination Facility: Clearing and grading; construction of porous concrete paver panels, curbing, driveway aprons and paving; construction of site perimeter fencing and slide gates; Landscaping; construction of the sodium bisulfite chemical fill station and concrete delivery containment area; construction of domestic water service and fire service utility lines; construction of stormwater and sanitary sewer lines; construction of combined sewage (CSO) sampling lines.

      2) TI-010 Outfall Tide Gates: Construction of sodium bisulfite carrier and containment piping, manholes, leak detection system, and accessories to the dosing points at the TI-010 Outfall tide gates; CSO sample piping from TI-010 outfall tide gates back to the TI-010D Dechlorination Facility Restoration of disturbed areas.

   c. Architectural and Structural Work: Construction of the new TI-010D Dechlorination Facility.

   d. Process Mechanical Work:

      1) TI-010D Dechlorination Facility: Construction of sodium bisulfite storage tanks and associated fill, drain, and overflow piping, valves, and accessories; construction of sodium bisulfite metering pumps and piping, including valves and accessories; construction of sodium bisulfite transfer pumps and piping, including valves and accessories; construction of chemical containment area sump pumps including piping, valves, and accessories; construction of service water piping, valves, and accessories; construction of motorized trolley and hoist for equipment removal.

      2) TI-010 Outfall Tide Gates: Construction of sodium bisulfite piping, valves, and accessories; construction of chemical diffusers at Barrels 1, 2, and 3; construction of CSO sample pump in Barrel 3.

   e. HVAC Work (TI-010D Dechlorination Facility only): Construction of separate heating and ventilating systems for the Chemical Room and Electrical Room and Entry Hall, including

supply and exhaust fans, ductless split heat pumps, ductwork and duct heater, gravity ventilators, motorized dampers, controls, and accessories; construction of electric unit heaters.

f. Plumbing Work: Construction of new backflow preventers for the fire service, domestic water service, and service water systems; construction of domestic water piping, valves, hose bibbs, hose reels, service sinks, and accessories; construction of hot water heater and expansion tank; construction of emergency eyewash showers; construction of sanitary and vent piping and accessories.

g. Fire Protection Work: Construction of wet pipe sprinkler system, including fire service piping, valves, sprinklers; and accessories.

h. Electrical Work: Construction of new electrical service; construction of electrical distribution equipment; construction of VFDs, starters, and local control stations; Provision of new portable generator, docking station and automatic transfer switch; construction of LED lighting and emergency lighting fixtures; construction of conduit and wire required for equipment and field instruments.

i. Instrumentation and Control Work:

1) TI-010D Dechlorination Facility: Construction of the sodium bisulfite chemical fill panel; construction of a PLC-based Dechlorination Control Panel and cellular modem; construction of ultrasonic level sensors for the sodium bisulfite storage tanks; construction of flow switches on the sodium bisulfite storage tank overflows; construction of pressure gauges and pressure switches on the sodium bisulfite metering and transfer pump piping; construction of flow meters and flow switches on sodium bisulfite metering pump piping; construction of automatic strainers, sample conditioning equipment and piping, and TRC analyzers.

2) TI-010 Outfall: Construction of sample pumps for the TRC analyzers.

5. TI-011 Disinfection Facility Principal Items of Work:

a. Overall Work Description: Construction of chlorination and dechlorination systems related to existing outfall TI-011, which includes the construction of the new TI-011 Disinfection Facility and Work at the existing CSO Regulator TI-R09 and CSO Outfall TI-011 and connected sewer barrels.

b. Civil Work:

1) TI-011 Disinfection Facility: Clearing and grading; construction of porous concrete panels and paving; construction of site perimeter fencing and slide gates;

Landscaping; construction of the chemical fill stations and concrete delivery containment; construction of domestic water service and fire service utility lines; construction of sanitary sewer lines. Relocation of 128-inch diameter storm sewer on micropiles per Allowance Item described in the Contract.

2) TI-R09: Construction of sodium hypochlorite piping, manholes, leak detection system, and accessories to the dosing points at the TI-R09 Outfall tide gates; restoration of disturbed areas.

3) TI-011 Outfall Sewer: Construction of sodium bisulfite piping, manholes, leak detection system, and accessories to the dosing points at the TI-011 double barrel sewer; restoration of disturbed areas; construction of CSO sample lines from the TI-011 outfall sewer barrels back to the TI-011 Disinfection Facility.

c. Architectural and Structural Work: Construction of the new TI-011 Disinfection Facility

d. Process Mechanical Work:

1) TI-011 Disinfection Facility: Construction of sodium hypochlorite and sodium bisulfite storage tanks and associates fill, drain, and overflow piping, valves, and accessories; construction of sodium hypochlorite and sodium bisulfite metering pumps and piping, including valves and accessories; construction of sodium hypochlorite and sodium bisulfite transfer pumps and piping, including valves and accessories; construction of chemical containment area sump pumps in piping, valves, and accessories; construction of service water piping, valves, and accessories.

2) TI-R09: Construction of sodium hypochlorite piping, valves, and accessories; construction of chemical diffuser at TI-R09.

3) TI-011 Double Barrel Sewer: Construction of sodium bisulfite piping, valves, and accessories; construction of chemical diffusers at Barrels 1 and 2.

e. HVAC Work: Construction of separate heating and ventilating systems for the Chlorination Chemical Room, Dechlorination Chemical Room, and Electrical Room, including supply and exhaust fans, ductwork, gravity ventilators, motorized dampers, controls, and accessories; construction of electric unit heaters.

f. Plumbing Work: Construction of new backflow preventers for the fire service, domestic water service, and service water systems; construction of domestic water piping, valves, hose bibbs, hose reels, service sinks, and accessories; construction of hot water heater and expansion tank; construction of emergency eyewash showers; construction of sanitary and vent piping and accessories.

g. Fire Protection Work: Construction of wet pipe sprinkler system, including fire service piping, valves, sprinklers; and accessories.

h. Electrical Work: Construction of new electrical service; construction of electrical distribution equipment; construction of VFDs, starters, and local control stations; Provision of new portable generator, docking station and automatic transfer switch; construction of lighting and emergency lighting fixtures; construction of conduit and wire required for equipment and field instruments.

i. Instrumentation and Control Work:

1) TI-011 Disinfection Facility: Construction of the chemical fill panels; construction of a PLC-based Main Control Panel and cellular modem; construction of ultrasonic level sensors for the chemical storage tanks; construction of flow switches on the chemical storage tank overflows; construction of pressure gauges and pressure switches on the sodium metering and transfer pump piping; construction of flow meters and flow switches on metering pump piping; construction of automatic strainers, sample conditioning equipment and piping, and TRC analyzers.

2) TI-011 Outfall: Construction of sample pumps for the TRC analyzers.

C. Other Construction Contracts

1. Contracts in Progress or Contracts to be Started:

a. None.

D. Inspection before Bidding

1. Before bidding, the Contractor is advised to visit the Site of the work. The Contractor shall obtain all necessary information of any and all conditions which may affect in any way the performance of their work and their bid prices under their Contracts. All pertinent data and dimensions with regard to existing construction shall be verified by the Contractor.

2. The Contractor may examine the drawings of existing facilities used in preparation of the Contract Drawings which will be available at Department of Environmental Protection, 17th Floor, High Rise, 59-17 Junction Boulevard, Corona, New York 11368-5107. Access to the site for

inspection purposes prior to bidding will only be on the date advertised for the pre-bid tour.

E. Site Characterization Report

1. For the purposes of design, borings have been made, samples taken, and a topographical survey has been made at the proposed Site. The following documents are available for inspection by bidders:

   a. Topographical and Utility Survey prepared by Matrix New World in November 2020 and Muñoz Engineering, P.C. in December 2024.

   b. Hazardous Materials Mitigation Report, Contract CSO-FC-DF-DES, prepared by Bidwell Environmental, LLC dated February 2024.

   c. Soil and Groundwater Sampling Report, Contract CSO-FC-DF-DES, prepared by Bidwell Environmental, LLC, dated June 11, 2025.

   d. Geotechnical Subsurface Investigation Report, prepared by Yu & Associates, PC, dated June 2, 2025.

   e. Combined Sewer Pipe Assessment, prepared by Arcadis of New York, Inc., dated July 2025 – Appendix A, Combined Sewer Assessment Location Maps.

   f. Combined Sewer Pipe Assessment, prepared by Arcadis of New York, Inc., dated July 2025 – Appendix C, Combined Sewer Crossovers.

2. All such material and information relating to boring records and subsurface conditions are expressly excluded from and are not a part of this Contract and are available for information purposes only.

3. Copies of these reports are also available for purchase at the DEP Division of Contract Services.

F. Hazardous Soil Investigation

1. Soil samples have been taken and analyzed for the purpose of identifying contaminated and/or hazardous materials on the site. All results and reports pertaining to the investigation are available for inspection by bidders. Application for inspection of sampling records and related reports should be made to Department of Environmental Protection, 17th Floor, High Rise, 59-17 Junction Boulevard, Corona, New York 11368-5107. All such material and information relating to hazardous and contaminated soil investigation are expressly excluded from and are not a part of this Contract and are available for information purposes only.

G. Sustainability Reports and Applications

1. For the purposes of sustainability certification and design, the following documents are available for inspection by bidders:
    a. Sustainable Material Content Plan, prepared by JK Muir, dated August 2025.
    b. Construction Waste Estimate Report, prepared by JK Muir, dated October 2025.

H. Datum Plane

1. All elevations indicated or specified refer to the site datum plane of North American Vertical Datum of 1988 (NAVD88). References to existing drawings may be shown in Queens Borough Sewer Datum unless otherwise noted

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 APPLICATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 14 00 – WORK RESTRICTIONS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Normal Project Working Hours
2. Work Within New York City Department of Parks and Recreation (DPR) Property
3. Emission Control Technology for Non-Road Vehicles
4. Vehicle Idling Time
5. Compliance with Quality of Life Requirements
6. Bureau of Wastewater Treatment Checklists for Bulk Storage Tanks
7. City Fleet and Truck Safety
8. Environmentally Friendly Oils and Anti-Freeze

B. The following index of this Section is presented for convenience:

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C. The following exhibits, attached after the End of Section designation, are a part of this Section:

1. Exhibit A - Local Law 77: DEP Monthly Reporting Forms
2. Exhibit B - BWT Petroleum Bulk Storage (PBS) Checklist of Requirements for Contractors
3. Exhibit C - BWT Chemical Bulk Storage (CBS) Checklist of Requirements for Contractors

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 51 30 – Temporary Electrical System

1.04 REFERENCES

A. New York City Administrative Code, Section 24-163

B. New York City Executive Order No. 39 of 2024 – Improving City Fleet and Truck Safety

1.05 DESCRIPTION

A. Working Hours

1. "Normal Project Working Hours" for this Contract are between the hours of 7:00 AM through 6:00 PM, Monday through Friday (except for holidays). Work within the Right-Of-Way of College Point Boulevard, 32nd Avenue, Blossom Avenue, and East Road shall be as permitted by "Exhibit A - NYC DOT OCMC Traffic Stipulations" included as an Attachment to Section 01 25 26, Traffic Control and shall be considered Normal Project Working Hours as permitted by NYC DOT OCMC so as to minimize or eliminate disruption of vehicular and pedestrian traffic and disruption to daily business operations of affected neighbors within the vicinity of the right-of-way work that would otherwise result from performing the right-of-way work between the hours of 7:00 AM and 6:00 PM, Monday through Friday. The Contractor shall have the management, labor, equipment and subcontracted capabilities needed to complete the Work within the Period of Performance indicated in the General Conditions – Schedule A, by working only during "Normal Project Working Hours".

2. The Contractor shall abide by all federal, state and local laws, rules and regulations governing or restricting the performance of the Work, both during and outside Normal Project Working Hours.

3. The Contractor is advised that strict adherence to the local noise control code is mandatory, and that the Contractor shall be responsible for assuring that any required variance(s) from restrictions on construction hours are obtained, including permits required by Section 24-221 and Section 24-223(e)(5) of the NYC Administrative Code for Alternative Noise Mitigation Plans (AMNP) .

4. The Work shall be substantially completed (as defined where applicable in Article 14 of the Standard Construction Contract) within the period of performance specified in Schedule "A" of the General Conditions; all in strict accordance with the Contract Documents. The Contractor will make no claim for extra compensation solely because of additional costs to meet the scheduled dates.

5. If the Contractor for any reason fails to adhere to the official project schedule, the Contractor shall promptly adopt such other or additional means and methods of construction sufficient to make up for the time lost and assure completion of the Work in accordance with said schedule. The City may require the Contractor to adopt such corrective measures as the Engineer deems necessary, appropriate and adequate to recover lost time; and may also direct the Contractor to propose corrective measures for consideration (without any obligation by City to adopt the same), at no additional cost to the City.

6. The Contractor is advised that it has the option to work a second shift or additional scheduled overtime, as needed, to complete all intermediate activities, contract milestones and to meet the date of substantial completion of the Work as defined by Article 14 of the Standard Construction Contract and not exceed the period of performance as shown in Schedule A of the General Conditions.

7. The Contractor shall have sufficient forms, shoring and other construction materials; labor; permanent materials; equipment; tools and supervision available to support a second shift and/or scheduled overtime.

8. When work is scheduled to be performed beyond the Normal Project Working Hours, a second shift, at night or during weekends, the Engineer shall be informed a minimum of 5 business days or other reasonable length of time specified by the Engineer in advance of the beginning of such work. The Contractor shall adhere to any local laws or ordinances that may govern or restrict the performance of such work. Requirements for the provision and use of temporary light and power outside Normal Project Working Hours are included in Section 01 51 30 – Temporary Electrical System.

B. Work Within New York City Department of Parks and Recreation (DPR) Property:

1. The NYC DPR governs all work within the limits of Flushing Meadows Corona Park and on the Blossom Avenue property surrounding Diversion Chamber No. 5 (DC-5) and will issue Construction Work permits for all work occurring on DPR property. The Contractor shall abide by specific restrictions that will be included in DPR Construction Work Permits for the following locations:

   a. Al Oerter Recreation Center / NYCDPR Maintenance Yard (131-40 Fowler Avenue, adjacent to NYC DEP Flushing Bay CSO Retention Facility): Working hours within the NYCDPR Maintenance Yard at the Al Oerter Recreation Facility as shown on the Contract Drawings shall be coordinated with NYCDPR and performed between the hours of 6:00 PM and 7:00 AM. Work that cannot be completed in a single shift shall be temporarily road plated at the conclusion of the work for each day to allow normal DPR operations during daytime hours.

   b. Flushing Meadows Corona Park (FMCP) East Road and adjacent to the Outfall TI-010 Tide Gates and NYC DPR Allied Building: Working hours within the FMCP property as shown on the Contract Drawings shall be coordinated with NYCDPR and performed between the hours of 6:00 PM and 7:00 AM. Work that cannot be completed in a single shift shall be temporarily road plated at the conclusion of the work for each day to allow normal DPR operations during daytime hours.

2. NYC DPR will not permit any construction Work within FMCP and East Road during the following annual events:

   a. Gov Ball (three (3) continuous weeks in May/June, 24 hours per day including weekends)

   b. NYRR Queens 10K (one (1) weekend day in June, 24 hour duration)

   c. Water Lantern Festival (one (1) weekend day in July, 24 hour duration)

   d. AEG (two (2) continuous weeks in July, 24 hours per day including weekends)

   e. U.S. Open (three (3) continuous weeks in August/September, 24 hours per day including weekends)

   f. Breast Cancer Walk (one (1) weekend day in October, 24 hours duration)

g. Diplo 5K (one (1) weekend day in October, 24 hours duration)

3. Contractor shall coordinate with NYCDPR to confirm actual dates for the above annual events and obtain any other construction work blackout event dates.

C. Emission Control Technology for Non-Road Vehicles

1. The Contractor shall complete and submit to the Engineer the attached Local Law 77: DEP Monthly Reporting Forms (Exhibit A, attached to this Section) to report on usage of Ultra Low Sulfur Diesel (ULSD) fuel and Best Available Technology in diesel-powered non-road vehicles for reducing emission of pollutants on a monthly basis.

D. Vehicle Idling time

1. Idling time shall be limited to three consecutive minutes for all delivery, concrete and materials trucks as well as all other diesel-powered equipment (hereinafter referred to as a mobile source) except as follows:

a. When a mobile source is forced to remain motionless because of traffic conditions or mechanical difficulties over which the operator has no control.

b. When it is necessary to operate heating, cooling or auxiliary equipment installed on the mobile source when such equipment is necessary to accomplish the intended use of the mobile source.

c. To bring the mobile source to the manufacturer's recommended operating temperature.

d. When the outdoor temperature is below twenty (20) degrees Fahrenheit.

e. When the mobile source is being repaired.

2. The Contractor shall meet the requirements of the Section 24-163 (f) of the NYC Administrative Code, regarding vehicle idling time adjacent to schools.

E. Compliance with Quality of Life Requirements

1. The Contractor is strongly advised that the City regards the preservation of "Quality of Life" as a high priority for the community near a DEP construction project. The Contractor, therefore, will be held to the strictest account in its adherence to Contract requirements and all applicable ordinances, rules, and regulations that relate to "Quality of Life". These include: noise control, vibration control, dust control, particulate control, rodent control, cleanliness and maintenance of the site and surrounding areas, and adherence to traffic and parking stipulations.

2. When the Contractor is determined to be noncompliant with "Quality of Life" requirements, as described in the paragraph above, the Contractor shall be subject to the following measures:

   a. Where non-compliance with a "Quality of Life" requirement is not corrected within a timeframe specified by the City, work may be ordered to stop until such measures as the City deems satisfactory are taken to resolve the problem and prevent future occurrence. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for additional costs or damages by the Contractor.

3. The Contractor shall cooperate fully with the Engineer to prevent, address and resolve any and all "Quality of Life" issues, which may arise from time to time, by whatever means necessary, all at no additional cost to the City.

4. The Contractor's record of compliance with "Quality of Life" requirements for this project and its efforts to coordinate with the Engineer and comply with his/her directions in this regard will be reflected in the Contractor's Evaluation. This Evaluation will become a part of the Contractor's record of doing business with the City of New York and may affect the Contractor's ability to be awarded future projects.

F. Bureau of Wastewater Treatment (BWT) Checklists for Bulk Storage

1. BWT Petroleum Bulk Storage (PBS) Checklist. Contractors shall follow and comply with the requirements of the BWT Petroleum Bulk Storage (PBS) Checklist of Requirements for Contractors when they are bringing PBS tanks to the site for temporary use during construction. See Exhibit B, attached to this Section.

2. BWT Chemical Bulk Storage (CBS) Checklist. Contractors shall follow and comply with the requirements of the BWT Chemical Bulk Storage (CBS) Checklist of Requirements for Contractors when they are bringing CBS tanks to the site for temporary use during construction. See Exhibit C, attached to this Section.

G. City Fleet and Truck Safety

1. The Contractor shall comply with the requirements of New York City Executive Order No. 39 of 2024 (EO 39), and BEDC EHS Standards Chapter 29 – Vehicles and Truck Safety.

2. The Contractor shall submit to the Engineer a Fleet Safety Plan, as required by EO 39.

H. Environmentally Friendly Oils and Anti-Freeze

1. For all projects where work is occurring in an environmentally sensitive area, the Contractor shall ensure the following:

a. All off-road heavy equipment utilizes environmentally friendly, vegetable oil based, hydraulic fluids such as, EAL 224H as manufactured by Mobil, or approved equal.

b. All off-road heavy equipment utilizes environmentally friendly, propylene glycol based, antifreeze such as, Fleet Charge PG as manufactured by Old World Industries, or approved equal.

2. Environmentally Sensitive areas include:

a. Areas in the New York City water supply watershed.

b. On, or adjacent to, a reservoir, wetlands, streams, rivers, brooks, ponds, or other waterbody.

c. Adjacent to any storm water collection system.

d. Facilities or structures located on, or a part of, the aqueduct.

e. Any other area deemed as such by the DEP or other regulatory agency.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Quality of Life Compliance Plan

1. The Contractor shall submit a "Quality of Life" Compliance Plan for review and approval by the Engineer. This plan shall address all work required by the Contractor to satisfy the "Quality of Life" requirements s specified herein.

2. Work at the Site shall not commence until the Contractor's "Quality of Life" Compliance Plan is approved.

B. Fleet Safety Plan

C. Environmentally Friendly Oils and Anti-Freeze Documentation

1. The Contractor shall submit documentation necessary to demonstrate compliance with environmentally friendly oils and environmentally friendly anti-freeze requirements as specified herein:

a. Safety Data Sheet (SDS)

b. Self-certification, on company letterhead, confirming compliance with the requirements specified.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

EXHIBIT A – LOCAL LAW 77: DEP MONTHLY REPORTING FORMS

FORM LL-77

LOCAL LAW 77: DEP MONTHLY REPORTING FORM 1

Contractor: _____ Report # _____ Covering the Mo/Yr of: _____

Contractor Address: _____ Contractor's Phone: _____

Project Name: _____ Project # _____ Address: _____

DEP Representative or PM Contact Name: _____ DEP Representative or PM Contact Number: _____

The New York City of Environmental Protection requires its contractors to file this form so that it can repor to the DEP on USAGE of Ultra Low Sulfur Diesel (ULSD) fuel in diesel powered non-road vehicles, and the use of Best Available Technology (BAT) for reducing emissions of pollutants, as required by NYC Local Law 77 of 2003.

									DEP approved BAT installed (DEP sticker must be applied to vehicle indicating BAT type and date installed)					
Prior Months Used On Site	Days Used This Month	Est. Future Usage Months	Type	Make	Year	Model #	VIN #	HP Rating	Date Installed	Make	Model	LL-77 Category I(a),I(b),I(c), II, III	DEP waiver* required	DEP Decal No.

* Attach copy of DEP Waiver if BAT requirement is waived for any reason during all or part of the contract period.

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LOCAL LAW 77: DEP MONTHLY REPORTING FORM 2

Contractor: _____ Report # _____ Covering the Mo/Yr of: _____

Project Name: _____ Project # _____ Address: _____

DEP Representative or PM Contact Name: _____ DEP Representative or PM Contact Number: _____

SUMMARY OF LISTED EQUIPMENT AND BAT

Total pieces of Equipment used on site this Month = _____ **Total that used BAT this Month = _____**

Total pieces of equipment used on site this Calender Year = _____ **Total that used BAT this Year = _____**

DECLARATION OF COMPLIANCE

By signing this document, I certify that the information provided is accurate, and that all non-road diesel-powered vehicles used on the project during the reporting period by my employees and subcontractors are included, and that all BAT retrofits have been selected and installed in accordance with LL 77, including the Use of ULSD (Ultra Low Sulfur Diesel) fuel.
Note 1: Diesel fuel powered nonroad vehicles/equipment's used for fewer than twenty calendar days on the contract are exempt from BAT requirement.
Note 2: DEP will audit sites to ensure forms are accurate. Fines for non-compliance and fraud will be levied by DEP against the Contractor according to the terms of the Law.

Signed: _____ **Date:** _____

Print: _____

Contractor Name and Title

☐ **There are other Prime Contractors on this site whose equipment is not included here.**

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EXHIBIT B - BWT PETROLEUM BULK STORAGE (PBS) CHECKLIST OF REQUIREMENTS FOR CONTRACTORS

New York City Department of Environmental Protection Petroleum Bulk Storage (PBS) Checklist of Requirements for Contractors					
WPCP Name:		**Contract Supervisor (BEDC or BWT):**		**Date Distributed to Contractor:**	
Contractor Company:		**Contractor Contact:**		**Contact Cell Phone:**	
Contract Supervisor Assessment Date:		**WPCP Responsible Individual (RI):**		**RI's Concurrence Date:**	

PBS Checklist	
Contractor Requirements	**Assessment/Comment**
Contractor is responsible to comply with applicable "Contractor Requirements" for work to be completed on a BWT WPCP. The Contract Supervisor and the WPCP RI will assess the Contractor's compliance. Any findings of non-compliance or partial compliance must be addressed to the satisfaction of the Contract Supervisor and the WPCP RI.	*Contractor requirements are designed to meet applicable NYS PBS regulatory requirements and supplement the WPCP's Spill Prevention Control and Countermeasures Plan (SPCC).*
Prior to Commencement of Contractor's On-Site Work	
(PBS-C1) Provide a table identifying temporary aboveground storage tanks (ASTs) and containers storing petroleum (i.e., fuel, oil, lubricants) that are to be brought on-site by the Contractor to complete a construction project. Provide the total capacity, contents, construction material (i.e., steel, fiberglass), secondary containment type, and secondary containment capacity. Include all stationary and non-stationary (mobile) tanks and containers. Provide cut sheets describing specifications of the tanks. Provide an updated table to identify any additions or deletions from the table and as needed to maintain current and accurate information.	
(PBS-C2) Provide the manufacturing specification for each AST to be brought on-site to store petroleum. Demonstrate that each tank design meets or exceeds one of the following manufacturing standards: UL No. 142, UL No. 58, API 650, API 620, CAN4-S601-M84 or CAN4-S630-M84. See www.ul.com/info/standard.htm and www.api.org for tank manufacture standards.	
(PBS-C3) Ensure ASTs to be brought on-site have useful life for the duration of on-site use and are in sufficient condition to meet or exceed the inspection and testing requirements while on-site.	

(PBS-C4) Provide tank specifications, testing schedule, application, and fees to BWT Project Management. BWT Project Management will attach a letter and submit the application and fees to NYC DEC. All ASTs that store petroleum, oil and lubricants must be registered with the NYS DEC. Contact the NYS Bulk Storage Help Line at 518-402-9543 for assistance.	
(PBS-C5) No underground storage tanks are allowed on-site at a BWT WPCP.	
(PBS-C6) Tanks and ancillary piping installed by the Contractor must be tested for tightness before put in service on-site. All test records and manufacturer documents must be provided to BWT. BWT will incorporate these records into and update the WPCP's SPCC plan. Documentation for start-up must include the manufacturer's life expectancy of the tank and piping and Contractor certification of installation for the tank system.	
(PBS-C7) Provide a list of petroleum, oil, and lubricants and associated ASTs and containers to be brought on-site. Provide the MSDS for each petroleum product to be brought on-site. The WPCP's RI and BWT's Project Management Section will revise or modify the WPCP's SPCC plan as necessary with information provided by the Contractor.	

PBS Checklist	
Contractor Requirements	**Assessment/Comment**
(PBS-C8) Provide a facility layout drawing showing the proposed location of ASTs and containers (55-gallons or greater) storing petroleum, the contents of each, associated piping, and secondary containment systems. Show the location of all petroleum transfer areas and the direction of flow in the event of a spill from any tank, container, containment area, or transfer area. Secondary containment and / or diversionary structures are required for ASTs, containers, and transfer areas. (See below for containment requirements).	
(PBS-C9) Provide written procedures for spill response and the disposal of recovered material in the event of a spill or release to the environment. The written procedures must include Contractor's company contact list with emergency telephone numbers.	
(PBS-C10) Provide a drawing showing the location of Contractor's on-site spill response kit(s) that are adequate to respond to likely spills and releases from petroleum, oil, and lubricants and waste stored or handled on-site.	
(PBS-C11) Provide a list of used oil or associated waste to be generated on-site and the proposed management procedures including handling, storing, and disposal. No on-site disposal of used oil is allowed.	
(PBS-C12) Provide written procedures for loading / unloading contents from tanks. The procedure must address how the Contractor will prevent deliveries to the wrong tank, ensure safe deliveries, and respond to spills and releases.	
(PBS-C13) No damaged equipment or tanks are allowed on-site that may potentially cause a spill or release or otherwise not meet manufactures intended use. Used tanks cannot be reinstalled on-site unless they meet the standards for new tanks cited at 6 NYCRR 614.8. If a used tank meets the standards for new tanks it may be reinstalled if it is thoroughly inspected, internally and externally, and found to be structurally sound and free of deficiencies.	
(PBS-C14) Utilize this Contractor's PBS Checklist to ensure compliance with BWT policy and procedures while working on-site.	
During Contractor's On-Site Work	
(PBS-C15) Display the Contractor's tank registration at the WPCP Administration Building with the WPCP's other tank registration certificates. Ensure the information on the tank registration is consistent with the actual tanks the Contractor has on-site. Allow 90 days for the renewal of the tank registration.	
(PBS-C16) Ensure the tank registration is current; tank registration must be renewed every five years. Notify the NYS DEC and BWT Project Management 30 days prior to adding, replacing, reconditioning, or permanently closing a stationary tank. Fee must be paid by Contractor.	

(PBS-C17) Ensure on-site tanks are protected from physical damage by moving machinery such as fork lifts and trucks. As a best management practice, BWT requires protective posts or similar measures as needed to protect ASTs from moving machinery.	
(PBS-C18) Protect tanks that are subject to melting (i.e., plastic, polyethylene, fiberglass-reinforced plastic) against fire and locate so that any spills or release could not unduly expose persons, structures, or the environment. Contractor must provide a Class B fire extinguisher in close proximity to the tanks as needed to protect against flammable liquids and gases.	
(PBS-C19) ASTs resting on the ground must be approved by the BWT RI and Project Management. All ASTs must be furnished with saddles, support legs, or a foundation pad in accordance with manufacturers' recommendations.	
(PBS-C20) Unless constructed of corrosion-resistant materials, the exterior surface of ASTs must be painted and protected.	

PBS Checklist	
Contractor Requirements	**Assessment/Comment**
(PBS-C21) Provide loading areas and equipment storing 55-gallons or greater with a containment system or diversion structure that is adequate to retain likely spills and releases (i.e., drips, leaks, loading / unloading spills).	
(PBS-C22) Fill ports must be securely locked to prevent unauthorized access. Fill ports installed by the Contractor must be properly labeled according to BWT policy (i.e., color code and symbols; see the NYC DEP PBS Tank and Container Management policy and procedure document).	
(PBS-C23) Provide adequate secondary containment to prevent a discharge from all on-site stationary storage tanks, mobile tanks, and containers. Each secondary containment capacity must be sufficient to hold the volume of the largest tank or container inside the secondary containment plus additional freeboard for precipitation. The secondary containment (floor and walls) must be constructed so that any discharge will not escape the containment system before cleanup occurs.	
(PBS-C24) The secondary containment systems and containers must be designed and constructed to prevent any migration of petroleum out of the system. Clay or soil containment systems with plastic liners are not allowed at a WPCP.	
(PBS-C25) Ensure that secondary containment systems are designed so that overfills from connections, vents, and pressure relief devices occur within the secondary containment system. Also, instrumentation devices (i.e., sight glasses) must be located inside the containment system.	
(PBS-C26) Ensure that secondary containment systems are chemically compatible with the substance stored, on a foundation which prevents settlement, and equipped with a sump, siphon, or valve that is manually controlled from outside the containment or gravity drainage system with the valve locked in a closed position.	
(PBS-C27) Transfer areas (loading and unloading) must have a containment system with a capacity to retain spills and leaks that are likely to occur including spills and leaks from hoses. Containment systems for transfer areas must be sufficient to retain all substances before cleanup occurs.	
(PBS-C28) Discharges of precipitation from secondary containment systems must be uncontaminated; the BWT Shift Engineer must inspect and authorize any discharge of precipitation from the secondary containment to the environment or to the WPCP. The Shift Engineer must complete the SPCC Site Inspection Dike/Drainage Checklist before authorizing a discharge of precipitation from the secondary containment. Failure to follow this procedure could result in a report to the NYC DEP of an illegal Contractor discharge.	

(PBS-C29) Precipitation from secondary containment systems that are contaminated (i.e., visible sheen on the water, analytical data) will not be discharged to the environment and will not be discharged to the WPCP. All contaminated precipitation must be containerized and transported off-site for proper disposal by the Contractor.	
(PBS-C30) ASTs (except day tanks and similar small capacity tanks) must have appropriate ventilation in accordance with tank manufacturer's recommendations. Normal and emergency ventilation must be properly sized in accordance with NFPA 30 requirements.	
(PBS-C31) ASTs (except day tanks and similar small tanks) must have automated (i.e., Veeder Root or approved equal) leak detection, high level alarm, and level indicator.	
(PBS-C32) Installation of ASTs must be in a manner consistent with the New York State Uniform Fire Prevention Code, 9 NYCRR Parts 1002 and 1171.2.	

PBS Checklist	
Contractor Requirements	**Assessment/Comment**
(PBS-C33) Contractors' out of service tanks or containers are not allowed at a WPCP. Contractor is required to remove all out of service and unused tanks within 48 hours unless approved by the WPCP RI. Contractor must demonstrate to the WPCP RI that the tank will be used on-site within a reasonable time period.	
(PBS-C34) All piping must be UL-971 certified and Contractor must provide UL-971 certification letter from the NYC Fire Department. UL-971 must be clearly marked on the piping. On-ground piping and underground piping systems must be approved by the BWT Project Management. Underground piping must be non-metalic, flexible, and double-walled with leak detection.	
(PBS-C35) Aboveground and on-ground piping must be steel with a fiberglass protective coating, must meet the ASTM A 53 Standard, and must be inspected daily for leaks or evidence of a release. On-ground piping must not present a tripping or other safety hazard.	
(PBS-C36) Tank tightness testing and integrity testing of Contractor ASTs are the responsibility of the Contractor and must be performed in accordance with applicable regulations and the testing schedule identified on the tank registration.	
(PBS-C37) All ASTs, fill ports, and mobile tanks must be labeled with required information; labeled pipe contents (i.e., diesel) and flow direction (i.e., arrow pointing to direction of flow); attached warning signs (i.e., No Smoking) at appropriate locations. Required information is provided by the BWT PBS Tank Identification Protocol available from the BWT upon request.	
(PBS-C38) Monthly visual inspections of all Contractor ASTs and associated aboveground piping, containers, and equipment storing petroleum, oils, and lubricants in amounts of 55-gallons or greater must be performed by the Contractor. Monthly inspections shall include inspecting exterior surfaces, pipes, valves, and other equipment for leaks and maintenance deficiencies, cracks, areas of wear, corrosion and thinning, excessive settlement of structures, separation or swelling of tank insulation, malfunctioning equipment, and structural and foundation weaknesses.	
(PBS-C39) All monthly inspections must be documented and readily available for review by BWT upon request. Corrective actions required as a result of the monthly inspections are the responsibility of the Contractor. Contractor shall utilize an inspection form provided by the WPCP SPCC plan or their own if approved in writing by the Contract Supervisor and the WPCP RI.	
(PBS-C40) Training of Contractors personnel in receiving delivery, handling, using or storing petroleum, oil, and lubricants is the responsibility of the Contractor. Training is to be completed at least annually and include a review of the WPCP's SPCC plan as well as Contractors procedures and on-site work instructions.	

(PBS-C41) Contractor will manage all tanks and containers storing used oil by clearly labeling the tank or container as "Used Oil." Used oil will be transported off-site by the Contractor for recycling or disposal. Used oil tanks and containers on-site must have adequate secondary containment systems to ensure spills or leaks do not impact the environment.	
(PBS-C42) Contractor is responsible to notify the Contract Supervisor and the WPCP RI in the event of any changes in tanks, containers, materials brought on-site, or procedures that may require changes to the WPCP SPCC plan.	
(PBS-C43) Contractor is responsible to notify the Contract Supervisor and the Shift Engineer immediately in the event of any spill or release of any petroleum, oil, or lubricants to the secondary containment system, the environment, or contact with personnel.	
(PBS-C44) Contractor will have a spill response kit and emergency response equipment adequate to meet emergency response needs of Contractor's on-site work and petroleum, oil, or lubricant storage.	

PBS Checklist	
Contractor Requirements	**Assessment/Comment**
(PBS-C45) Contractor will cooperate fully with the BWT in any routine inspection or incident investigation involving Contractor's use, storage, or transportation of petroleum, oil, or lubricants.	
(PBS-C46) Contractor will post Contractors emergency contact names and evacuation procedures in close proximity of Contractors work area(s). Contractor will provide the WPCP RI and BWT Project Management with Contractor emergency contact information so they can be attached to the WPCP's SPCC plan.	
After Completion of Contractor's On-Site Work	
(PBS-C47) Provide a written de-mobilization schedule to the Contract Supervisor and the BWT RI at least five business days prior to the commencement of de-mobilization.	
(PBS-C48) Properly drain, close, and prepare all tanks, pipes, fill ports, valves, and containers appropriately for transportation off-site. Contractor is responsible for the safe handling and transportation of tanks, containers, and equipment during de-mobilization.	
(PBS-C49) Demobilize and remove from the WPCP all tanks, fill ports, pipes, drums, totes, and containers used on-site not intended for permanent use at the WPCP. Contractor is responsible to remediate any areas of impacted soil, repair any erosion; and restore the ground surface to the intended slope or contour.	
(PBS-C50) Notify the Contract Supervisor and the WPCP RI of any known or suspected impacted soil, groundwater, or surface water discovered during de-mobilization. Clean up shall be the responsibility of the Contractor.	

EXHIBIT C - BWT CHEMICAL BULK STORAGE (CBS) CHECKLIST OF REQUIREMENTS FOR CONTRACTORS

New York City Department of Environmental Protection Chemical Bulk Storage (CBS) Checklist of Requirements for Contractors					
WPCP Name:		**Contract Supervisor (BEDC or BWT):**		**Date Distributed to Contractor:**	
Contractor Company:		**Contractor Contact:**		**Contact Cell Phone:**	
Contract Supervisor Assessment Date:		**WPCP Responsible Individual (RI):**		**RI's Concurrence Date:**	

CBS Checklist	
Contractor Requirements	**Assessment/Comment**
Contractor is responsible to comply with applicable "Contractor Requirements" for work to be completed on a BWT WPCP. The Contract Supervisor and the WPCP RI will assess the Contractor's compliance. Any findings of non-compliance or partial compliance must be addressed to the satisfaction of the Contract Supervisor and the WPCP RI.	*Contractor requirements are designed to meet applicable NYS CBS requirements and supplement the WPCP's Spill Prevention Report (SPR)*
Before Contractor's On-Site Work	
(CBS-C1) Provide a table identifying temporary aboveground storage tanks (ASTs) and containers storing hazardous substances that are to be brought on-site by the Contractor to complete a construction project. Provide the total capacity, contents, construction material (i.e., steel, fiberglass), secondary containment type, and secondary containment capacity. Include all stationary and non-stationary (mobile) tanks. Provide cut sheets describing specifications of the tanks. Provide an updated table to identify any additions or deletions from the table and as needed to maintain current and accurate information.	
(CBS-C2) Provide the manufacturing specification for each AST to be brought on-site to store hazardous substances. Demonstrate that tank design meets or exceeds one of the following manufacturing standards: API 650, API 620, CAN4-S601-M84, CAN4-S630-M84, ASTM D4097-88, or ASTM D3299-88 or a comparable standard developed by a nationally recognized association or independent testing laboratory. See www.api.org and www.astm.org for tank manufacture standards.	
(CBS-C3) Ensure ASTs to be brought on-site have a useful life for the duration of on-site use and are in sufficient condition to meet or exceed the inspection and testing requirements while on-site.	

(CBS-C4) Provide tank specifications, testing schedule, application, and fees to BWT Project Management. BWT Project Management will attach a letter and submit the application and fees to NYC DEC. All ASTs that store a hazardous substance with a capacity of 185 gallons or greater must be registered with the NYS DEC. Contact the NYS Bulk Storage Help Line at 518-402-9543 for assistance.	
(CBS-C5) No underground storage tanks are allowed on-site at a BWT WPCP.	
(CBS-C6) Tanks and ancillary piping installed by the Contractor must be tested for tightness before put in service on-site. All test records and manufacturer documents must be provided to BWT. BWT will incorporate these records into and update the WPCP's SPR. Documentation for start-up must include the manufacturer's life expectancy of the tank and piping and Contractor certification of installation for the tank system.	

CBS Checklist	
Contractor Requirements	**Assessment/Comment**
(CBS-C7) Review the regulated hazardous substances cited at Part 597.2 and provide a list of the hazardous substances to be brought on-site. Provide MSDSs for each hazardous substance to be brought on-site. The WPCP's RI and BWT's Project Management section will revise or modify the WPCP's SPR as necessary with information provided by the Contractor.	
(CBS-C8) Provide a facility layout drawing showing: • The proposed location of ASTs and containers storing hazardous substances; • The contents of each; • Associated piping; • Secondary containment systems; • The location of all transfer areas and the direction of flow in the event of a spill from any tank, container, containment area, or transfer area; and • The locations for the Contractor's on-site spill response kits adequate to respond to likely spills and releases from hazardous substances and waste stored or handled on-site	
(CBS-C9) Provide the disposal plan for waste generated on-site (i.e., solid waste, special waste, hazardous waste). No on-site disposal of waste is allowed.	
(CBS-C10) Provide written procedures for spill response and the disposal of recovered material in the event of a spill or release to the environment. The written procedures must include Contractors company contact list with emergency telephone numbers.	
(CBS-C11) Provide written procedures for loading / unloading contents from tanks. The procedure must address how the Contractor will prevent deliveries to the wrong tank, ensure safe deliveries, and respond to spills and releases.	
(CBS-C12) No damaged equipment or tanks are allowed on-site that may potentially cause a spill or release or otherwise not meet manufactures intended use. Used tanks cannot be reinstalled on-site unless they meet the standards for new tanks cited at 6 NYCRR 599.8. If a used tank meets the standards for new tanks it may be reinstalled if it is thoroughly inspected, internally and externally, and found to be structurally sound and free of deficiencies.	
(CBS-C13) Utilize this Contractor's CBS Checklist to ensure compliance with BWT policy and procedures while working on-site.	

During Contractor's On-Site Work	
(CBS-C14) Display the Contractor's tank registration at the WPCP Administration Building with the WPCP's other tank registration certificates. Ensure the information on the tank registrations is consistent with the actual tanks the Contractor has on-site. Allow 90 days for the renewal of the tank registration.	
(CBS-C15) Ensure tank registration is current; tank registration must be renewed every two years. Notify the NYS DEC and BWT Project Management 30 days prior to adding, replacing, reconditioning, or permanently closing a stationary tank. Fee must be paid by Contractor.	

CBS Checklist	
Contractor Requirements	**Assessment/Comment**
(CBS-C16) Ensure all on-site tanks are: • Of sufficient strength to withstand normal handling and use; • Chemically compatible with the hazardous substances being stored; • Protected from, or resistant to, all forms of internal and external wear, vibration, shock, and corrosion; • Have a stable foundation under all operating conditions and be protected from fire, heat, vacuum, and pressure that might cause a tank failure; and • If fiberglass-reinforced plastic material is used, the material must be of sufficient density and strength to form a hard, impermeable shell which will not crack, wick, wear, soften, or separate under normal service conditions.	
(CBS-C17) Ensure on-site tanks are protected from physical damage by moving machinery such as fork lifts and trucks. As a best management practice, BWT requires protective posts or similar measures as needed to protect ASTs from moving machinery.	
(CBS-C18) Protect tanks subject to melting (i.e., plastic, polyethylene, fiberglass-reinforced plastic) against fire and locate them so that any spills or releases could not unduly expose persons, structures, or the environment. Contractor must provide the appropriate fire extinguisher in close proximity to the tanks as needed to protect against flammable liquids and gases.	
(CBS-C19) Fiberglass-reinforced plastic tanks are recommended for on-site work since they are not subject to corrosion. No tanks are allowed to contact the ground. All tanks must be underlain by an impervious barrier such as a concrete pad or other impervious secondary containment system.	
*(CBS-C20) Un*less constructed of corrosion-resistant materials, the exterior surface of ASTs must be painted and protected by an inhibitive primer coat, intermediate inhibitive, and two or more final coats of paint or other method described in Part 599.8 (f).	
(CBS-C21) Drums, containers, and mobile tanks storing 2,200 pounds or more of a hazardous substance must have a containment system capable of retaining 110% of the largest container with the containment system. Secondary containment systems must be a surrounding dike and impoundment system, remote catch tank or impoundment area, or another system or practice which will collect and contain a leak or spill. Capacity of the secondary containment must be 110% of the largest tank inside the containment. However, all manifold tanks require secondary containment volume of 110% of their entire capacity.	
(CBS-C22) The secondary containment system must be designed and constructed to prevent any migration of hazardous substances out of the system. Clay or soil containment systems with plastic liners are not allowed on-site at a WPCP.	

(CBS-C23) Ensure that secondary containment systems are designed so that overfills from connections, vents, and pressure relief devices occur within the secondary containment system. Also, instrumentation devices (i.e., sight glasses) must be located inside the containment system.	
(CBS-C24) Ensure that secondary containment systems are chemically compatible with the substance stored, on a foundation which prevents settlement, equipped with a sump, siphon, or valve that is manually controlled from outside the containment, or is gravity a drainage system with the valve locked in a closed position.	

CBS Checklist	
Contractor Requirements	**Assessment/Comment**
(CBS-C25) Transfer areas (loading and unloading) must have a containment system with a capacity to retain spills and leaks that are likely to occur including spills and leaks from hoses. Containment systems for transfer areas must be coated with a material compatible with the substance being handled and sufficient to retain all substances before cleanup occurs.	
(CBS-C26) Fill ports must be securely locked to prevent unauthorized access. Fill ports remote to the tank must be labeled with the chemical name, hazard warnings, tank information, and closed and open positions for valves and controllers. Fill port pipes installed by the Contractor must be sized according to BWT policy (hypochlorite – 2 inch; sodium hydroxide – 2.5 inch; ferric chloride – 2 inch; polymer – 3 inch).	
(CBS-C27) Discharges of precipitation from secondary containment systems must be uncontaminated; the BWT Shift Engineer must authorize any discharge of precipitation from the secondary containment to the environment or to the WPCP. Failure to follow this procedure could result in a report to the NYC DEP of an illegal Contractor discharge.	
(CBS-C28) Precipitation from secondary containment systems that are contaminated (i.e., visible sheen on the water, analytical data) will not be discharged to the environment in any case and will not be discharged to the WPCP without written authorization from the WPCP duty operator. All contaminated precipitation must be containerized and transported off-site for proper disposal by the Contractor unless written authorization is received from the WPCP duty operator.	
(CBS-C29) ASTs must have a monitoring system for monitoring leakage between the tank bottom and the secondary containment system.	
(CBS-C30) Installation of ASTs must be in a manner consistent with the New York State Uniform Fire Prevention Code, 9 NYCRR Parts 1002 and 1171.2.	
(CBS-C31) Contractors' out of service tanks or containers are not allowed at a WPCP. Contractor is required to remove all out of service and unused tanks within 48 hours unless approved by the WPCP RI. Contractor must demonstrate to the WPCP RI that the tank will be used on-site within a reasonable time period.	
(CBS-C32) All piping must be designed, labeled, protected, and otherwise constructed in accordance with Part 599.13. On-ground piping and underground systems must be installed with secondary containment and provided with leak monitoring. Piping must pass an inspection as specified by Part 599.16 before being placed in service at a WPCP.	

(CBS-C33) All ASTs, fill ports, valves, and mobile tanks must be labeled with required information; label pipe contents (i.e., Ferric Chloride) and flow direction (i.e., arrow pointing to direction of flow); attached warning signs (i.e., No Smoking) at appropriate locations. Required information is provided by the BWT CBS Tank Identification Protocol available from the BWT Project Management Section.	
(CBS-C34) Daily inspections of ASTs and associated piping for hazardous substances must be completed and documented. Contractor is responsible for retaining daily inspection records for the duration of on-site work. Inspections must include an inspection of the tank and the secondary containment system. Contractor shall submit their inspection form for review and approval by the Contract Supervisor and the WPCP RI. Inspections must include inspecting exterior surfaces, pipes, valves, and other equipment for leaks and maintenance deficiencies, cracks, areas of wear, corrosion and thinning, excessive settlement of structures, separation or swelling of tank insulation, malfunctioning equipment, and structural and foundation weaknesses.	

CBS Checklist	
Contractor Requirements	**Assessment/Comment**
(CBS-C35) Tank tightness testing and integrity testing of Contractor ASTs are the responsibility of the Contractor and must be performed in accordance with applicable regulations and the testing schedule identified on the tank registration.	
(CBS-C36) Annual and five-year inspections are the responsibility of the Contractor. These inspections are comprehensive inspections and tests to evaluate the tank integrity and fitness for service. Annual and five-year inspections must be performed by the Contractor in accordance with regulations and the schedule of testing must be included in the Contractors initial submittals.	
(CBS-C37) Training of Contractors personnel handling, using, or storing hazardous substances is the responsibility of the Contractor. Training is to be completed at least annually and include a review of the WPCP's SPR as well as Contractors procedures and on-site work instructions.	
(CBS-C38) Contractor is responsible to notify the Contract Supervisor and the BWT RI in the event of any changes in tanks, containers, materials brought on-site, or procedures that may require changes to the WPCP's SPR.	
(CBS-C39) Contractor is responsible to notify the Contract Supervisor and the Shift Engineer immediately in the event of any spill or release of a hazardous substance to the secondary containment system, the environment, or contact with personnel.	
(CBS-C40) Contractor will have a spill response kits and emergency response equipment adequate to meet emergency response needs of Contractor's on-site work and hazardous substance storage.	
(CBS-C41) Contractor will cooperate fully with the BWT in any routine inspection or incident investigation involving Contractor's use, storage, or transportation of hazardous substances	
(CBS-C42) Contractor will post Contractors emergency contact names and evacuation procedures in close proximity of Contractors work area(s). Contractor will provide the WPCP RI and BWT Project Management with Contractor emergency contact information so they can be attached by the WPCP's SPR.	
After Completion of Contractor's On-Site Work	
(CBS-C43) Provide a written de-mobilization schedule to the Contract Supervisor and the BWT RI at least five business days prior to the commencement of de-mobilization.	
(CBS-C44) Properly drain, close, and prepare all tanks, pipes, fill ports, valves, and containers appropriately for transportation off-site. Contractor is responsible for the safe handling and transportation of tanks, containers, and equipment during de-mobilization.	

(CBS-C45) Demobilize and remove from the WPCP all tanks, fill ports, pipes, drums, totes, and containers used on-site not intended for permanent use at the WPCP. Contractor is responsible to remediate any areas of impacted soil, repair any erosion, and restore the ground surface to the intended slope or contour.	
(CBS-C46) Notify the Contract Supervisor and the BWT RI of any known or suspected impacted soil, groundwater, or surface water discovered during de-mobilization. Clean up shall be the responsibility of the Contractor.	

SECTION 01 21 20 – EXPANDED WORK ALLOWANCE
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The total amount of the Contract shall include an allowance (the "Expanded Work Allowance" or "EWA") that, subject to compliance with the terms of this Contract, can be used for the items set forth in Article 1.05.B herein (said items to be referred to as the "Expanded Work Items" and this Section 01 21 20 shall be referred to as the "EWA Specification"). Payment for the Expanded Work Items may only be made through the EWA in accordance with this EWA Specification. Except as specifically provided in this EWA Specification, nothing in this EWA Specification alters, or will be deemed to alter, the interpretation or application of the Contract, including but not limited to Articles 21, 24, 25, 26, 28, and 78 thereof.

B. Section Includes:

1. Process
2. Work Eligible for Expanded Work Allowance
3. Work Not Eligible for Expanded Work Allowance

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. Eligible EWA payments will be made under Contract Item No. A-4, titled “Expanded Work Allowance.” The Contractor shall only be entitled to payment from the EWA under the conditions and in accordance with the requirements set forth in this EWA Specification. In the event the EWA amount or any portion thereof remains unexpended at the conclusion of the Contract, such amount shall remain the sole property of the City.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Definitions

1. Capitalized terms not otherwise defined in this EWA Specification shall have the meaning ascribed to them in the Contract.

1.05 DESCRIPTION

A. PROCESS

1. Except for those provisions specifically applicable to Expanded Work Items, all other provisions of the Contract applicable to Work shall be applicable to Expanded Work Items. To be eligible for the EWA, all work must be authorized in conformance with this EWA Specification and payment for the Expanded Work Items will not be made without written authorization as set forth in this EWA Specification. This EWA Specification shall not be used to make interim payment for work that is being progressed as disputed Work.

2. The EWA may be utilized only under the conditions set forth in this EWA Specification.

3. The Contractor may request that identified Extra Work be subject to the EWA. If the Engineer determines that use of the EWA is appropriate, in their sole discretion, the Engineer will prepare a written scope document for the Expanded Work Items (“EWA Scope Memo”). Upon EAO approval, the Engineer will issue a Notice of Direction ("NOD") to proceed under the EWA Scope Memo. The EWA Scope Memo will set forth the maximum amount payable from the EWA (“Maximum Amount”) prior to the issuance of a final cost memorandum, in accordance with this Section. The Maximum Amount may be increased from time to time by the Engineer, in their sole discretion, except that the Maximum Amount may not exceed 80% of the Engineer’s estimated total cost for such Work (the “Estimated Cost”) unless and until a final cost and scope is determined and a final cost memorandum (“Final Cost Memo”) executed in accordance with this Section.

4. Neither the Maximum Amount nor the Estimated Cost will be deemed to be the final cost of the Expanded Work Items. The final cost for the Expanded Work Items will be determined in accordance with Article 26 of the Contract as if the Expanded Work Items were Extra Work. The Contractor must submit its detailed price proposal for the Expanded Work Items, calculated in accordance with the Contract, within the time period set forth in the EWA Scope Memo or within 90 Days after the executed EWA Scope Memo is issued to the Contractor, whichever is sooner ("Submission Period").

5. Once the EWA Scope Memo is executed and the Contractor is issued an NOD to proceed with the Work, the Agency will make progress payments for completed work under the EWA Scope Memo, as provided in the Contract, up to the Maximum Amount.

6. The Agency will not make any progress payments for the performance of the Expanded Work Items beyond the Submission Period set forth in sub-Section 4, above, unless and until a final cost and scope has been determined and a Final Cost Memo executed in accordance with this Section. No amounts above the Maximum Amount will be payable from the EWA, unless and until a final cost and scope has been determined and a Final Cost Memo executed in accordance with this Section. In all events, the Contractor shall promptly and diligently comply with the Engineer's direction and perform all Work required by the Contract and the EWA Scope Memo.

7. Upon receipt of the Contractor's detailed cost proposal, the Engineer will evaluate the proposal and initiate negotiations, as necessary, to determine the final cost of the Expanded Work Items in accordance with Article 26 of the Contract as if the Expanded Work Items were Extra Work. The Contractor is responsible to furnish time and material records in accordance with Article 28 of the Contract for all work performed under an EWA Scope Memo until a Final Cost Memo is executed. If the parties cannot agree on a unit price or fixed price, the Contractor will be paid on the basis of time and material records in accordance with Article 26 of the Contract as if the Expanded Work Items were Extra Work, subject to the provisions of Article 28 of the Contract.

8. A Final Cost Memo will be prepared by the Engineer to be executed by the parties. The total net sum of the amounts added and/or credited under the EWA Scope Memo and payment of the finalized Final Cost Memo constitutes full accord and satisfaction for the costs resulting from the Expanded Work Items. In the event the EWA is insufficient to pay the full amount of the Final Cost Memo, the parties agree to execute change order documents for the remaining funds, subject to registration in accordance with the New York City Charter.

9. Upon EAO approval, the Engineer has the power to execute the Final Cost Memo on behalf of the Commissioner. The description of the work

described in the Final Cost Memo shall be considered to be included in the description of the Work as if it were fully set out in the Contract Documents and the Contractor shall perform the Work necessary to complete the Expanded Work Items in the same manner and under the same terms as any other Work described in the Contract Documents.

10. All payments for EWA work will be billed with other Contract Work and paid pursuant to Article 42 of the Contract.

11. No payment will be made for incomplete items included in the EWA Scope Memo and/or the Final Cost Memo.

B. WORK ELIGIBLE FOR AN EXPANDED WORK ALLOWANCE

1. Only the items set forth below shall be eligible for consideration by the Engineer for payment using the EWA:

a. Non-material changes in the Work necessary to complete Contract Work due to the following:

1) Site conditions that significantly differ from those included in the Contract Documents and that could not reasonably have been anticipated by the Contractor (excluding pollution remediation).

2) Overruns of unit price items and quantity increases in accordance with Article 26.

3) NYCDOT traffic stipulations or permit requirements required for the operation of the construction site that significantly differ from those included in the Contract Documents and that could not have been anticipated by the Contractor.

4) Changes to the sizes of materials or changes to specifications of materials from those provided in the Contract Documents that are approved by the Commissioner and/or the Engineer.

b. Non-material changes in the scope of Work directed by the Commissioner that result in a net change in the cost to the Contractor for the Work to be performed under this Contract, including but not limited to for the following:

1) Increased costs of operation and maintenance of the Site due to changed site conditions or environmental hazards at the Site materially differing from any shown on the Contract Drawings or indicated in the Specifications or such conditions or environmental hazards as could not reasonably have been anticipated by the Contractor, which conditions or hazards will materially affect the cost of the Work to be done under the Contract. The attention of the Commissioner must be called immediately to such conditions or hazards before

they are disturbed in accordance with Article 78.2 of the Contract.

2) Construction methodology changes issued in writing by the Engineer.

3) Changes as a result of newly available technology that became available and/or approved for use by the City after the bidding opening was complete.

4) Safety enhancements not regulated or beyond Law.

5) Additional work to address non-regulatory changes in Agency or City policy.

6) Contractor-initiated value engineering that results in reduced scope, more efficient design or more efficient construction in accordance with Contract value engineering requirements concerning the sharing of cost or time changes from such value engineering.

7) The following administrative/regulatory non-material scope changes after Bid submission:

   a) Changes to applicable federal, state and local laws, rules, ordinance, regulations, or requirements of the local authority having jurisdiction, including:

      (1) FDNY regulatory requirements that result in revisions or upgrades to existing standpipes, fire alarm systems, hydrants, pre-combustion gas compressors, or sprinkler systems that are not provided in the Contract documents.

      (2) Changes to DOB regulatory requirements.

      (3) Changes to DEP and NYS DEC regulatory requirements.

      (4) Additions due to Local Law 94 of 2019 with respect to sustainable roof.

      (5) Public Design Commission regulatory requirements resulting in change in material/structure to match overall site scheme.

      (6) Addition of bypasses/shut off valves to avoid interruption of service to adjacent jurisdictions or neighborhoods.

   b) Changes due to utility company requests.

C. WORK NOT ELIGIBLE FOR EWA

1. Items not specifically numerated in Article 1.05.B are ineligible for EWA.
2. Notwithstanding anything in Article 1.05.B, the following work is not eligible for EWA:
    a. Costs related to design errors and/or omissions.
    b. Costs related to pollution remediation.
    c. Costs associated with the purchase of standalone equipment.
    d. Costs for initial outfitting.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor is encouraged to and is authorized to develop, prepare and submit to the Agency Chief Contracting Officer or his/her designee (the "ACCO"), in writing, Value Engineering Proposals (VEPs) for modifying the plans, Specifications or other requirements of the Contract for the sole purpose of reducing the net cost of construction.

B. VEPs shall not impair, in any manner, the essential functions or characteristics of the Project, including but not limited to service life, economy of operation, ease of maintenance, desired appearance, design, and safety standards.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. VEP Cost Sharing and Payment

1. VEP net cost savings and payment shall be determined as follows:

2. "Net Cost Savings": means the total reduction in Contractor cost of performance resulting from the acceptance of the VEP minus allowable Contractor development and implementation costs.

3. The City's cost to review, design and implement the VEP shall be determined by the ACCO and fifty (50%) percent of such cost shall be deducted from the total Contract price as part of a VEP change order.

4. Payment for an accepted VEP shall be reflected in the adjusted total contract price per the following:

   a. Original Contract price for the Work;

   b. Less fifty percent (50%) of Net Cost Savings;

   c. Less fifty percent (50%) of the City's Cost.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Abbreviations / Acronyms:

1. VEP - Value Engineering Proposal

1.05 DESCRIPTION

A. Consideration of VEPs

1. The provisions of this Section shall not be construed to require DEP to consider any VEP, which may be submitted hereunder.

2. Proposed changes in the following will not be accepted as VEPs:

   a. Disinfection treatment process

   b. Unit process performance characteristics and capacities

3. If a VEP submitted by the Contractor is similar to a change in the Contract Documents under consideration by DEP for the Project at the time said VEP is submitted, or if such a VEP is based upon or similar to Specifications, policy or details adopted by DEP after the advertisement for the Contract and prior to conceptual discussion between the Contractor and DEP, DEP will not accept such VEP and reserves the right to make such changes without compensation to the Contractor under the provisions of this Section.

4. A VEP that requires a material change in Contract scope will not be considered as an acceptable VEP.

B. The ACCO Is Sole Judge

1. The ACCO will be the sole judge of the acceptability of a VEP.

2. In determining the net cost savings, DEP reserves the right to disregard the Contract bid prices if in the judgment of the ACCO, such prices do not

represent a fair measure of the value of Work to be performed or to be deleted.

C. Continuation of Contract Work

1. The Contractor shall continue to perform the Work in accordance with the requirements of the Contract until an executed change order incorporating an accepted VEP has been issued. If an executed change order has not been issued by the date upon which the Contractor's VEP specifies that a decision thereon should be made, or such other date as the Contractor may subsequently have specified in writing, such VEP shall be deemed rejected.

1.06 QUALITY ASSURANCE

A. All approved VEPs shall deliver the same quality of product, finish, or workmanship as originally specified under the Contract.

1.07 SUBMITTALS

A. General

1. The Contractor's VEP submittal shall include the following in order to be considered for approval by the ACCO:

a. Cover letter proposing the VEP and written description.

b. Complete description of the difference between the existing Contract requirements and those proposed, listing of advantages and disadvantages associated with the VEP, and effect, if any, the VEP has on the performance of the Work.

c. Preliminary sketches.

d. List and analysis of the Contract requirements that must be changed if the VEP is accepted, including proposed Specification requirements.

e. A separate, detailed cost estimate showing the affected portions of the existing Contract requirements and the cost savings associated with the VEP. The VEP cost estimate shall include an itemization of the Contractor's development and implementation costs along with all costs attributable to Subcontractors. This cost estimate shall be correlated, where required, with the original detailed estimate breakdown submitted by the Contractor.

f. Description and estimate of the costs DEP may incur implementing the VEP.

g. Prediction of effect the VEP will have on DEP's Operations and Maintenance costs should the VEP be accepted.

h. Statement of time by which a change order must be issued to achieve maximum value and cost reduction, noting any time impact on

Contract milestones and the completion date. This statement shall be correlated with, where required, the baseline construction schedule in use for monitoring progress.

i. If the ACCO notifies the Contractor that additional information is required to evaluate the VEP, such information must be provided in a timely manner; otherwise, the VEP will be rejected.

2. The VEP shall be submitted to the ACCO for review and processing.

3. VEPs may be submitted at any time following the Notice to Proceed and up to 90 days prior to the latest accepted date for Substantial Completion.

B. Contract Time

1. Acceptance of a VEP and performance of the Work thereunder shall not extend the time for completion of the Contract unless specifically provided for in the Contract change order implementing the VEP.

C. VEP Design Requirements

1. Upon acceptance of the VEP, the ACCO will incorporate the VEP into the Contract Documents. The cost to revise and update the Contract Documents shall be included in the DEP's cost.

D. VEP Review and Acceptance

1. Within 15 days after the date of submittal of the VEP, the ACCO shall notify the Contractor of the status of the review of the VEP proposal. If DEP requires additional time to evaluate the Contractor's VEP, the ACCO will notify the Contractor of the additional review time required within such 15-day period.

2. The Contractor has the right to withdraw the VEP at any time during the review process.

3. Any VEP may be accepted in whole or part at the ACCO's discretion.

4. DEP expressly reserves the right to adopt a VEP for use on other contracts administered by it.

5. The accepted VEP shall be incorporated into the Contract pursuant to a change order. The change order will include any changes in the quantities of unit bid items and new agreed price items, as appropriate.

6. The ACCO will provide to the Contractor, along with the notification of the acceptance of the VEP, an assessment of DEP's cost in order to finalize VEP cost sharing and payment arrangements as defined in this Section. This will be used in determining the VEP change order amount.

E. Conditions

1. The following conditions shall apply to any VEP accepted by the ACCO:

a. Bid prices may not be based on the anticipated approval of a VEP, and if a VEP is rejected, the Contractor will be required to complete the Contract in accordance with the plans and Specifications at the prices bid.

b. Where a VEP has been approved and implemented by change order but subsequent modifications to the VEP are necessary in order to adjust for unanticipated field or other conditions, any further change order(s) to implement those subsequent modifications will provide for payment for any additional Work at prices no higher than those in the Contractor's bid, as if such Work was being done in accordance with the original Contract requirements.

c. If the Engineer determines that unsatisfactory results are being obtained as a result of Work performed pursuant to an implemented VEP, he/she may reject all or any portion of such Work and direct its removal, and require the Contractor to proceed in accordance with the original Contract requirements. The change order required to "reverse" the VEP shall not entitle the Contractor to compensation for any Work performed under the failed VEP or for its removal. Such rejection or limitation of reimbursement shall not constitute the basis of any claim against DEP.

d. All terms and conditions of the Contract, including quality of the Work and inspection, shall apply to a VEP accepted by the ACCO as if the VEP was included originally.

e. The Contractor shall have no claim against DEP due to or arising from the ACCO's rejection of a VEP.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 APPLICATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 01 27 00 – MEASUREMENT AND PAYMENT
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Total Bid Price for the Contract shall include the following items in the Bid Schedule of Prices.

1. Lump Sum Prices (Contract Items LS-1 through LS-3)

2. Unit Price Items (Contract Items UP-1 through UP-19)

3. Allowances (Contract Items A-1 through A-4)

B. Excluding the Allowance and Unit Price items specified in this Section, no separate payment will be made for the Work. All costs thereof shall be included by the Contractor in its lump sum prices bid for the Contract.

C. Payment of the Total Bid Price shall be in accordance with the requirements of the Contract Documents.

D. The following index of this Section is presented for convenience:

E.

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1.02 PAYMENT

A. There is no separate payment provision for this Section.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Lump Sum Price Contract Items

1. Contract Item LS-1 - Mobilization

a. Under Contract Item LS-1 - Mobilization, the Contractor shall offset all costs necessary to commence the Work, including but not limited to, staging and production, supervision and prefinancing as required under this Contract.

b. The value for Mobilization, as indicated on the Bid Schedule of Prices, shall not exceed six percent (6%) of the Total Bid Price for the Contract, excluding the bid values for all Allowance Items. Should the Contractor's bid for mobilization exceed 6%, the Mobilization Item shall be adjusted to 6% with any overage added to LS-2 Work Result. In no event will the Total Bid Price for the Contract be adjusted because of this re-allocation.

c. The Contractor shall be paid one-half of Mobilization in the first partial payment.

d. The Contractor shall be paid the remainder of Mobilization in a subsequent partial payment after all of the following deliverables are completed to the satisfaction of the Resident Engineer:

1) Performance and Payment Bonds per Schedule A.

2) Insurance per Schedule A.

3) Preliminary and Final Schedule of Values per Section 01 29 10 – Schedule of Values.

4) Preliminary CPM Schedule per Section 01 32 10 – Progress Scheduling.

5) Final Detailed CPM Schedule per Section 01 32 10 – Progress Scheduling.

6) Submissions pertaining to Environmental, Health, and Safety Requirements per Section 01 35 27 – Environmental Health and Safety Requirements.

7) Installation of the project information panel and its supports per Section 01 58 13 – Temporary Project Signage.

e. The 5% retainage specified in Schedule A applies to all payments including those for Mobilization.

f. The payments for Mobilization do not apply to costs associated with change orders.

2. Contract Item LS-2 – Work Result

a. Contract Item LS-2 has been provided on the Bid Schedule of Prices as a lump sum price for all Contract Work not inclusive of Mobilization, De-Mobilization, Unit Prices and Allowance items.

b. Payment under Contract Item LS-2 will constitute full compensation for all labor and materials required to complete all Work under this Contract, with the exception of Mobilization, De-Mobilization, the Unit Price Items and Allowances as specified herein and shown on the Bid Schedule of Prices.

3. Contract Item LS-3 – De-Mobilization

a. Under Contract Item LS-3 – De-Mobilization, the Contractor shall offset all costs necessary to de-mobilize the Work, including but not limited removal of all temporary facilities, materials, and equipment from the Site, as well as removal of all Contractor's facilities in the staging area, as required under this Contract. The following Work shall be compensated by Contract Item LS-3 – De-Mobilization:

1) Removals pertaining to Temporary Water and Sanitary Services per Section 01 51 11 - Temporary Water and Sanitary Services.

2) Removals pertaining to Temporary Electrical Systems per Section 01 51 30 - Temporary Electrical Systems.

3) Removals pertaining to Temporary Field Office Trailers per Section 01 52 10 - Temporary Field Office Trailers.

4) Removals pertaining to Traffic Control per Section 01 55 26 - Traffic Control.

5) Removals pertaining to Temporary Barriers and Enclosures per Section 01 56 00 - Temporary Barriers and Enclosures.

6) Removals of the project information panel and its supports per Section 01 58 13 - Temporary Project Signage.

7) Final Cleaning per Section 01 74 17 - Cleaning and Site Maintenance.

8) Providing all Operations and Manuals as required under this Contract per Section 01 78 25 – Operation and Maintenance Manuals.

9) Final Record Documents per Section 01 78 39 - Final Record Documents.

4. The value for De-Mobilization, as indicated on the Bid Schedule of Prices, shall not exceed one percent (1%) of the Total Bid Price for the Contract,

excluding the bid values for all Allowance Items. Should the Contractor's bid for de-mobilization exceed 1%, the De-Mobilization Item shall be adjusted to 1% with any overage added to LS-2 Work Result. In no event will the Total Bid Price for the Contract be adjusted because of this re-allocation. Notwithstanding any other Contract Item, Contract Item LS-3 shall not be considered to pay for Work to be paid under other Contract Items included elsewhere in the Contract, and shall be considered in addition to any such other Contract Items. The Contractor shall be paid the De-Mobilization Price in the final payment for the Work, as set forth in Article 45 of the City of New York Standard Construction Contract, after the Resident Engineer has certified that all Work under this item has been satisfactorily completed.

B. Unit Price Items

1. Contract Items UP-1 through UP-19 have been provided on the Bid Schedule as unit prices for the Contract.

   a. Payment under Contract Items UP-1 through UP-19 will constitute full compensation without limitation for all services, labor and materials, necessary to complete a respective unit of work.

   b. The Contractor and the Engineer shall meet and jointly review the Contractor's "pencil copy" of the payment request prior to submission. The payment request shall include the quantity of unit price Work performed during the performance period.

2. Contract Item UP-1 – Epoxy Crack Repair, 1/4-inch and Narrower

   a. Description: The Contractor shall repair cracks ¼-inch and narrower, as specified in Section 03 01 30.71 – Rehabilitation of Cast-in-Place Concrete.

   b. Measurement for Payment: The Contractor shall be paid per linear foot of crack repair. Pre- and Post-crack repair surveys shall define the quantities and be approved by the Engineer. The quantity of crack repair measured for payment shall be the actual length of cracks repaired by the methods and materials as ordered by the Engineer under this item, measured in place within limits designated by the Engineer.

3. Contract Item UP-2 –Flexible Polyurethane Crack Repair

   a. Description: The Contractor shall repair leaking cracks with flexible polyurethane, as specified in Section 03 01 30.71 – Rehabilitation of Cast-in-Place Concrete.

   b. Measurement for Payment: The Contractor shall be paid per linear foot of crack repair. Pre and Post crack repair surveys shall define the quantities and be approved by the Engineer. The quantity of crack repair measured for payment shall be the actual length of cracks repaired by the methods and materials as ordered by the

Engineer under this item, measured in place within limits designated by the Engineer.

4. Contract Item UP-3 – Spall Repair, Depth One Inch or Less (not requiring formwork)

   a. Description: The Contractor shall repair spalls, with depth of one inch or less and not requiring formwork, as specified in Section 03 01 30.71 – Rehabilitation of Cast-in-Place Concrete.

   b. Measurement for Payment: The Contractor shall be paid per square footage of spall repair. Pre and Post spall repair surveys shall define the quantities and be approved by the Engineer. The quantity of spall repair measured for payment shall be the actual square footage of spalls repaired by the methods and materials as ordered by the Engineer under this item, measured in place within limits designated by the Engineer.

5. Contract Item UP-4 – Test Pits

   a. Description: Under this Contract Item, the Contractor shall perform excavation for test pits as directed by the Engineer. The Work shall include excavation of all materials of whatever nature encountered as specified or ordered, including the providing of all sheeting, bracing; modifications of sheeting systems; pumping; bridging; decking; cleaning up; disposal of surplus and rejected excavated material; grading and compacting of subgrades; and all work incidental thereto, all in accordance with Section 02 43 10 – Relocation of Utilities and Section 31 23 16 – Excavation and as directed by the Engineer.

   b. Measurement for Payment: The quantity of earth excavation for test pits to be measured for payment will be the number of cubic yards of material actually excavated, as ordered in writing by the Engineer.

6. Contract Item UP-5 – Tree Consultant

   a. Description: Under this Contract Item, the Contractor shall furnish the services of a Tree Consultant for performing Work outside the property lines of the facilities as specified under Section 01 14 00 – Work Restrictions and Section 31 10 10 - Site Clearing and as directed by the Engineer in accordance with the requirements of the NYC Department of Parks and Recreation Street Tree 6 permit issued by NYC Department of Parks and Recreation.

   b. Measurement for Payment: The quantity to be measured for payment will be the time, measured in person hours, that the Tree Consultant actually performed the specified Work to the satisfaction of the Engineer.

7. Contract Item UP-6 – Maintenance Tree Pruning (Under 12” Cal.)

a. Description: Under this Contract Item, the Contractor shall prune trees outside the property lines of the facilities as shown on the Contract Drawings, as specified, or as directed by the Engineer and in accordance with NYCDOT Specifications 4.18 and the permit issued by NYC Department of Parks and Recreation.

b. Measurement for Payment: The quantity to be measured for payment will be the number of trees (under 12" Cal.) that are actually pruned where directed by the Engineer to the satisfaction of the Engineer.

8. Contract Item UP-7 – Asphaltic Concrete Base for Pavement (NYCDOT)

a. Description: Under this Contract Item, the Contractor shall provide concrete base for pavement as shown on the Contract Drawings, specified under Section 32 12 16.01 Asphalt Paving for NYCDOT ROW, or as directed by the Engineer, including furnishing such samples and cores for testing and to providing such testing equipment, laboratory space and facilities as may be required, and maintaining the concrete base in good condition as specified.

b. Measurement for Payment: The quantity to be measured for payment will be the volume of concrete in cubic yards and the amount to be paid shall be determined from core samples taken by the Contractor after twenty-eight (28) days of curing. Where concrete is laid upon an existing concrete base, the volume of concrete in cubic yards shall be determined from cross sections. determining the volume of concrete to be paid for, the spaces occupied by rails, bases of columns, manhole heads, gate boxes, road boxes and similar structures will be deducted when their superficial areas measure more than one (1) square foot and will not be deducted when they measure one (1) square foot or less.

9. Contract Item UP-8 – Asphaltic Tack Coat (NYCDOT)

a. Description: Under this Contract Item, the Contractor shall prepare the surfaces, spray tack coat, and do all other incidental work as shown on the Contract Drawings, specified under Section 32 12 16.01 Asphalt Paving for NYCDOT ROW, or as directed by the Engineer.

b. Measurement for Payment: The quantity to be measured for payment will be the number of square yards of surface actually tack coated.

10. Contract Item UP-9 – Asphaltic Concrete Wearing Course, 3" Thick (NYCDOT)

a. Description: Under this Contract Item, the Contractor shall provide asphaltic wearing course, 3" thick, as shown on the Contract Drawings, as specified under Section 32 12 16.01 Asphalt Paving for NYCDOT ROW, and as directed by the Engineer, including

furnishing and laying test strips, furnishing samples for testing, and providing such testing equipment, laboratory space and facilities as may be required and to maintain the courses or mixtures, as laid, in good condition as specified.

b. Measurement for Payment: The quantity of asphaltic concrete wearing course laid to 3" thick to be measured for payment will be the area, in square yards incorporated into the Work as shown, as specified, and as directed by the Engineer. In determining the area of wearing course to be paid for, the areas of the spaces occupied by rails, bases of columns, manhole heads, gate boxes, roadway boxes and similar structures will be deducted when they measure more than one (1) square foot and will not be deducted when they measure one (1) square foot or less. The measured quantity will be adjusted for deficiencies in thickness and density. No payment will be made under this Item where the Contractor fails to provide the Engineer with an approved Quality Control Plan and Marshall Design Mix. Also, no payment will be made for any asphalt work placed each work day in which a copy of all test results for gradation, asphalt cement content, and theoretical maximum density and the Marshall plug test results for stability, flow, and air voids were not submitted to the Engineer.

11. Contract Item UP-10 – Reflective Cracking Membrane (18" Wide)

a. Description: Under this Contract Item, the Contractor shall provide reflective cracking membrane (18" wide) as shown on the Contract Drawings, as specified under Section 32 12 16.01 Asphalt Paving for NYCDOT ROW, and as directed by the Engineer.

b. Measurement for Payment: The quantity of reflective cracking membrane to be measured for payment will be the number of linear feet of reflective cracking membrane, 18" wide, actually and satisfactorily installed, excluding overlaps.

12. Contract Item UP-11 – Concrete Curb (27" Deep)

a. Description: Under this Contract Item, the Contractor shall provide concrete curbs (27" deep), including, but not limited to, excavation (other than rock excavation), backfilling, furnishing samples for testing, providing testing, and maintaining the curb in good condition as shown on the Contract Drawings, as specified under Section 32 16 13 – Curbs and Gutters, and as directed by the Engineer.

b. Measurement for Payment: The quantity to be measured for payment will be the length of concrete curb or integral concrete curb and gutter, constructed, completed, in, place, as required, measured along the top of the exposed face of curb. When the proposed adjacent sidewalk is designated to be pigmented, no additional

payment will be made for the cost of pigmenting the concrete curb to match the proposed adjacent pigmented sidewalk in color.

13. Contract Item UP-12 – Straight Steel Faced Concrete Curb (27" Deep)

    a. Description: Under this Contract Item, the Contractor shall provide straight steel faced concrete curbs (27” deep), including, but not limited to, excavation (other than rock excavation), backfilling, furnishing samples for testing, providing testing, and maintaining the curb in good condition as shown on the Contract Drawings, as specified under Section 32 16 13 – Curbs and Gutters, and as directed by the Engineer.

    b. Measurement for Payment: The quantity to be measured for payment will be the number of linear feet of straight steel faced concrete curb constructed, complete, in place, as required, measured along the top of the exposed face of steel.

14. Contract Item UP-13 – Depressed Steel Faced Concrete Curb (27" Deep)

    a. Description: Under this Contract Item, the Contractor shall provide depressed steel faced concrete curbs (27” deep), including, but not limited to, excavation (other than rock excavation), backfilling, furnishing samples for testing, providing testing, and maintaining the curb in good condition as shown on the Contract Drawings, as specified under Section 32 16 13 – Curbs and Gutters, and as directed by the Engineer.

    b. Measurement for Payment: The quantity to be measured for payment will be the number of linear feet of depressed steel faced concrete curb constructed, complete, in place, as required, measured along the top of the exposed face of steel.

15. Contract Item UP-14 – Corner Steel Faced Concrete Curb (27" Deep)

    a. Description: Under this Contract Item, the Contractor shall provide corner steel faced concrete curbs (27” deep), including, but not limited to, excavation (other than rock excavation), backfilling, furnishing samples for testing, providing testing, and maintaining the curb in good condition as shown on the Contract Drawings, as specified under Section 32 16 13 – Curbs and Gutters, and as directed by the Engineer.

    b. Measurement for Payment: The quantity to be measured for payment will be the number of linear feet of corner steel faced concrete curb constructed, complete, in place, as required, measured along the top of the exposed face of steel.

16. Contract Item UP-15 – Concrete Sidewalk on Existing Foundation (Unpigmented), 4" Deep

    a. Description: Under this Contract Item, the Contractor shall construct concrete sidewalk (4” deep), complete in place on existing

foundation material, including, but not limited to, pigment when specified, silicon carbide when specified, curing, excavation (other than rock excavation) and backfilling, to furnish such samples for testing and to provide such testing equipment, laboratory space and facilities as may be required and the cost of maintaining the sidewalk in good condition as shown on the Contract Documents, as specified under Section 32 16 13 – Curbs and Gutters, and as directed by the Engineer.

b. Measurement for Payment: The quantity to be measured for payment will be the area, in square feet, of concrete sidewalk installed. The areas occupied by the tree wells, bases of columns, manhole heads, gate boxes and similar structures will be deducted from the measured area of concrete sidewalk when they measure more than one (1) square foot and will not be deducted when they measure one (1) square foot or less.

17. Contract Item UP-16 – Concrete Sidewalk (Unpigmented), 7" Deep

a. Description: Under this Contract Item, the Contractor shall construct concrete sidewalk (7” deep) complete in place with foundation material , including, but not limited to, pigment when specified, silicon carbide when specified, curing, excavation (other than rock excavation) and backfilling, to construct test standards, to furnish such samples for testing and to provide such testing equipment, laboratory space and facilities as may be required and the cost of maintaining the sidewalk in good condition as shown on the Contract Documents, as specified under Section 32 16 13 – Curbs and Gutters, and as directed by the Engineer.

b. Measurement for Payment: The quantity to be measured for payment will be the area, in square feet, of concrete sidewalk installed. The areas occupied by the tree wells, bases of columns, manhole heads, gate boxes and similar structures will be deducted from the measured area of concrete sidewalk when they measure more than one (1) square foot and will not be deducted when they measure one (1) square foot or less.

18. Contract Item UP-17 – Embedded Preformed Detectable Warning Units

a. Description: Under this Contract Item, the Contractor shall provide embedded detectable warning units in compliance with NYCDOT Specification 4.13DWS, including but not limited to bedding material, job site sample(s), repairs, surface preparation, restoration of substrate surface, and clean up, as shown on the Contract Drawings, and as directed by the Engineer.

b. Measurement for Payment: The quantity to be measured for payment will be the number of square feet, measured to the nearest tenth of a square foot, of embedded preformed detectable warning

units installed to the satisfaction of the Engineer. Payment for items Embedded Preformed Detectable Warning Units will be in addition to payment for the concrete sidewalk pavement item on which the preformed detectable warning unit is installed.

19. Contract Item UP-18 – Concrete-Filled Steel Piles

a. Description: Under this Contract Item, the Contractor shall provide Concrete-Filled Steel Piles as shown on the Contract Drawings, including test piles, as specified in Section 31 62 23.13 – Concrete-Filled Steel Piles and 31 23 64 – Protective Coating for Steel Pile, or as directed by the Engineer, including, pile tips, splices, concrete, test piles, removing damaged or misdriven piles, jetting if permitted, pile surveys and related drawings, pile cut-offs and their disposal off-site, excavating for pile driving, replacing unsuitable materials or for furnishing, placing and compacting fill and backfill material, and all work thereto.

b. Measurement for Payment: The quantities of steel piles in vertical linear feet (VLF) to be measured for payment will be the actual vertical length of piles driven or installed and left in place in conformity with the Contract requirements, including test piles. The linear footage of pile to be measured for payment shall be the length in place below the cutoff elevation measured to the tip.

20. Contract Item UP-19 – Predrilling Concrete-filled Steel Piles

a. Description: Under this Contract Item, the Contractor shall pre-drill concrete-filled steel piles when ordered by the Engineer in accordance with Section 31 62 23.13 – Concrete-Filled Steel Piles.

b. Measurement for Payment: The quantity of predrilling for piles will be per vertical linear foot (VLF) of predrilling measured from the ground surface to the vertical depth of predrilled hole approved by the Engineer.

C. Allowances

1. Allowance Contract Items A-1 through A-4

a. Descriptions of the Work to be performed under the allowances can be found in the related Sections referenced herein. The amounts of the allowances are given in the Bid Schedule of Prices. The Allowances will be included, as listed under this Article, in the Total Bid Price for the Contract.

b. All work under the Allowance items set forth above shall be performed on a Time and Material basis unless otherwise stated. Price to be paid shall be the actual and reasonable cost, calculated in accordance with Articles 26.2.1 through 26.2.13 (excluding Article 26.2.10) and Article 26.3 of the City of New York Standard Construction Contract. The words “Extra Work” in the above

referenced Articles shall be substituted with "Allowances" as outlined in this Section.

2. Contract Item A-1: Unforeseen Hazardous Materials Remediation

   a. Description: Confirmed Suspect/Unforeseen hazardous materials remediation and disposal in accordance with Section 01 35 45 – Hazardous Materials Controls.

   b. Payment to abate and dispose of Asbestos Containing Material (ACM) and resulting Asbestos-Containing Waste Materials produced by this Work will not be made until all required documentation, including the following is provided to the City:

      1) Copies of all NYSDOL and DEP Asbestos Control Program (ACP)-approved Asbestos Project notifications, work permits, Variances, Work Place Safety Plans, and any applicable documentation filed or received from the NYSDOL and DEP ACP, including Notices of Violations (NOV).

      2) Copies of the Asbestos Abatement Contractor's Handling license.

      3) Copies of DEP and NYSDOL Asbestos Handler Supervisor and Asbestos Handler certificates, where applicable, for all workers engaged in the project.

      4) A copy of the Asbestos Abatement Contractor's daily Isolation Barrier book (bound notebook). Copies of laboratory reports and Chain-of-Custody (COC) documents for Worker Exposure Monitoring conducted by the Asbestos Abatement Contractor, including the name, address, and New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) registration number of the laboratory used for air sample analysis (10 NYCRR 55-2).

      5) All data related to bulk sampling, including the results of any asbestos surveys performed by a DEP-certified Asbestos Investigator and NYSDOL-certified Asbestos Inspector, where applicable.

      6) The Asbestos Work Plan submitted and implemented in accordance with the requirements of this Section.

      7) The total quantity of ACM abated.

      8) The start and completion dates of the Asbestos Project(s).

      9) A signed copy of the manifest(s) from the asbestos-permitted landfill with complete COC documentation, certifying the amount of asbestos waste delivered.

10) The name and address of the asbestos waste transporter.

c. Payment for the disposal of Lead Wastes (with the exception of painted/coated scrap metal) will not be made until a signed copy of the manifest from the Treatment, Storage, and Disposal Facility (TSDF), certifying the amount of Lead Waste delivered is returned with complete chain-of-custody (COC) documentation to the NYCDEP.

d. Payment for the disposal of polychlorinated biphenyl (PCB) Wastes will not be made until a signed copy of the manifest from the Treatment, Storage, and Disposal Facility (TSDF), certifying the amount of PCB Wastes delivered is returned with complete chain-of-custody (COC) documentation to the DEP.

e. Payment for disposal of Mercury-Containing Equipment and Material and Mercury Wastes will not be made until a signed copy of the manifest from the recycling facility/Treatment, Storage, and Disposal Facility (TSDF), certifying the amount of mercury-containing equipment and material and mercury wastes delivered is returned to DEP.

3. Contract Item A-2: New Electrical Service Feeder

a. Description: Allowance for electrical service feeder installation costs for the TI-010D Dechlorination Facility and TI-011 Disinfection Facility to Consolidated Edison to provide new electrical service to the termination at customer point of entry as specified in Section 26 05 11 – General Electrical Requirements. Payment under this Allowance will be made based on invoices submitted by Con Edison to the Contractor as approved by the Engineer. Payment to the Contractor shall equal the amount invoiced by Con Edison, with no additional payment for overhead or profit.

4. Contract Item A-3: Unforeseen Non-Gas Utilities

a. Description: Protect-in-place, support, maintain, replace, install and repair or relocate unforeseen non-gas utilities accordance with Section 02 43 10 – Relocation of Utilities.

5. Contract Item A-4: Expanded Work Allowance

a. The Contractor shall only be entitled to payment from this Allowance under the conditions and in accordance with the requirements set forth in Section 01 21 20.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 APPLICATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 27 10 – PROJECT MILESTONES AND SCHEDULING CONSTRAINTS

CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Project Milestones

B. Liquidated Damages

C. Determination of Liquidated Damages

D. Scheduling or Operational Constraints

E. The following index of this Section is presented for convenience:

F.

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1.02 PAYMENT

A. Timely Completion

1. In addition to the period of performance in consecutive calendar days (CCDs) for Substantial Completion of Work, timely completion of work required for project milestones as indicated in Schedule “A” to the General Conditions and as specified in this Section. To encourage timely completion, the City may assess liquidated damages for each of the project milestones set forth herein.

B. Liquidated Damages

1. Liquidated damages will be assessed against the Contractor if the actual time for completion of any milestones fail to occur within the scheduled time for completion of that milestone, plus any time extensions authorized under Paragraph 1.06(A)(5) of this Section, even if the Commissioner has declared the Contractor in Default pursuant to Chapter X of the Standard Construction Contract.

2. For each Project Milestone subject to liquidated damage, the amount of liquidated damages will be determined as follows: the liquidated damages rate, as shown in Schedule A, multiplied by the number of calendar days successful completion occurs after the time for completion, plus any time extensions authorized under Paragraph 1.06(A)(5) of this Section.

3. The Commissioner may, in the exercise of his/her sole discretion, find that the Work specified under the appropriate milestone would have received a determination of completion prior to the actual time of completion and that such determination was precluded solely by actions by the City. The amount of the liquidated damages would be calculated to the date on which the Commissioner finds that the Contractor would have otherwise been entitled to receive a determination of completion.

C. The Combined Sewer Overflow Order on Consent

1. The work under this Contract shall be entirely completed in a manner acceptable to the City within the Period of Performance indicated in Schedule A in the General Conditions. The work to be performed under Contract CSO-FC-DF is subject to the Combined Sewer Overflow Order on Consent, dated January 14, 2005 between New York City Environmental Protection and New York State Department of Environmental Conservation. Within the Order on Consent, a State-mandated milestone date exists for completion of the disinfection facilities for the Flushing Creek TI-010 and TI-011 CSO outfalls by December 31, 2029.

2. In addition to the Liquidated Damage value provided in Schedule A for the Substantial Completion of the Work, the Contractor shall be required to reimburse the City for the payment of any fines imposed by the New York State Department of Environmental Conservation that the City of New York may be subject to, to the extent such fines are incurred as a result of the Contractor's failure to complete the work in a timely manner as noted herein:

   a. The reimbursement amounts will be determined by the Commissioner, in his/her sole and absolute discretion, based upon

his/her evaluation of the Contractor's liability for the City's failure to meet the terms of the Order on Consent.

b. The extent of a Contractor's liability for damages, resulting from the City's failure to meet a Consent Decree imposed milestone, will be assessed by the Commissioner in his/her sole and absolute discretion, based upon his/her evaluation of all delays in meeting the completion dates noted above and the portion thereof, which is directly attributable to the Contractor.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Project Milestones

1. Milestone # 1: Construction Completion

a. Completion of Milestone: December 31, 2029

b. Major Work Activities to be Performed: Flushing Creek CSO TI-010 and TI-011 Disinfection Facilities Construction shall be considered complete when the process-related equipment and facilities are constructed in accordance with the approved plans and specifications, and are placed in operation to meet the applicable SPDES permit requirements. In addition to the foregoing, Respondents shall make all best efforts to place in operation all treatment units and associated automatic controls as soon as they are operable, to maximize treatment as soon as possible, up until the time the Facility complies with its SPDES permit requirements.

1.06 QUALITY ASSURANCE

A. Determination Liquidated Damages

1. The determination of liquidated damages assessment will be made solely by the Commissioner, and his/her decision with respect thereto shall be accepted as final, binding, and conclusive.

2. For the purpose of calculating the number of calendar days for liquidated damages assessment, such calculation shall include the day on which the Contractor has successfully completed the Work under the appropriate milestone, but shall not include the day of scheduled completion.

3. For the purpose of determining the Time for Completion, unless otherwise specified herein, the start date for each milestone shall be the date given for commencing work in the Notice to Proceed (NTP) for the Contract.

4. There will be no limit to the amount of liquidated damage which may be assessed for failure to achieve a Milestone within the Time for Completion.

5. Determination of the amounts of liquidated damage will be made at the time of Final Payment for the project as defined in Article 45 of the Standard Construction Contract. Any such amounts determined shall be paid to the Contractor or credited to the City at this time.

    a. Request for extensions of time for completion for milestones based on delays beyond the Contractor's control shall be submitted at least 90 days in advance in writing to the Commissioner. The Commissioner will have sole authority to approve or deny such a delay request from the Contractor.

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 29 10 – SCHEDULE OF VALUES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Preliminary Schedule of Values (SOV)
2. Final SOV
3. Cross Reference Listing
4. Changes to the SOV
5. Table 1 – Preliminary SOV (Major Work Results)
6. Table 2 – Final SOV (Minimum Detail Required)

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 32 10 – Progress Scheduling

1.04 REFERENCES

A. Schedule of Values: A breakdown of the (Contractor's) lump sum bid price for the Contract or of lump sums bid for items of the Contract, excluding any values associated with mobilization, showing the various operations to be performed under the Contract and the value of each operation, in accordance with Article 41 of the Standard Construction Contract. The Contractor shall also submit such other information relating to the bid breakdown as directed by the Resident Engineer.

B. Logic and Duration Schedule: See Section 01 32 10 – Progress Scheduling for a definition of the term and details of what it requires.

C. Work Result: Permanent or temporary aspect of a construction project achieved in the production stage or by subsequent alteration, maintenance or demolition processes, through the application of a particular skill or trade to construction resources.

1.05 DESCRIPTION

A. The SOV shall be developed in parallel and in coordination with the development of the Logic and Duration Schedule in accordance with the requirements of Section 01 32 10 – Progress Scheduling

B. Partial payments, in accordance with Article 42 of the Standard Construction Contract, will be determined from the Final SOV.

C. Preliminary Schedule of Values

1. The preliminary SOV shall include, as a minimum, the proposed values estimated by the Contractor for the Work of the Contract which shall be indicated in Table 1 – Preliminary SOV attached to this Section.

2. The Contractor and Engineer shall meet and jointly review the preliminary SOV and make adjustments in value allocations if, in the opinion of the Engineer, these are necessary to establish fair and reasonable allocation of values to the Work spread over the term of the Contract. Unbalanced allocations weighted towards the commencement of the Contract term or a specific Contract item will not be permitted. Within 14 days of joint review, Contractor shall submit revised SOV for DEP approval. The Engineer shall review and approve (or return for any necessary revisions) within 14 days from the date of the resubmittal.

D. Final Schedule of Values

1. The minimum required detail of breakdown of the Work of this Contract is indicated in Table 2 – Final Schedule of Values attached to this Section. This list is not intended to be an exhaustive list of work to be performed or items to be installed. Greater detail shall be provided if requested by the Engineer.

2. Approved change orders reflected in the Logic and Duration Schedule shall each be incorporated by the Contractor into the SOV as a single unit identified by the change order number. Depending on the magnitude and duration of the change order work, the unit may require further breakdown for payment as required by the Engineer. The Contractor shall resubmit within 14 days of Change Order approval. The Engineer shall review and approve submission (or return for any additional revisions) within 14 days of receipt of revised SOV.

E. Cross Reference Listing

1. The Contractor shall furnish a cross reference listing in two (2) parts. The first part shall list each scheduled activity with the breakdown of the respective valued items making up the total cost of the activity. The second part shall list the valued item with the respective scheduled activity or activities that make up the total cost indicated. These listings shall be updated and submitted in conjunction with the Logic and Duration Schedule monthly submittals as specified in Section 01 32 10 – Progress Scheduling.

F. Changes to the Schedule of Values

1. Changes to the Logic and Duration Schedule which add activities not included in the original schedule, but included in the original scope of Work (schedule omissions or errors) shall have values assigned in the SOV as approved by the Engineer. Necessary revisions will incorporate the Cross Reference Listing.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Preliminary Schedule of Values

1. The Contractor shall submit a preliminary SOV for the Engineer's approval within 15 days of the commencement date given in the Notice to Proceed.

B. Final Schedule of Values

1. The Contractor shall prepare and submit a final SOV to the Engineer within 90 days of the commencement date given in the Notice to Proceed. The final SOV shall be based on the accepted preliminary SOV for major Work and it must be in sufficient detail to determine monthly progress payments related to the Work performed as shown in the monthly progress schedule update. The Engineer shall be the sole judge of acceptable SOV figures, details and description of the values established. If, as directed by the Engineer, a greater number of items is required, the Contractor shall add the additional items to the SOV and resubmit within 14 days of notification. The Engineer shall review and approve submission (or return for any additional revisions) within 14 days of receipt of revised SOV.

C. Cross Reference Listing

1. A cross reference listing shall be submitted as specified herein, in order to assist in the correlation of the SOV, proposed monthly cash flow (per Article 9 of the New York City Standard Construction Contract), and the Logic and Duration Schedule.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

TABLE 1
PRELIMINARY SCHEDULE OF VALUES
(Major Work Results)

I. CONTRACT

1. LS-1 Mobilization
2. LS-2 Work Result
    i. Area/Process/Location
    ii. Site Construction (Division 02) to Water and Wastewater Equipment (Division 46) as required
3. LS-3 De-Mobilization

TABLE 2
FINAL SCHEDULE OF VALUES
(Minimum Detail Required for Contract CSO-FC-DF)

I. Lump Sum 01 – Mobilization

II. Lump Sum 02 – Work Result

A. TI-010C Chlorination Facility
1. Site Construction Work
   i. Maintenance and Protection of Traffic .....Div. 01
   ii. Existing Conditions.....Div. 02
   iii. Site demolition
   iv. Equipment and piping demolition
   v. Earth Work.....Div. 31
   vi. Excavation
   vii. Fill
   viii. Access Manholes
   ix. Exterior Improvements .....Div. 32
   x. Pavement Restoration
   xi. Utilities.....Div. 33
   xii. Chemical piping, trenchbox and manholes
   xiii. Domestic water piping
   xiv. Fill station drainage piping
2. Concrete .....Div. 03
   i. Chemical fill station pads
   ii. Pump equipment pads
   iii. Containment Pads
   iv. Concrete Repair and Rehabilitation
3. Metals.....Div. 05
   i. Railing modifications
   ii. Structural steel supports
4. Wood, Plastics and Composites.....Div. 06
   i. FRP platforms, stairs, and railings
5. Finishes .....Div. 09
   i. Painting
   ii. Chemical resistant concrete coating
6. Specialties .....Div. 10
   i. Identifying devices
   ii.

7. Process Mechanical Work
   i. Process Interconnections.....Div. 40
      1. Chemical piping and valves
      2. Service water piping and valves
      3. Chemical fill station
      4. Piping insulation and jacketing

5. Piping supports

ii. Process Gas and Liquid Handling, Purifications, and Storage Equip. Div. 43
1. Liquid chemical diffusers
2. Chemical sump pumps
3. Peristaltic pumping units
4. Automatic strainers
5. FRP tank liners

8. Building Mechanical Work
i. Plumbing.....Div. 22
1. Domestic water piping
2. Tepid water piping
3. Heat trace and insulation
4. Hot water tank
5. Eyewash showers
6. Piping insulation and jacketing
7. Piping supports

ii. HVAC .....Div. 23
1. Duct cleaning
2. DC-5 fan replacement

9. Electrical Work .....Div. 26
i. Portable generator
ii. Panelboards
iii. Variable frequency drives
iv. Motor starters
v. Local control stations
vi. Lighting
vii. Conduit and cable
viii. MCC Modifications

10. I&C Work .....Div. 40
i. Process Interconnections
ii. Control panels
iii. Chemical fill panel
iv. Field instruments
v. Telemetry integration
vi. CCTV systems

B. TI-010 Dechlorination Facility
1. Site Construction Work
i. Maintenance and Protection of Traffic .....Div. 01
ii. Existing Conditions.....Div. 02
1. Site demolition
2. Existing utility support and protection

iii. Earth Work.....Div. 31
1. Excavation
2. Fill

iv. Piles

1. Gravel base

v. Exterior Improvements .....Div. 32
1. Perimeter fencing and gates
2. Landscaping
3. Paving
4. Porous paver panels and subsurface storage
5. Sidewalks and Curbs

vi. Utilities.....Div. 33
1. Chemical piping, trench boxes and manholes
2. Domestic water piping
3. Fill station drainage piping
4. Stormwater Piping and manholes
5. Drainage Structures
6. Sanitary sewer piping and manholes
7. Valve boxes
8. Electrical ductbanks and manholes

2. Structural and Architectural Work

i. Concrete .....Div. 03
1. Foundation, grade beams and walls
2. Equipment pads.
3. Concrete fill on metal deck

ii. Masonry .....Div. 04
1. Exterior CMU cavity wall.
2. Interior CMU walls.
3. Façade.

iii. Cast stone base.

iv. Metals.....Div. 05
1. Structural steel framing and roof.
2. Exterior stairs and platforms.
3. Railings, ladders, and grating.
4. Access hatches.
5. Metal Panel System.

v. Wood, Plastics and Composites.....Div. 06
1. FRP grating, railings, platforms, and ladders

vi. Thermal and Moisture Protection .....Div. 07
1. Roofing
2. Roof hatches
3. Waterproofing
4. Insulation
5. Damproofing
6. Wall Panels

vii. Openings .....Div. 08
1. Doors, frames and hardware
2. Windows

viii. Finishes .....Div. 09
1. Painting
2. Chemical resistant concrete coating

ix. Specialties .....Div. 10
1. Identifying devices.
2. Fire extinguishers.

x. Material Processing and Handling Equipment .....Div. 41
1. Monorail and hoisting equipment

3. Process Mechanical Work
i. Process Interconnections.....Div. 40
1. Chemical piping and valves
2. Service water piping and valves
3. Chemical fill station
4. Piping supports

ii. Process Gas and Liquid Handling, Purifications, and Storage Equip. .....Div. 43
1. Liquid chemical diffusers
2. Chemical sump pumps
3. Peristaltic pumping units
4. FRP tanks
5. Automatic strainers
6. Sample pumps

4. Building Mechanical Work
i. Plumbing.....Div. 22
1. Domestic water piping
2. Hot water tank
3. Plumbing fixtures
4. Sanitary waste and vent piping
5. Insulation and jacketing
6. Piping supports
7. Fire protection piping

ii. HVAC .....Div. 23
1. Electric unit heaters.
2. Fans
3. Ductwork and Piping
4. Supports
5. Insulation and Jacketing
6. Controls

5. Electrical Work
i. Electrical .....Div. 26
1. Portable generator
2. Panelboards
3. Variable frequency drives
4. Local control stations
5. Lighting
6. Conduit and cable
7. Electrical ductbanks and manholes
8. Solar panels
9. ATS
10. Electrical feeder

11. Telephone and cellular services

6. I&C Work
   i. Process Interconnections.....Div. 40
   ii. Chemical fill panel
   iii. Control panel
   iv. Field instruments
   v. Cellular services
   vi. Telemetry integration

C. TI-011 Chlorination Facility
   1. Site Construction Work
      i. Maintenance and Protection of Traffic .....Div. 01
      ii. Existing Conditions.....Div. 02
         1. Site demolition
         2. Existing utility support and protection
         3. 128-inch sewer demolition
         4. Bypass pumping and bulkheading
      iii. Earth Work.....Div. 31
         1. Excavation
         2. Fill
         3. Dewatering
         4. Piles
         5. Gravel base
      iv. Exterior Improvements .....Div. 32
         1. Perimeter fencing and gates
         2. Landscaping
         3. Paving
         4. Porous paver panels and subsurface storage
         5. Sidewalks and Curbs
      v. Utilities.....Div. 33
         1. Chemical piping, trench boxes and manholes
         2. Domestic water piping
         3. Fill station drainage piping
         4. Stormwater Piping and manholes
         5. Drainage Structures
         6. Sanitary sewer piping and manholes
         7. Valve boxes
         8. Electrical ductbanks and manholes
         9. Flowable Fill
         10. 128-inch stormwater pipe relocation
   2. Structural and Architectural Work
      i. Concrete .....Div. 03
         1. Foundation, grade beams and walls
         2. Equipment pads.
         3. Concrete fill on metal deck
      ii. Masonry .....Div. 04

1. Exterior CMU cavity wall.
2. Interior CMU walls.
3. Façade.

iii. Cast stone base.

iv. Metals.....Div. 05
1. Structural steel framing and roof.
2. Exterior stairs and platforms.
3. Railings, ladders, and grating.
4. Access hatches.
5. Metal Panel System.

v. Wood, Plastics and Composites.....Div. 06
1. FRP grating, railings, platforms, and ladders

vi. Thermal and Moisture Protection .....Div. 07
1. Roofing
2. Roof hatches
3. Waterproofing
4. Insulation
5. Damproofing
6. Wall Panels

vii. Openings .....Div. 08
1. Doors, frames and hardware
2. Windows

viii. Finishes .....Div. 09
1. Painting
2. Chemical resistant concrete coating

ix. Specialties .....Div. 10
1. Identifying devices.
2. Fire extinguishers.

x. Material Processing and Handling Equipment .....Div. 41
1. Monorail and hoisting equipment

3. Process Mechanical Work

i. Process Interconnections.....Div. 40
1. Chemical piping and valves
2. Service water piping and valves
3. Chemical fill station
4. Piping supports

ii. Process Gas and Liquid Handling, Purifications, and Storage Equip. .....Div. 43
1. Liquid chemical diffusers
2. Chemical sump pumps
3. Peristaltic pumping units
4. FRP tanks
5. Automatic strainers
6. Sample pumps

4. Building Mechanical Work

i. Plumbing.....Div. 22
1. Domestic water piping

2. Hot water tank
3. Plumbing fixtures
4. Sanitary waste and vent piping
5. Insulation and jacketing
6. Piping supports
7. Fire protection piping

ii. HVAC .....Div. 23

1. Electric unit heaters.
2. Fans
3. Ductwork and Piping
4. Supports
5. Insulation and Jacketing
6. Controls

5. Electrical Work

i. Electrical .....Div. 26

1. Portable generator
2. Panelboards
3. Variable frequency drives
4. Local control stations
5. Lighting
6. Conduit and cable
7. Electrical ductbanks and manholes
8. Solar panels
9. ATS
10. Electrical feeder
11. Telephone and cellular services

6. I&C Work

i. Process Interconnections.....Div. 40
ii. Chemical fill panel
iii. Control panel
iv. Field instruments
v. Cellular services
vi. Telemetry integration

III. Lump Sum 03 – De-Mobilization

1. Remove Temporary Water and Sanitary Services .....Div. 01
2. Remove Temporary Electrical Systems.....Div. 01
3. Remove Temporary Field Office Trailers.....Div. 01
4. Remove Traffic Control.....Div. 01
5. Remove Temporary Barriers and Enclosures .....Div. 01
6. Remove Project Signage .....Div. 01
7. Final Cleaning .....Div. 01
8. Operation and Maintenance Manuals .....Div. 01
9. Final Record Documents .....Div. 01

END OF SECTION

SECTION 01 31 10 – PROJECT PARTNERING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall participate in "project partnering" along with DEP and its consultants for this project. The Contractor should also include its major subcontractors and suppliers in partnering so that these participants may "buy-in" to the concept and work cooperatively with other parties on the project.

B. Partnering is considered by DEP to be important to the overall success of this project. It is also important to this project that the Contractor be equally concerned with safety, quality, performance, budget, and schedule and that they will endorse and adopt Partnering as an effective tool for achieving these objectives.

C. Partnering will be effective only if all parties willingly and enthusiastically enter into this cooperative arrangement which is supported by each entity at the highest level in their organizations.

D. Project partnering and goals;

E. Initial workshop and follow-up;

F. Partnering Facilitator and project charter.

G. The following index of this Section is presented for convenience:

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3.02	Installation	6
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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. "Partnering" refers to the team-building required to create mutual trust among the Contractor, subcontractors, representatives of DEP and its consulting firms, and other stakeholders in a construction project, and respect for one another's roles in the project and recognition of the risks inherent in those roles, so that all members of the team (participants) become partners in executing and completing the Work. As a minimum, the participants shall include the following entities in addition to the Contractor and their subcontractors:

1. The Bureau of Engineering Design & Construction (BEDC), which will represent DEP in the project at all times during the period of the project unless otherwise specified herein.
2. The DEP Bureau or Bureaus which are responsible for operating and maintaining the existing or new facility where the project is to take place.
3. The consulting firm or firms, if applicable, which are hired by DEP to design the construction project, including the preparation of the Drawings and Specifications.
4. The consulting firm or firms, if applicable, which are hired by DEP to manage the construction project.

B. The Partnering "Facilitator" is the mutually agreed upon professional selected to initiate the Partnering effort and assist with the Partnering workshops and other activities as specified herein and as required.

1.05 DESCRIPTION

A. Project Partnering & Goals

1. To be successful, this project must achieve the following goals:
   a. Construction meets the project performance standards as defined in the Drawings and Specifications;
   b. Completion of the project on schedule;
   c. Conformance to budgetary requirements and limitations.
2. Safety, profit, liability limitation, avoidance of litigation, reputation, good will, and other factors are also of significant importance to participants involved in the project.

3. Through Partnering, the participants will agree among themselves as to the primary goals for the project and the methods that will be used to accomplish them. This will require development of a trust relationship, not an adversarial one, among these parties who will be working closely and cooperatively for the duration of the project.

4. Commitment, communication and conflict resolution must be of highest importance for this relationship to succeed. The parties mutually will develop a communication framework and a procedure for addressing conflicts that may arise during the performance of the Work.

   a. Nothing in this Section shall change or modify any other provisions of the Contract.

B. Initial Workshop & Follow-Up Meetings

1. The Contractor shall hold an initial workshop and conduct follow-up meetings, as required under this Article, to facilitate Project Partnering.

2. Initial Workshop: Partnering will include an initial workshop in which the basic requirements for the Partnering relationship will be established. The workshop will be held within 30 days of issuance of the Notice to Proceed (NTP) at a time and date agreed upon by all parties at the site of the work or a mutually agreed upon location. Attendees at the Partnering workshop shall typically include:

   a. Contractor/subcontractors Representatives:

      1) Project Director;

      2) Project Manager;

      3) Superintendent.

   b. DEP Representatives:

      1) Assistant Commissioner(s);

      2) Director(s);

      3) Operating Bureau Chiefs;

      4) Portfolio Manager;

      5) Design; Liaison

      6) Accountable Manager;

      7) Engineers

   c. Construction Management (CM) Consulting Firm Representatives:

      1) Project Director;

      2) Project Manager;

      3) Engineers.

d. Design Engineering Consulting Firm Representatives:

1) Project Director;

2) Project Manager;

3) Engineers

3. Follow-up Meetings: Quarterly half-day Partnering sessions shall be held throughout the project in order to confirm the relationship and assure the Partnering effort continues to be successful. The intent of the on-going sessions is to maintain communication between the key parties and to resolve higher order issues that require decisions at the executive level and areas for improvement. It is not meant to replace the routine project progress meetings or the normal flow of the project.

C. Partnering Facilitator & Project Charter

1. The Contractor shall employ a Partnering Facilitator who will help establish and monitor the Partnering relationship. The Contractor shall pay all costs associated with employing the Partnering Facilitator.

2. The Partnering Facilitator shall initiate the Partnering effort and conduct the Partnering workshops. The Contractor shall pay all costs for facilities used to conduct the workshops.

3. Selection of the Facilitator

a. As soon as practicable after award of the Contract, the City and the Contractor shall meet to discuss the establishment of the formal Partnering process.

b. The Contractor shall propose up to three (3) candidates to select from as Partnering Facilitator.

c. The City and the Contractor shall mutually select one (1) of the three (3) candidates to be the Facilitator.

4. The Facilitator shall develop a project Charter with input from all parties. The Charter shall include, but not be limited to:

a. Statement of goals and objectives for the construction project;

b. Identification of all project participants and descriptions of their roles in the project;

c. The procedures for communicating both normal progress of Work and any barriers to meeting project goals and objectives;

d. A process for resolving conflicts that may arise during the performance of Work. This process is not intended nor shall it be deemed to affect or replace the dispute resolution process set forth in Article 27 of the Standard Construction Contract.

1.06 QUALITY ASSURANCE

A. The Facilitator shall be trained in the recognized principles of Partnering by an accredited institution such as the International Partnering Institute, Associated General Contractors of New York State, or possess equivalent qualifications as determined by DEP.

B. The Facilitator shall have the following professional experience and qualifications:

1. At least five (5) years' experience in Partnering facilitation with a demonstrated track record, including public sector construction; and,

2. Skill set that includes some or all of the following; construction management, negotiations, labor management mediation, and/or human relations.

1.07 SUBMITTALS

A. Within 30 days after the NTP, the Contractor shall provide the resumes of the proposed candidates to select from as Partnering Facilitator containing their full names, contact information, and the following verifiable information:

1. Certification or training;

2. Experience and qualifications;

3. Past facilitation participation.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 01 31 15 – PROJECT COORDINATION
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Contractor Cooperation

B. Coordination Drawings

C. Final Coordination Drawings

D. Project Meetings

E. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 32 10 – Progress Scheduling

B. Section 01 35 27 – Environmental, Health and Safety Requirements

C. Section 01 35 45 – Hazardous Materials Control

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Contractor Cooperation

1. The Contractor shall not interfere with DEP or its contractors, consultants, or agents from entering the Work Site for the purpose of constructing, operating, maintaining, removing, repairing, altering or replacing such pipes, sewers, conduits, manholes, wires, poles, or other structures and appliances which may be required to be installed at or in the Work. The Contractor shall cooperate with all the aforesaid parties and shall allow reasonable provisions for the prosecution of any other work by the City, or others, to be done in connection with the Work, or in connection with normal use of the facilities.

2. The Contractor shall cooperate fully with the City, the Engineer, and Other Contractors employed on the Work, to effect proper coordination and progress to complete the project on schedule and in proper sequence. To the extent possible, decisions of all kinds required from the Engineer shall be anticipated by the Contractor to provide ample time for inspection, or the preparation of instructions.

B. Coordination Drawings

1. Coordination Drawings, including point-to-point field wiring diagrams, shall be completed, within 90 days from the date for the start of Work given in the Notice to Proceed.

2. Coordination Drawings, including point-to-point field wiring diagrams, shall be initiated, completed and submitted for distribution so as not to delay the construction.

3. In addition to any reproducible prints required to be furnished or submitted, the Contractor shall submit electronic AutoCAD (latest version) drawings. This shall also include all pertinent files relating to the drawings such that the drawings can be replicated or edited on any computer that uses AutoCAD (latest version).

4. The Contractor shall initiate coordinating the installations of all the Subcontractors (HVAC, Electrical, Plumbing) by means of Coordination Drawings, as specified herein. The Coordination Drawings may lack complete data in certain instances pending receipt of shop drawings, but sufficient space shall be allotted for the items affected. When final information is received, such data shall be promptly inserted on the Coordination Drawings.

5. The Contractor shall initiate coordinating the electrical installations of all the Subcontractors (HVAC, Plumbing, and Electrical) by means of the Point-to-Point Field Wiring Diagrams. In certain instances these diagrams may lack complete data on all conduits and wiring pending receipt of shop drawings, but sufficient conduits and wiring shall be allocated for the items affected. When final information is received, such data shall be promptly inserted on the Point-to-Point Field Wiring Diagrams.

6. In preparation of all the Coordination Drawings, composite drawings, large-scale details as well as cross and longitudinal sections shall be made as required, or as directed by the Engineer, to fully delineate all conditions. Particular attention shall be given to the locations, size and clearance dimensions of equipment items, shafts, sleeves, and similar features. In preparing the Coordination Drawings, minor changes in duct, pipe or conduit routings that do not affect the intended function may be made as required to avoid space conflicts, when mutually agreed, but items may not be resized or exposed items relocated without the Engineer's approval. No changes shall be made in any wall or chase locations, ceiling heights, door swings or locations, windows or other openings, or other features affecting the function or aesthetic effect of the building. If conflicts or interferences cannot be satisfactorily resolved, the City shall be notified and its decision obtained.

7. At the completion of the coordination meetings, and after all necessary changes have been made, the Engineer will hold a final coordination meeting, where these Coordination Drawings shall be signed-off by the Contractor and each of the Subcontractors, indicating their awareness of, and agreement with, the indicated routings, layouts and wiring and their inter-relationship with the adjoining or contiguous Work of all trades. Thereafter no unauthorized deviations will be permitted and if made without the knowledge or agreement of the Engineer or other affected Subcontractors, will be subject to removal and correction at no additional cost to the City.

C. Project Meetings

1. The Contractor shall attend Project meetings, including but not limited to the following:

a. Pre-construction Meeting

1) Upon receipt of a copy of the Notice to Proceed, or at an earlier time if agreeable to the Contractor, the Engineer will arrange a pre-construction meeting. Attendees shall include: the Contractor's project representative authorized to act on behalf of the Contractor and to direct the performance of Work by the Contractor’s employees and agents; the Contractor's superintendent; major subcontractors; the

Engineer; DEP representatives; and others involved in the execution of the Work.

2) The purpose of this meeting will be to establish a working relationship and understanding between the parties and to discuss project organization, job communications, construction schedule, submittals and processing, Schedule of Values, payment procedures, Extra Work procedures, safety requirements, permits and inspections, and such other subjects as may be pertinent for the execution of the Work.

b. Monthly Status Meetings

1) Upon commencement of Work at the Site or earlier as directed by the Engineer, the Contractor shall attend the project status meetings on a monthly basis (or as required by the Engineer). The Engineer will arrange and conduct these meetings and will prepare and circulate an agenda for each meeting. A representative of the Contractor approved by the Engineer shall attend these meetings.

2) The status of outstanding submittals will be reviewed to determine anticipated dates of any submittals yet to be provided, and the status of those submittals under review by DEP. The status and progress on resolving any outstanding requests for change orders. The status of any other items that could have a significant impact upon the course of the Work will also be reviewed and discussed.

c. Monthly and CPM Progress Meetings: These meetings shall be carried out in accordance with Section 01 32 10 – Progress Scheduling.

d. EHS Coordination Meetings: These meetings shall be carried out in accordance with Section 01 35 27 – Environmental, Health and Safety Requirements.

e. Special Coordination Meetings

1) During the course of performing the Work, attend special coordination meetings in advance of commencing certain work activities as specified or directed by the Engineer, including but not limited to the following:

a) Specific requirements for coordination meetings are included in Section 01 35 45 – Hazardous Materials Control.

2) DEP will determine the need for additional special coordination meetings and convene such meetings with written notice to the Contractor.

3) The Contractor shall attend and participate in these special coordination meetings at no additional cost to the City.

1.06 QUALITY ASSURANCE

A. Work on Coordination Drawings

1. All Work on the Coordination Drawings shall be performed in a clear, legible manner. The Engineer shall be the sole judge of the acceptability of the Coordination Drawings.

B. All changes in the Work on any Contract, whether a change in price is given or not, shall be shown on the Coordination Drawings.

1.07 SUBMITTALS

A. Final Coordination Drawings

1. After the final Coordination Drawings have been agreed upon and signed by the Contractor and all Subcontractors, the Contractor shall provide and distribute fifteen (15) copies to the Engineer, for reference and record purposes.

2. The record copies of final Coordination Drawings shall be retained by the Contractor and each Subcontractor as a working reference. All Shop Drawings, prior to their submittal to the Engineer, shall be compared with the Coordination Drawings and developed accordingly by the Contractor or Subcontractor responsible. Any revisions to the Coordination Drawings which may become necessary during the progress of the Work shall be noted by the Contractor and all Subcontractors and shall be neatly and accurately recorded on the record copies. The Contractor and each Subcontractor shall be responsible for the up-to-date maintenance of his own record copies of the Coordination Drawings and to keep one copy available at the Site.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 01 31 19 – PROJECT MEETINGS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Project Meetings

1. The Contractor shall attend Project meetings, including but not limited to the following:

a. Pre-construction Meeting

1) Upon receipt of a copy of the Notice to Proceed, or at an earlier time if agreeable to the Contractor, the Engineer will arrange a pre-construction meeting. Attendees shall include: the Contractor's project representative authorized to act on behalf of the Contractor and to direct the performance of Work by the Contractor's employees and agents; the Contractor's superintendent; major subcontractors; the Engineer; DEP representatives; and others involved in the execution of the Work.

2) The purpose of this meeting will be to establish a working relationship and understanding between the parties and to discuss project organization, job communications, construction schedule, submittals and processing, Schedule of Values, payment procedures, Extra Work procedures, safety requirements, permits and inspections, and such other subjects as may be pertinent for the execution of the Work.

3) A schedule of regular meetings will be established at the Pre-construction meeting.

b. Monthly Status Meetings

1) Upon commencement of Work at the Site or earlier as directed by the Engineer, the Contractor shall attend the project status meetings on a monthly basis (or as required by the Engineer). The Engineer will arrange and conduct these meetings and will prepare and circulate an agenda for each meeting. A representative of the Contractor approved by the Engineer shall attend these meetings.

2) The status of outstanding submittals will be reviewed to determine anticipated dates of any submittals yet to be provided, and the status of those submittals under review by DEP. The status and progress on resolving any outstanding requests for change orders. The status of any other items that could have a significant impact upon the course of the Work will also be reviewed and discussed.

c. Monthly and CPM Progress Meetings: These meetings shall be carried out in accordance with Section 01 32 10 – Progress Scheduling.

d. EHS Coordination Meetings: These meetings shall be carried out in accordance with Section 01 35 27 – Environmental, Health and Safety Requirements.

e. Special Coordination Meetings

1) During the course of performing the Work, attend special coordination meetings in advance of commencing certain work activities as specified or directed by the Engineer, including but not limited to the following:

a) Specific requirements for coordination meetings are included in Section 01 35 45 – Hazardous Materials Control.

2) DEP will determine the need for additional special coordination meetings and convene such meetings with written notice to the Contractor.

3) The Contractor shall attend and participate in these special coordination meetings at no additional cost to the City.

2. Contractor Representation

a. A Contractor's project representative shall be required to attend all meetings scheduled by the Engineer, as set forth above.

b. If the Contractor's project representative fails to attend two scheduled meetings without prior approval, the Contractor will be directed to replace the current Contractor's project representative. Further incidents of non-attendance by the Contractor's project representative will form the basis for review of the Contractor's PASSPort performance evaluation.

B. Quality Assurance

B. Not Used.

1.06 SUBMITTALS

A. Not Used

1.07 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.08 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.09 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 01 31 25 – WEB BASED PROJECT MANAGEMENT INFORMATION SYSTEM
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the requirements for the Contractor's use of DEP's web-based Enterprise Project Management Information System ("EPMIS" or "the System") to manage all Project communications, workflows and document submittals.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 32 10 – Progress Scheduling

B. Section 01 33 00 – Submittal Procedures

C. Section 01 78 42 – Records in Electronic Formats.

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Use and Operation of the System:

1. The Contractor shall utilize EPMIS for electronic submittal of all data and documents throughout the duration of the Contract.

2. The System is required for use by all participants in the Project including DEP, the Construction Manager, Engineer, Contractor, and all other users authorized by DEP.

3. The System will operate primarily on an e-Builder, Inc. (www.e-builder.net) platform that will be administered by DEP and the Construction Manager. Joint use of the System will facilitate electronic exchange of information, automation of key processes, and overall management of the Contract.

4. The System shall be the primary means of Project information submission and management. When required by DEP or its representatives, paper documents shall also be provided.

B. User Access Limitations and Data Ownership

1. DEP, the Construction Manager and the Engineer will control access to the System by allowing access and assigning user profiles to authorized Contractor and Project personnel. User roles will define levels of access to the System, and determine assigned role-based authorizations and user privileges. Subcontractors and suppliers will be given access to the System through the Contractor. Entry of information exchanged and transferred between the Contractor and its Sub-contractors and suppliers through the System shall be the responsibility of the Contractor.

2. Secure username and password will be required for controlled access to the System for all authorized participants via a web URL address. The Contractor shall designate its staff to be granted access to the System.

3. Data entered in a collaborative mode (entered with the intent to share as determined by permissions and workflows within the System) by DEP and its representatives and the Contractor will be owned by DEP.

C. Automated System Notification and Audit Log Tracking

1. Any review comments made (or the failure to make review comments) by DEP and its representatives on Contractor-submitted documentation shall not relieve the Contractor of responsibility for compliance with the requirements of the Contract Documents. The Contractor is responsible for managing, tracking, and documenting the Work to comply with the requirements of the Contract Documents. The City's acceptance through

automated System notifications or audit logs extends only to the fact that the documentation was submitted and does not constitute substantive approval of the Contractor's submitted information.

D. Computer Requirements

1. The System will have a minimum bandwidth of 4MB/s download and 1MB/s upload. A faster connection is recommended (1.5MB per concurrent user should be used as a planning factor) and may be used, but uploading time considerations by the Contractor when uploading pictures and files to the System shall be based on the bandwidth defined herein.

2. Once implemented on the project, if the System does not meet its minimum performance standards, as listed below, the Contractor shall make the corrections necessary to its computers or network until the standards are met.

3. The required minimum EPMIS performance standards, and the higher, recommended levels of performance, are as follows:

   a. File download speed

      1) One (1) second per MB of data recommended (e.g., one (1) 20MB file should download in less than 20 seconds)

      2) Five (5) seconds per MB of data minimum (e.g., one (1) 20MB file must download in less than 100 seconds)

   b. File upload speed

      1) One (1) second per MB of data recommended (e.g., one (1) 20MB file should upload in less than 20 seconds)

      2) Five (5) seconds per MB of data minimum (e.g., one (1) 20MB file must upload in less than 100 seconds)

4. The Contractor shall use computer hardware and software that meets the requirements of the System. Computers shall be less than three (3) years old. As recommendations are modified by the System provider, the System will be upgraded to meet those recommendations or better. Any need for upgrading of the Contractor's computer systems will not be justification for a cost or time modification to the Contract.

5. The Contractor shall ensure that its authorized System users have access to the public internet from a computer system running a currently supported Microsoft Windows operating system and Microsoft Edge web browser. The connection to the internet should be high speed (broadband) as described under “Computer Requirements,” above. The Contractor shall ensure that anti-virus and anti-malware software is installed and maintained on all computers given access to EPMIS.

E. Contractor Responsibilities

1. The Contractor shall be responsible for the validity of its information placed in the System and for the abilities of its personnel to use the System. Accepted users shall be knowledgeable in the use of computers, including internet browsers, email programs, CAD and Revit drawing applications, and Adobe portable document format (PDF) document conversion programs. The Contractor shall utilize the existing forms and processes in the System to the maximum extent possible. If an additional form is required that does not exist in the System, the Contractor shall request approval to develop such form or for one to be provided by DEP. Adobe PDF documents will be created through electronic conversion rather than optically scanned. The Contractor, in coordination with the Construction Manager, is responsible for the training of its personnel in the use of the System (beyond what is provided by DEP) and of the other programs indicated above, as needed.

2. DEP owns EPMIS, and will provide initial training and rollout services after Contract award. DEP will provide overall System administration during the Contract period. The Construction Manager will have a System administrator for the project with limited System administration support responsibilities, including ongoing training of the Contractor team.

3. The Contractor shall provide a list of its key personnel designated for access to the System for the City's approval. The Contractor is responsible for timely notifying the City and the Engineer of any changes in personnel that require adding or removing authorized users from the System. DEP reserves the right to perform a security check on all potential users. The Contractor may be given the rights to provide System access to additional personnel or Subcontractors.

4. The System user license fees will be paid by DEP.

F. Connectivity

1. EPMIS is a web-based environment and therefore subject to the inherent speed and connectivity problems of the internet. The Contractor is responsible for its own connectivity to the Internet. The System's response time is dependent on the equipment used to access it, including processor speed, internet access speed, etc. and current traffic on the internet. The City will not be liable for damages resulting from any delays associated with the use of the System including, but not limited to: slow response time, downtime periods, connectivity problems, or loss of information. Moreover, such delay shall not be deemed a sufficient basis for a time extension of or cost adjustment to the Contract.

G. Training

1. DEP, through the System vendor or the System vendor's qualified representative, will provide on-site training in the use and functionality of the System. Training sessions will be provided for employees of the

Construction Manager, Engineer, the City, and the Contractor. Each training session will be for a duration of eight (8) hours. The Contractor shall have two (2) qualified persons attend the training. One (1) refresher training session will be provided upon request.

1.06 QUALITY ASSURANCE

A. All Contractor representatives participating in workflows and EPMIS processes (e.g. RFIs, submittals, Non Conformance Reports, etc.) shall have a minimum of three (3) years of experience in the use of Microsoft Word and Excel. The Contractor's Document Control Specialist shall be experienced and trained in the use of entering and monitoring documentation into a web-based document management system, e.g., e-Builder, Meridian Prolog, Oracle-Primavera Contract Manager, or an equivalent system. The Document Control Specialist shall be knowledgeable of the status of all Contract documentation aspects of the work throughout the term of the Contract.

1.07 SUBMITTALS

A. Within thirty (30) calendar days of issuance of the Notice to Proceed, the Contractor shall submit for approval by the Engineer a list of the Contractor's and its Subcontractors' key personnel who have been designated to have access to the System. The list shall include descriptions of the designated individual's roles and responsibilities for this Project. The Contractor should also identify its organization's System administrator on the list.

B. The Contractor shall submit the name and qualifications of its designated Document Control Specialist. Any change in the individual serving as Document Control Specialist shall be submitted to and coordinated with the Construction Manager.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. System Utilization

1. The System shall be utilized in connection with all submittal preparation and information management required under this Contract. Requirements contained in this Article are in addition to the applicable submittal and documentation requirements of other Sections of the Specifications, including without limitation, Section 01 33 00 – Submittal Procedures and Section 01 78 42 – Records in Electronic Formats.

2. All submittals detailed in design drawings and related specifications shall be submitted by the Contractor as CAD or Revit files (in .dwg or .rvt format) and PDF files through the System submittal workflow process.

3. Shop Drawing and design data documents shall be submitted as CAD or Revit files (in .dwg or .rvt format) and PDF files through the System submittal work flow process. Examples of Shop Drawings include, but are not limited to:

   a. Standard manufacturers' installation drawings;

   b. Drawings prepared to illustrate portions of the Work designed or developed by the Contractor;

   c. Steel fabrication, piece, and erection drawings.

4. Product catalog data and manufacturers' instructions shall be submitted as PDF files through the System submittal workflow process. The PDF files should be the original, searchable PDF files from the manufacturer and not scanned files which are not searchable. Examples of product data include, but are not limited to:

   a. Manufacturers' printed literature;

   b. Preprinted product specification data and installation instructions.

5. All correspondence and pre-construction administrative submittals shall be submitted using the System. Examples of administrative submittals include, but are not limited to the following:

a. Digging permits and notices for excavation;

b. Requests for Deviation (RFDs) for product substitutions;

c. List of contact personnel;

d. Notices for roadway interruption, Work outside of Normal Project Working Hours, and utility cut overs;

e. Requests for Information (RFIs);

f. Network Analysis Schedules and associated reports and updates;

g. Each schedule submittal specified in Section 01 32 10 – Progress Scheduling shall be submitted as a native backed-up file (.PRX or XER) of the scheduling program being used. The schedule will also be posted as a PDF file in the format specified in Section 01 32 10 – Progress Scheduling.

h. Plans for safety, demolition, environmental protection, and similar activities;

i. Quality control plan(s), testing plan and log, quality control reports, production reports, quality control specialist reports, preparatory phase checklist, initial phase checklist, field test reports, summary reports, rework items list, etc.;

j. Meeting minutes for quality control meetings, progress meetings, pre-installation meetings, etc.;

k. Any general correspondence submitted.

6. Compliance submittals such as test reports, certificates, and manufacturer's field report submittals shall be submitted through the System as PDF attachments. Examples of compliance submittals include, but are not limited to:

a. Field test reports;

b. Quality control certifications;

c. Manufacturers' documentation and certifications for quality of products and materials provided.

7. Record submittals such as operation and maintenance data and closeout submittals shall be submitted through the System as PDF documents during the approval and review stage as specified, with a hard copy (paper) set of documents submitted for final. Examples of record submittals include, but are not limited to:

a. Operation and maintenance manuals: final documents shall be submitted as specified;

b. As-Built Drawings: final documents shall be submitted as specified;

c. Extra materials, spare stock, etc.: submittal forms shall indicate when actual materials are to be submitted;

8. Financial submittals, such as Schedule of Values, pay estimates and change order request proposals, shall be submitted through the System. Supporting material for pay estimates and change order requests shall be submitted through the System as PDF attachments. Upon acceptance of corrected "pencil copies" of payment estimates, hard copies shall be submitted for processing. Examples of financial submittals include, but are not limited to, the following:

   a. Contractor's Schedule of Values;

   b. Contractor's monthly progress payment requests

   c. Contract change order proposals requested by the City.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 01 32 10 – PROGRESS SCHEDULING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. CPM and Project Schedule Software
2. Work Breakdown Structure (WBS)
3. Activities and Activity Code Structure
4. Sequence and Interdependence of Work Activities
5. Project Calendars
6. Activity Labor and Resource Data
7. CPM Progress Meeting and Reports
8. Remedial Measures and Recovery Schedule
9. Exhibit 1 - Work Breakdown Structure
10. Exhibit 2 - Activity ID Format
11. Exhibit 3 – Schedule Milestones
12. Exhibit 4 – Proposed Activity Codes
13. Exhibit 5 – Project Calendars

B. The following index of this Section is presented for convenience:

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3.04 Startup / Demonstration 19
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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Activity - A representation of a discrete portion of the overall scope of Work or an event through Duration and description.

B. Baseline Construction Schedule - The planned, detailed Critical Path Method (CPM) schedule of activities, including all Logic, Durations, Resource and Cost Loading, and showing the entire scope of Work, which has been accepted by DEP.

C. Critical Path Method (CPM) - A management technique used to plan and control a project which combines all relevant information into a single plan defining the sequence and duration of operations, and depicting the interrelationship of the Work elements required to complete the project. The critical path is defined as the longest sequence of activities in a network which establishes the minimum length of time for accomplishment of the end event of the project.

D. Current Construction Schedule - The most recently updated schedule that captures progress to date and forecasts the Early Start/Early Finish for each Activity and the remaining cash flow, depicted with the open bar chart activity line with corresponding schedule dates shown.

E. Data Date - The date used as a starting point for scheduling calculations. The Data Date is changed to the current end of period date when a schedule is updated for progress.

F. Duration - The amount of time, in workdays, an Activity will take to perform once begun and continuously performed until complete.

G. Early Finish - The earliest estimated date an Activity is calculated to be complete, based on the estimated performance of all prior Activities to which the Activity is logically connected in a progressive relationship.

H. Early Start - The earliest estimated date an Activity is calculated to begin, based on the estimated performance of all prior Activities to which the Activity is logically connected in a progressive relationship.

I. Float - The calculated amount of time that the estimated start or finish of an Activity can be delayed without impacting the start or finish of other downstream Activities logically connected in a progressive relationship.

J. Fragnet - Fragmentary network: a portion of the project schedule detailing impacts of an event on specific Activities in the broader schedule.

K. Late Finish - An estimate of the latest plausible date an Activity's completion can be postponed until without rendering as unachievable the required completion of any downstream milestones to which the Activity is Logically connected to in a progressive relationship.

L. Late Start - An estimate of the latest plausible date an Activity's start can be postponed until without rendering as unachievable the required completion of any downstream milestones to which the Activity is Logically connected to in a progressive relationship.

M. Logic - A direct progressive relationship between Activities where one Activity's performance restricts the performance of another Activity.

N. Original Duration - The estimated amount of time, in workdays, an Activity is expected to take to complete at the beginning of a project as anticipated by the Contractor based on its planned means and methods at time of bid and documented in the Baseline Construction Schedule.

O. Percent Complete - The percentage of the scope of Work represented by an Activity completed as of the Data Date calculated by dividing the progress earned by the budgeted value.

P. Remaining Duration - The amount of time, in workdays, the remaining scope of Work represented by an Activity is expected to take to complete at the current Data Date

Q. Resource and Cost Loading - Values assigned for estimated manpower, equipment and/or materials necessary to complete the scope of Work represented by a specific Activity.

R. Total Float - The amount of time the start or finish of an Activity can be delayed without affecting the project completion date.

S. Work Breakdown Structure (WBS) - A deliverable-oriented decomposition of a project into smaller components. A WBS also provides the necessary framework for detailed cost estimating and control along with providing guidance for schedule development and control.

1.05 DESCRIPTION

A. CPM & Project Schedule Software

1. Critical Path Method – The CPM type construction schedule will be used to monitor Contract progress. The Contractor shall be responsible for providing all information concerning the sequencing, Logic and Duration of all Activities as well as providing the electronic schedule file produced in the Primavera Project Management (.xer) format. Once the initial Baseline Construction Schedule is accepted by the Engineer, the Contractor shall be responsible for preparing and submitting monthly update information regarding schedule Logic, physical Percent Complete, actual

start and finish dates, duration changes to actualized activities, added Activities, change orders and related reports and schedules, including the updated Primavera Project Management (.xer) format electronic file.

B. Work Breakdown Structure (WBS)

1. WBS is a deliverable-oriented decomposition of a project into smaller components. A WBS also provides the necessary framework for detailed cost estimating and control along with providing guidance for schedule development and control. The WBS depicted in **Exhibit 1**, attached to this Section, reflects the minimum structure needed for reporting and the Contractor is expected to define and add additional lower levels as needed.

C. Activities

1. Activities included in the CPM schedule shall be of sufficient detail to assure adequate planning and execution of the Work, such that, in the judgment of the Engineer, it provides an appropriate basis for forecasting, monitoring and evaluating the progress of the Work.

a. Activities shall conform to the following requirements:

1) Subdivide the total scope of Contract Work into Activities of Duration no longer than twenty working days each, except as to non-construction activities (such as purchase of materials, delivery of materials, delivery of equipment and concrete curing) and any other Activities for which the Engineer may approve longer Duration. The Duration of the Activities representing the Engineer's approval of items such as shop drawing submittals, drawing submittals, requests for manufacturer approval, requests for Subcontractor approval, etc. shall not be less than twenty-one calendar days but may be longer if the detail and complexity of the submittal warrant.

2) The construction time as determined by the CPM schedule from Early Start to Late Finish for any sub phase, phase or the entire project shall not exceed the Contract time specified or shown in the Contract Documents.

3) One day shall be the smallest time unit shown unless otherwise directed by the Engineer.

4) Activity descriptions shall contain consistent terminology such that the scope of Work represented is readily identifiable for assessment of completion.

5) Activities labeled "start," "continue," or "complete," will not be allowed. Lead and lags are not acceptable.

6) Show the following on each Activity, as directed by the Engineer:

a) Activity number consistent with Engineer's provided template and in accordance with **Exhibit B**, attached to this Section.

b) Complete (self-explanatory) description of the Work represented by the Activity stated in a verb, noun, and location format.

c) Duration in days.

d) Labor hours required to accomplish scope represented by the Activities. Labor hours are to include all direct labor, by trade, required for Activities representing construction.

e) Physical quantity of material to be installed (cubic yard of concrete, linear feet of pipe, etc.) for items directed by the Engineer and in accordance with this Section.

f) Other Activity coding as directed by the Engineer to define the Activity's scope, constraints, responsibility or other requirements.

g) Completed coding and organization of data and schedule information in accordance with the Activity Code Structure requirements provided in this Section and approved by the Engineer.

2. All Activities, with the exception of the Notice to Proceed (NTP) and Substantial Completion, shall have a predecessor and successor. No open-ended Activities will be permitted.

3. The construction schedule shall contain Activities representing contractual and non-contractual milestones as designated by the Engineer and detailed in **Exhibit 3**, attached to this Section.

D. Activity Code Structure

1. Activity codes proposed for scheduling Work progress under the Contract are shown on **Exhibit 4**, attached to this Section.

2. Activity codes should be defined as project Activity codes, not global Activity codes.

3. The Contractor shall break the Work into Activities in accordance with the specified coding structure and in accordance with the Contract Drawings and Specifications. The selection of Activities and the coding structure shall be subject to the review and acceptance by the Engineer.

4. The coding shall follow the designation conventions outlined above and shall include identification of subcontractors, suppliers/vendors and fabricators, and other parties reporting to the Contractor.

a. The Contractor is required to develop other Activity codes and values needed to comply with the reporting requirements listed in this Section, subject to acceptance by the Engineer.

5. The Engineer will provide the Contractor with a system of identification numbers that shall be used for CPM schedule numbering system and project coding. Additional coding required by the Contractor may be added to the network to supplement that supplied by the Engineer.

6. Activity IDs will conform to the format detailed in **Exhibit 2**, attached to this Section, or as directed by the Engineer.

E. Sequence and Interdependence of Work Activities

1. The CPM schedule shall indicate the Logic of Activities. It shall include, but not be limited to, the following items as appropriate to the Contract:

a. Contractor working drawing preparation and review by the Engineer;

b. Materials, Equipment, and Systems:

1) Vendor submittal/approval;

2) Shop drawing submittal/approval;

3) Release for fabrication;

4) Fabrication period;

5) Witness shop test;

6) Delivery;

7) Installation;

8) Preliminary test;

9) Final test;

10) Operation and Maintenance (O&M) manuals submittal/approval;

11) Equipment training plans and procedures submittal/approval;

12) Equipment training;

13) Systems training plans and procedures submittal/approval;

14) Systems training.

c. Shop and field performance tests and supervisory service Activities;

d. Mobilization and move-in;

e. Preparing and coordinating drawings;

f. Obtaining all required permits;

g. Inspections;

h. Specific Work activities, such as, but not limited to:

1) Sitework;
2) Underground piping;
3) Electrical ductbanks;
4) Structural excavation;
5) Soil testing;
6) Backfill;
7) Placement of sheeting;
8) Pile driving;
9) Formwork erection;
10) Rebar placement;
11) Placing of concrete;
12) Stripping forms;
13) Concrete curing;
14) Installation of process piping and valves;
15) Electrical conduits and wiring;
16) Instrumentation and controls conduits and wiring;
17) Terminations;
18) Maintenance and exercising activities;
19) Other materials and plant equipment;
20) Cleanup.

i. Construction of all facilities outlined in the Contract Documents;

j. Subcontractors' items of Work;

k. Time allowance for inclement weather per National Oceanographic and Atmospheric Administration (NOAA) information for local area;

l. Delivery, installation, and check out/testing of City-supplied equipment;

m. Time allowance for checkout and startup;

n. Contract coordination with Other Contractors, substantial completion and final completion dates and maintenance of existing operations;

o. Indicate all coordination activities from related construction contracts;

p. Interruption and shut down requests of plant utilities to allow for new connections;

q. Connection to all existing plant systems and equipment;

r. Preparation of final copies of Contractor working drawings;

s. Specific information required by or from the Engineer;

t. All temporary utilities and construction;

u. Required inspections by the Contractor or Engineer;

v. Submittal of Contract record drawings at project completion, or as directed by the Engineer.

F. Project Calendars

1. All Activities should have a project calendar assigned, not a global calendar. This allows the calendars to easily travel with the project when exported and more importantly, when imported.

2. Each calendar should also identify all other days considered non-work days, including but not limited to observed holidays.

3. Each calendar should be adjusted for months beginning in the year of NTP and lasting three years beyond the Contract completion date.

4. Each calendar should be named @-### _X, where @-### _ represents the project and X summarizes the nature of the calendar. Typically, the number of days per week. See examples in **Exhibit 5**, attached to this Section.

G. Activity Labor and Resource Data

1. The Contractor shall accurately labor load by craft or trade all Activities requiring direct field labor. All labor loading shall be in hours. At the direction of the Engineer, and at no additional cost to the City, the Contractor may be required to include additional resource loading, such as, but not limited to, major pieces of construction equipment, in order to track major critical Activities and measure progress.

2. When required by the Engineer, and at no additional cost to the City, the Contractor shall accurately quantify load specific Activities or groups of Activities. The quantity amount shall equal the total quantity to be installed for each specific Activity. Quantity loading may be required for major Activities with Durations dependent on daily production, such as mass excavation – cubic yards, piling – linear feet of piles, concrete formwork – square feet of forms, concrete pours – cubic yards of concrete, piping installation – linear feet of pipe, electrical duct banks – linear feet, electrical conduit and wire – linear feet, terminations – number of terminations, etc.

3. All resource loading shall be coded to the Contract identifier under a "root." Since resource loading cannot be project-specific, this root heading is needed to keep the database segregated.

1.06 QUALITY ASSURANCE

A. The Contractor shall retain a CPM scheduling consultant, or utilize its own qualified CPM scheduler in lieu of a CPM consultant, to develop and maintain the update of the CPM schedule plan for the Work for the duration of the Contract. This consultant, along with the Contractor, is expected to work closely with the Engineer to deliver acceptable work products as outlined in this Section. The purpose of this Section is to expand and further clarify the requirements for the CPM schedule under Article 9 of the Standard Construction Contract.

B. Within seven days after the NTP, the Contractor shall submit the qualifications of the proposed CPM scheduler for review and approval.

1. The Contractor may submit to the Engineer for approval a written request to provide its own qualified CPM scheduler or a CPM consultant. In the case of a Contractor's scheduler, the Contractor is responsible for performing all activities described in this Section as being performed by the CPM consultant.

2. If, after approval, the Engineer determines that the Contractor's scheduler or scheduling consultant is unable to adequately perform the CPM requirements of this Specification, the Engineer will require the Contractor to provide a new qualified CPM consultant at no additional cost to the City.

C. Upon NTP, the Contractor shall meet with its CPM scheduling consultant at least weekly for the purpose of developing the information required by this Section. These meetings will continue until a minimum status of "Accepted" has been achieved on the Baseline Construction Schedule.

D. The Contractor will be required to coordinate its scheduling of Activities with the CPM scheduling consultant. If, in the judgment of the Engineer, the Contractor is deemed uncooperative in providing the required information to the CPM scheduling consultant necessary to develop the preliminary CPM, Baseline Schedule, or monthly schedule updates, then the Engineer may withhold partial payments or a portion thereof.

E. The monthly CPM schedule update payment item for any specific month will not be earned until the Contractor submits the required monthly CPM progress schedule. In the event the Contractor fails to submit such schedule, liquidated damages will be assessed against the Contractor in the amount fixed in Schedule A of the General Conditions, unless the Engineer determines that the Contractor is not the cause for the delay in submitting monthly updates or update information per Monthly Progress Meeting and Reports described herein. The Contractor shall be notified within one week of said delinquency that the liquidated damages are being assessed against its Contract.

F. Monthly Progress Meeting and Reports, including the use of Contractor Daily Quality Control Reports, shall be used as the basis for updating progress schedules.

1.07 SUBMITTALS

A. Within 7 days after the NTP, the Contractor shall submit the qualifications of the CPM consultant to the Engineer for approval. The Engineer will respond to the submittal within seven (7) calendar days of receipt.

B. CPM Schedule

1. The preliminary CPM Schedule shall be submitted **fifteen (15) calendar days** after NTP. The preliminary CPM Schedule shall include:

   a. All critical mobilization, Project set-up, procurement, and construction activities in each of the major Work areas required during the first 180 calendar days of Contract time after the NTP, including submittals and permitting;

   b. The balance of the Work depicted in summary activities by MLS (milestone), AREA (area), SYS (system) and RESP (responsibility). (See Activity Code Structures for MLS, AREA, SYS and RESP in **Exhibit A** of this Section);

   c. All submittal and procurement activities for long lead items necessary to meet all Project milestones;

   d. The Project's overall critical path and each milestone's critical path.

   e. An electronic copy of the schedule in Primavera Project Planner (.xer) format.

2. Within fourteen (14) calendar days after submittal of the preliminary CPM Schedule, the Engineer will notify the Contractor of the acceptance, rejection, or acceptance with comments of the preliminary CPM Schedule. If the preliminary CPM Schedule has been rejected, or accepted with comments, the Contractor shall address all comments and re-submit within 14 calendar days for review. The submittal process shall continue until the Engineer accepts the preliminary CPM schedule with no comments.

3. The final, complete and detailed CPM Schedule required for submittal under this Section shall be composed of two parts, with each part due as follows:

   a. Part 1 - Logic and Duration Schedule is due within **sixty (60)** calendar days **after** NTP.

      1) Submit an electronic copy of the schedule in Primavera Project Planner (.xer) format, schedule reports, and the narrative report as specified within this Section.

      2) This schedule is at the final level of detail for each Activity, containing the required relationships completely identified and the Duration of each Activity correctly depicted and coded in accordance with this Section.

3) This Baseline Construction Schedule shall identify all Contract milestones.

a) If the schedule reflects completion of a milestone or completion of Contract Work earlier than specified in the General Conditions, this in no way revises or voids the dates set forth in the Contract. The dates specified in the Contract govern.

b) Where the schedule reflects such an early completion date, the schedule may be accepted by the Engineer with the Contractor's understanding that no claim for additional Contract time or an increase in the Contract price shall be made by the Contractor as the result of failure to complete the Work by the earlier date shown on the schedule.

4) This schedule shall show the overall schedule requirements as set forth in Schedule "A" of the General Conditions being met.

a) This detailed CPM Schedule shall not reflect any Contract changes or delays that may have occurred during the interim schedule development period.

b) Any such changes and all progress through the time of Baseline Schedule acceptance will be entered at the first update after the schedule has been accepted.

b. Part 2 - Resource and Cost Loaded Schedule

1) At the direction of the Engineer and at no additional cost to the City, a Resource and Cost Loaded Schedule is due within **30 calendar days** after acceptance of the Logic and Duration Schedule.

a) Submit an electronic copy of the schedule in Primavera Project Planner (.xer) format, schedule reports and other reports as specified in this Section.

b) Each Activity shall be resource loaded to permit initial and monthly generation of a resource and cost curve and to assess the progress of the Work.

c) Cost loading of the schedule is required on a summary level and is not required to the Activity level unless requested by the Engineer. The intent of the cost loading is to facilitate forecasting, tracking, and reporting of overall cash flow by major work areas or systems, and Specifications. The summary level cost loading requirements will be determined and agreed to by the Engineer during the

development of the project-specific schedule coding developed for the Baseline Logic and Duration Schedule and used to track the construction progress.

4. Once the Logic and Duration Schedule is accepted by the Engineer, it shall become the basis for future updates until acceptance of the Resource and Cost Loaded Schedule. The Resource and Cost Loaded Schedule, once accepted, may only contain changes to the Logic and Duration Baseline that are necessitated by resource issues identified during the preparation of the Resource and Cost Loaded Schedule.

5. Once the Resource and Cost Loaded Schedule is accepted, it shall become the Baseline Schedule of record and the basis for future updates. All subsequent monthly updates shall be compared to the Baseline Schedule. In addition, each current monthly update shall be compared to the last accepted update. Each update shall be labeled by period with the Data Date and report date identified on the hard copy and electronic file label.

6. After the acceptance of the Baseline Schedule required by this Section, no changes shall be made to Logic, Duration of actualized activities, or description of Activities therein without acceptance by the Engineer.

7. The Contractor shall have no claim for damages by reason of the failure of the Engineer to give timely acceptance or comments on any progress schedule under this Section.

8. The monthly update schedule submittal to the Engineer shall include the following:

   a. An electronic copy of the schedule in Primavera Project Planner (.xer) format, with Data Date and monthly period clearly marked.

   b. Electronic (.pdf) format copy of the CPM computer printouts in bar chart form, including:

      1) A comparison of the Baseline Schedule Activities against current update Activities organized and summarized by milestone, AREA, and DIV according to the requirements for Activity codes in this Section, or as otherwise directed by the Engineer. Each Activity shall have two bars with different colors (one showing the current schedule and one showing the Baseline Schedule).

      2) A comparison of current activities against the prior month's activities organized and summarized by milestone, AREA, and DIV according to the requirements for Activity codes in this Section, or as otherwise directed by the Engineer. Each Activity summary shall have two bars with different colors (one showing the current schedule and one showing the prior month's update schedule).

3) A clear presentation of the specific detailed Activities making up the critical path(s) for the Project and for each milestone.

c. Electronic (.pdf) format copy of the Narrative Report as outlined in this Section.

9. Comments made by the Engineer on the initial and monthly updated Current Construction Schedule will not relieve the Contractor from compliance with the requirements of the Contract Documents. This review is only for general conformance with the schedule concept of the project and general compliance with the information given in the Contract Documents.

C. Narrative Reports

1. Schedule Basis Narrative shall be submitted to the Engineer with each Baseline Schedule submittal to memorialize assumptions made in development of the schedule and shall include the following:

a. A description of scope of the project and how the Work is represented in the schedule activities;

b. A description of the overall sequence of major components of Work;

c. Planned work week;

d. Description of the critical path in the proposed Work plan;

e. Basis of Activity Durations;

f. How weather will be accommodated in the schedule;

g. How, regulatory, operational or third party constraints are accommodated in the schedule;

h. Description of key Project coordination points or events;

i. Discussion of long lead items and basis of time frames for submittals;

j. Description of anticipated means and methods for large quantity production Activities;

k. Potential opportunities and risks and quantify the schedule reduction or expansion;

l. Assumptions/exclusions made in the schedule.

2. Update Narrative Report shall be submitted to the Engineer each month with the monthly update submission, and include the following:

a. The Contractor's transmittal letter;

b. Contract complete date status by milestone:

1) Ahead of schedule and number of calendar days;

2) Behind schedule and number of calendar days;

3) Calendar days lost/gained compared with the previous update.

c. Schedule change report organized by milestone and area listing each Activity in the CPM schedule that has been/ will be:

1) Completed during this reporting period;

2) In progress during this reporting period;

3) Scheduled to be performed during the next reporting period.

d. Analysis, organized by milestone and area, of the critical and near critical path/s describing:

1) The nature of the critical/near critical path;

2) Impact on other Activities, milestones and completion dates;

3) Risks and opportunities impacting the critical/near critical paths.

e. List of current and anticipated delays by milestone:

1) Cause of the delay;

2) Corrective actions and schedule adjustments to correct the delay;

3) Impact of the delay on other Activities, milestones and completion dates;

4) Weather delays – when applicable, the Contractor shall describe how the impacts of weather conditions and constraints were absorbed and accounted for in the schedule and documentation showing they were beyond normal for the area or those provided for in the baseline.

f. Changes in Activity descriptions for non-required work Logic, or Duration for actualized and non-required work shall be grouped and organized in the report in a manner that communicates in detail the rationale associated with each change and the impact upon construction sequence, relationships and the critical path.

g. Added Activities and the rationale associated with each action;

h. Pending issues and status of other items:

1) Permits;

2) Contract modifications;

3) Change orders;

4) Long lead procurement items;

5) Other.

i. Out of Sequence Report describing the necessity of each Activity relationship shown therein, as described within this Section;

j. Illogical Progress/Restraint Reports (if any);

k. Other project or scheduling concerns;

l. Electronic copy of the latest CPM schedule update file in Primavera (.xer) format;

m. Primavera scheduling error report.

D. CPM Progress Meeting and Reports

1. Monthly, on a date established by the Engineer, a CPM Progress Meeting will be held, at which time the schedule will be reviewed. The meeting shall be attended by the Engineer, and representative(s) of the Contractor to include the scheduling consultant. The Contractor representative(s) at the meetings shall have the competence and authority to make any necessary decisions and their statement shall commit the Contractor to the agreed procedures, sequencing of Work, coordination and time schedules.

2. Prior to the meeting, the CPM scheduling consultant shall obtain, through any required means including Site meetings, the necessary information to update the CPM schedule to reflect progress to date and to update/revise the schedule (plan) of the Work for the balance of the project. The updated schedule and draft narrative report shall be furnished to the Engineer at least 72 hours prior to the meeting and be distributed by the Contractor in hard copy at the meeting for review.

3. To update the CPM schedule, the Contractor shall:

a. Enter actual start and completion dates for those Activities started and/or completed during the previous reporting period;

b. For Activities in progress, indicate the Remaining Duration correlating to an accurate forecasted completion date and physical percentage complete to date (Percent Complete is to reflect the actual quantity of Work completed, and is separate from any actual or Remaining Duration calculation). Review, and revise as necessary, the network Logic for the Remaining Duration of the Work from the update to the estimated completion date;

c. For Activities not yet started, review, and revise as required, the necessary Logic, and the estimated start and completion dates;

d. Enter, for each applicable Activity, actual installed quantities information;

e. For identified construction change requests, Extra Work or change orders, add the appropriate detailed schedule Activities upon submittal of Form 1 for changes in the Work. The change order

review and registration Fragnet will be provided by the Engineer and shall include the following Activities in sequence:

1) Submittal of Form 1 on the actual date submitted;

2) Contractor pricing of the identified change subsequent to submittal of Form 1;

3) Pricing negotiations;

4) Comptroller review and registration; followed by;

5) Detailed submittal and construction Activities with correct Activity coding as specified within this Section.

4. The total Duration to be initially added to any schedule update reflecting the Activities from submittal of Form 1 to the registration of any specific change order, shall be in accordance with the Fragnet provided by the Engineer and shall be incorporated into the monthly schedule update following the submittal of Form 1 for the change in Work. The forecasted construction Activities shall be logically tied to the appropriate predecessor and successor base Contract Activities and contain all of the required Logic, Duration, and Resource Loading specified for the detailed CPM schedule Activities.

5. In the event the Contractor begins performance in the field of identified Extra Work during the update period, the monthly progress schedule update shall reflect the actual start date of the Work, and any predecessor Logic ties or restraints shall be broken in order to accurately forecast completion of the identified Extra Work Activity. This will allow for accurate forecasting of the successor Work Activities and completion milestones.

   a. Annotate updated status information on the CPM schedule update in a manner that will graphically depict the current status of the Work;

   b. Should discrepancies regarding data/information accuracy be noted during the review meeting or other discussions, the Engineer may direct the Contractor to adjust the percentage completion, Remaining Duration and actual dates to selected activities and re-issue the updated schedule and reports.

6. Default progress data provided from the scheduling system shall not be allowed. Actual start and finish dates and Remaining Durations of Activities shall not be automatically updated by default mechanisms that may be included in CPM scheduling software systems. Actual start and finish dates on the CPM schedule shall match those dates provided from the Contractor’s Daily Quality Control Reports. Failure of the Contractor to document the actual start and finish dates on the Contractor Daily Quality Control Report for every in-progress or completed Activity, and to ensure that the data contained on the Contractor Daily Quality Control Reports is the sole basis for schedule updating, shall result in the disapproval of the Contractor's submittal.

7. Activities that have reported progress without predecessor Activities being completed (out-of-sequence progress) will not be allowed except on a case-by-case basis with the approval of the Engineer. A written explanation for each instance shall be included in the monthly submittal.

8. The Contractor shall not constrain the schedule with artificial Logic ties and or constraint dates and or any other scheduling techniques that may distort the Activity Float and Total Float associated with the critical path Activities and the schedule in general.

9. In addition to the requirements of the General Conditions, the Contractor shall submit monthly the proposed correlated sequence and estimated dates for submission, approval and final submission activities for the following:

   a. Working drawings submittals;

   b. Equipment operation and maintenance manuals submittals;

   c. Witness shop tests;

   d. Delivery of materials and equipment to Site;

   e. Final field tests;

   f. Special tools and lubricant deliveries;

   g. Spare part deliveries;

   h. Instructional services;

   i. Permits;

   j. Final record documents;

   k. Startup and commissioning/testing;

   l. Piping and equipment identification.

10. The above information shall be presented in an organized tabular format, showing for each submittal item, organized by item:

    a. Submission date (actual or forecast);

    b. Approval date (actual or forecast);

    c. Final submissions (actual or forecast);

    d. Comments (actual or forecast).

11. Equipment/material procurement information shall be presented in an organized tabular format, showing for each item, organized by item:

    a. Drawing submittal date (actual or forecast);

    b. Drawing approval date (actual or forecast);

    c. Release for fabrication date (actual or forecast);

    d. Witness shop test date (actual or forecast);

e. Delivery date (actual or forecast).

E. Remedial Measures and Recovery Schedule

1. Delays to the Critical Path – Whenever it becomes apparent from the monthly CPM schedule update that delays to the critical path have occurred due to action or inaction of the Contractor, and as a result the Contract completion date will not be met, the Contractor shall take some or all of the following actions at no additional cost to the City, in addition to and apart from the other requirements of this Section, as directed by the Engineer:

   a. Increase construction manpower in such quantities and crafts as will substantially eliminate the backlog of Work.

   b. Increase the number of working hours per shift, shifts per day, or working days per week; the amount of construction equipment; the forms for concrete work; etc., or any combination of the foregoing to substantially eliminate the backlog of Work.

   c. Reschedule Activities to achieve maximum practical concurrence of accomplishment of Activities, and comply with the revised schedule.

   d. Submit to the Engineer for review a written statement of the steps the Contractor intends to take to remove or arrest the delay to the schedule. The Contractor shall promptly provide the necessary level of effort to bring the Work back on schedule.

2. The Engineer may require the Contractor to add to its equipment and materials or construction forces, as well as increase the working hours, if operations for critical, less critical or non-critical activities fall behind the Contractor's Baseline Schedule at any time during the construction period.

3. The Engineer may require the Contractor, at any time during the project and at no additional cost to the City, to develop a more detailed schedule/Fragnet than depicted in the detailed Baseline Schedule to provide a clearer understanding of the effort needed to complete a specific area of Work or task.

4. Should the Contractor fall behind schedule, the Engineer may require the Contractor to prepare a recovery schedule for Engineer review and acceptance. The recovery schedule shall propose alternative methods, overtime, and other means available to the Contractor to recover the schedule slippage incurred to date.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

EXHIBIT 1 -- WORK BREAKDOWN STRUCTURE

WBS Code	WBS Name
@-CSO-FC-DF	CSO-FC-DF Construction of Flushing Creek CSO Disinfection Facilities
@CSO-FC-DF-CN	Construction
@CSO-FC-DF.CN.CON	Contractual
@CSO-FC-DF.CN.MOB	Mobilization
@CSO-FC-DF.CN.S	Submittals/Fabrication &Delivery
@CSO-FC-DF.CN.SCI	Article 14 Substantial Completion
@CSO-FC-DF.CN.TI-010C	TI-010C Chlorination Facility
@CSO-FC-DF.CN.TI-010C.STE	Site Work
@CSO-FC-DF.CN.TI-010C.STE.UTL	Utilities
@CSO-FC-DF.CN.TI-010C.STR	Street Work
@CSO-FC-DF.CN.TI-010C.STR.CHEM	Chemical Piping
@CSO-FC-DF.CN.TI-010C.ARC	Structural/Architectural Work
@CSO-FC-DF.CN.TI-010C.ARC.CON	Concrete
@CSO-FC-DF.CN.TI-010C.ARC.MET	Metals
@CSO-FC-DF.CN.TI-010C.ARC.WPL	Woods and Plastics
@CSO-FC-DF.CN.TI-010C.ARC.FIN	Finishes
@CSO-FC-DF.CN.TI-010C.PROC	Process Mechanical Work
@CSO-FC-DF.CN.TI-010C.PROC.EXIST	Existing Conditions
@CSO-FC-DF.CN.TI-010C.PROC.UTL	Utilities
@CSO-FC-DF.CN.TI-010C.PROC.HVAC	HVAC
@CSO-FC-DF.CN.TI-010C.PROC.PLUMB	Plumbing
@CSO-FC-DF.CN.TI-010C.PROC.EQPT	Process Mechanical Equipment
@CSO-FC-DF.CN.TI-010C.PROC.INST	Instrumentation
@CSO-FC-DF.CN.TI-010C.PROC.ELEC	Electrical
@CSO-FC-DF.CN.TI-010C.IOT	Article 16 Inspection & Operational Testing
@CSO-FC-DF.CN.TI-010D	TI-010D Dechlorination Facility
@CSO-FC-DF.CN.TI-010D.STE	Site Work
@CSO-FC-DF.CN.TI-010D.STE.EXIST	Existing Conditions
@CSO-FC-DF.CN.TI-010D.STE.CON	Concrete
@CSO-FC-DF.CN.TI-010D.STE.EARTH	Earthwork
@CSO-FC-DF.CN.TI-010D.STE.UTL	Utilities
@CSO-FC-DF.CN.TI-010D.STE.EXT	Exterior Work
@CSO-FC-DF.CN.TI-010D.STR	Street Work
@CSO-FC-DF.CN.TI-010D.STR.CHEM	Chemical Piping
@CSO-FC-DF.CN.TI-010D.ARC	Structural/Architectural Work
@CSO-FC-DF.CN.TI-010D.ARC.EARTH	Earthwork

@CSO-FC-DF.CN.TI-010D.ARC.CON	Concrete
@CSO-FC-DF.CN.TI-010D.ARC.MAS	Masonry
@CSO-FC-DF.CN.TI-010D.ARC.MET	Metals
@CSO-FC-DF.CN.TI-010D.ARC.WPL	Wood and Plastics
@CSO-FC-DF.CN.TI-010D.ARC.TMP	Thermal Moisture Protection
@CSO-FC-DF.CN.TI-010D.ARC.OPEN	Openings
@CSO-FC-DF.CN.TI-010D.ARC.FIN	Finishes
@CSO-FC-DF.CN.TI-010D.ARC.SPEC	Specialties
@CSO-FC-DF.CN.TI-010D.ARC.MONO	Monorails
@CSO-FC-DF.CN.TI-010D.PROC	Process Mechanical Work
@CSO-FC-DF.CN.TI-010D.PROC.EQPT	Process Mechanical Equipment
@CSO-FC-DF.CN.TI-010D.PROC.PIPE	Process Mechanical Piping
@CSO-FC-DF.CN.TI-010D.MECH	Building Work
@CSO-FC-DF.CN.TI-010D.MECH.PLUMB	Fire Protection
@CSO-FC-DF.CN.TI-010D.MECH.PLUMB	Plumbing
@CSO-FC-DF.CN.TI-010D.MECH.HVAC	HVAC
@CSO-FC-DF.CN.TI-010D.ELEC	Electrical Work
@CSO-FC-DF.CN.TI-010D.ELEC.EARTH	Earthwork
@CSO-FC-DF.CN.TI-010D.ELEC.CON	Concrete
@CSO-FC-DF.CN.TI-010D.ELEC.ELEC	Electrical
@CSO-FC-DF.CN.TI-010D.ELEC.ESS	Electronic Safety and Security
@CSO-FC-DF.CN.TI-010D.I&C	Instrumentation & Control Work
@CSO-FC-DF.CN.TI-010D.I&C.INST	Instrumentation
@CSO-FC-DF.CN.TI-010D.IOT	Article 16 Inspection & Operational Testing
@CSO-FC-DF.CN.TI-011	TI-011 Disinfection Facility
@CSO-FC-DF.CN.TI-011.STE	Site Work
@CSO-FC-DF.CN.TI-011.STE.EXIST	Existing Conditions
@CSO-FC-DF.CN.TI-011.STE.CON	Concrete
@CSO-FC-DF.CN.TI-011.STE.EARTH	Earthwork
@CSO-FC-DF.CN.TI-011.STE.UTL	Utilities
@CSO-FC-DF.CN.TI-011.STE.EXT	Exterior Work
@CSO-FC-DF.CN.TI-011.STR	Street Work
@CSO-FC-DF.CN.TI-011.STR.CHEM	Chemical Piping
@CSO-FC-DF.CN.TI-011.ARC	Structural/Architectural Work
@CSO-FC-DF.CN.TI-011.ARC.EARTH	Earthwork
@CSO-FC-DF.CN.TI-011.ARC.CON	Concrete
@CSO-FC-DF.CN.TI-011.ARC.MAS	Masonry
@CSO-FC-DF.CN.TI-011.ARC.MET	Metals
@CSO-FC-DF.CN.TI-011.ARC.WPL	Wood and Plastics
@CSO-FC-DF.CN.TI-011.ARC.TMP	Thermal Moisture Protection

@CSO-FC-DF.CN.TI-011.ARC.OPEN	Openings
@CSO-FC-DF.CN.TI-011.ARC.FIN	Finishes
@CSO-FC-DF.CN.TI-011.ARC.SPEC	Specialties
@CSO-FC-DF.CN.TI-011.ARC.MONO	Monorails
@CSO-FC-DF.CN.TI-011.PROC	Process Mechanical Work
@CSO-FC-DF.CN.TI-011.PROC.EQPT	Process Mechanical Equipment
@CSO-FC-DF.CN.TI-011.PROC.PIPE	Process Mechanical Piping
@CSO-FC-DF.CN.TI-011.MECH	Building Work
@CSO-FC-DF.CN.TI-011.MECH.PLUMB	Fire Protection
@CSO-FC-DF.CN.TI-011.MECH.PLUMB	Plumbing
@CSO-FC-DF.CN.TI-011.MECH.HVAC	HVAC
@CSO-FC-DF.CN.TI-011.ELEC	Electrical Work
@CSO-FC-DF.CN.TI-011.ELEC.EARTH	Earthwork
@CSO-FC-DF.CN.TI-011.ELEC.CON	Concrete
@CSO-FC-DF.CN.TI-011.ELEC.ELEC	Electrical
@CSO-FC-DF.CN.TI-011.ELEC.ESS	Electronic Safety and Security
@CSO-FC-DF.CN.TI-011.I&C	Instrumentation & Control Work
@CSO-FC-DF.CN.TI-011.I&C.INST	Instrumentation
@CSO-FC-DF.CN.TI-011.IOT	Article 16 Inspection & Operational Testing

EXHIBIT 2 – ACTIVITY ID FORMAT

1. Activity ID format: Activity ID's shall be preceded by the Contract identifier: @-CSO-FC-DF - …
2. Do not use the letters X or Z within the activity ID as these are reserved for DEP use
3. For Activities added to the schedule during the project representing Contract change order execution and Extra Work, the Contractor shall insert "CO" after the Contract identifier and use the succeeding numbers to identify the change order number.

EXHIBIT 3 – SCHEDULE MILESTONES

1. NTP - @-CSO-FC-DF;
2. Mobilization - @- CSO-FC-DF-MOB;
3. Construction Start (start of installation of permanent Work in the field - @-CSO-FC-DF);
4. Project Specific milestones - @-CSO-FC-DF;
5. Substantial Completion - @- CSO-FC-DF;

6. Or other Milestones as directed by the Engineer.

EXHIBIT 4 -- PROPOSED ACTIVITY CODES

1. **@-** CSO-FC-DF **_RESP -** Responsibility Code – The party contractually responsible for the scheduled Activity. This Activity Code field should be defined as being four digits in length.

VALUE	SEQUENCE	TITLE
DEP	1	Department of Environmental Protection
ENG	2	DEP's Design Engineer
CCM	3	DEP's Construction Manager
GEN	4	General Prime Contractor
ELE	5	Electrical Subcontractor
HVC	6	HVAC Subcontractor
PLB	7	Plumbing Subcontractor

2. **@-** CSO-FC-DF **_MLS -** Milestone Code – Milestones specified in the Contract. This Activity Code field should be defined as being four digits in length.

VALUE	SEQUENCE	TITLE
M1	1	Notice To Proceed
M2	2	Substantial Completion

3. **@-** CSO-FC-DF **_LOC -** Location Code – Project location specified in the Contract. This Activity Code field should be defined as being four digits in length.

VALUE	SEQUENCE	TITLE
TI-10C	1	TI-010C Chlorination Facility
TI-010D	2	TI-010D Dechlorination Facility
TI-011	3	TI-011 Disinfection Facility

4. **@-** CSO-FC-DF **_AREA -** Area Code - The specific area within the project Site where the Work is taking place. This Activity Code field should be defined as being four digits in length.

VALUE	SEQUENCE	TITLE
STE	1	Site Construction
STR	2	Street Construction
ARC	3	Structural / Architectural Construction
PROC	4	Process Mechanical Work
MECH	5	Building Mechanical Work
ELEC	6	Electrical Work
I&C	7	Instrumentation and Control Work

5. **@-** CSO-FC-DF **_OPER -** Operation Code - The operation or type of Work

Note: The operation codes listed are for example only. The specific operation codes will be determined during the development of the Baseline Logic and Duration schedule and will reflect the Contractor's anticipated means and methods. This Activity Code field should be defined as being four digits in length.

VALUE	SEQUENCE	TITLE
01	1	General Requirements
02	2	Site Clearing
03	3	Site Earthwork
04	4	Utilities
05	5	Access Roads
06	6	Temp Facilities
07	7	Erosion Control
08	8	Concrete
09	9	Landscape
10	10	Drainage
11	11	Temp Power
12	12	Lighting
13	13	Dewatering
14	14	Masonry
15	15	Metals
16	16	Wood and Plastics
17	17	Thermal and Moisture Protection

VALUE	SEQUENCE	TITLE
18	18	Doors and Windows
19	19	Finishes
20	20	Specialties
21	21	Equipment
22	22	Furnishings
23	23	Special Construction
24	24	Conveying Systems
25	25	Mechanical
26	26	Electrical
27	27	Instrumentation and Control
28	28	Site Restoration
29	29	Piping modifications
30	30	Electrical modifications
31	31	Maintenance Activities

6. **@-** CSO-FC-DF **_ADD -** Activities Added – Code for Activities added during the current schedule update period. This Activity Code field should be defined as being four digits in length.

VALUE	SEQUENCE	TITLE
001	1	Activity Added in Update #01
002	2	Activity Added in Update #02
003	3	Activity Added in Update #03
Continued – to be updated by Contractor in each Progress Schedule		

7. **@-** CSO-FC-DF **_CO# -** Change Order Number – Code for Activities added for Change Order work. This Activity Code field should be defined as being four digits in length.

VALUE	SEQUENCE	TITLE
G001	1	G001 – General Change Order No.1 Description
G002	2	G002 – General Change Order No.2 Description
Continued – to be updated by Contractor in each Progress Schedule		

8. **@-** CSO-FC-DF **_Contractor** General Contractor. This Activity Code field should be defined as being seven digits in length.

VALUE	SEQUENCE	TITLE
G1	1	General Contractor
E1	2	Electrical sub-Contractor
H1	3	HVAC sub -Contractor
P1	4	Plumbing sub-Contractor
Continued – to be updated by Contractor in each Progress Schedule		

9. @- CSO-FC-DF _Point of Contact DEP Accountable Manager. This Activity Code field should be defined as being seven digits in length.

VALUE	SEQUENCE	TITLE
MH	1	Monica Harvey
Continued – to be updated by Contractor in each Progress Schedule		

10. **@-** CSO-FC-DF **_Key Milestones** Optional Field for DEP use. This Activity Code field should be defined as being seven digits in length.

11. **@-** CSO-FC-DF **_Standard Milestones** Optional Field for DEP use. This Activity Code field should be defined as being seven digits in length.

12. **@-** CSO-FC-DF **_Temporary** Optional Field for DEP use. This Activity Code field should be defined as being seven digits in length.

13. **@-** CSO-FC-DF **_Hide** Optional Field for DEP use. This Activity Code field should be defined as being seven digits in length.

14. In addition to the required Activity coding outlined above, the Engineer may direct the Contractor to provide additional Activity coding, at no additional cost to the City, in order to facilitate the management of the project and schedule. Additional Activity coding may include:

    a. SUBC – Code designating major subcontractors or vendors;

    b. SYST – Code designating process or functional system;

    c. TYPE – Code designating general type of Work;

    d. PHAS – Phase of Work in accordance with construction phasing requirements.

EXHIBIT 5 – PROJECT CALENDARS

1. @- CSO-FC-DF_5D1S - 5 days per week and one shift per day
2. @- CSO-FC-DF_5D2S - 5 days per week and two shifts per day
3. @- CSO-FC-DF_5D3S - 5 days per week and three shifts per day
4. @- CSO-FC-DF_7D3S - 7 days per week and one shift per day
5. @- CSO-FC-DF_Planting - Contains months warm enough for planting vegetation
6. @- CSO-FC-DF_X-Xxx - Limited months in calendar year (Xxx – Xxx) work can occur.

NO TEXT ON THIS PAGE

SECTION 01 32 30 – JOB PHOTOGRAPHS AND VIDEOS
CONTRACT WP-169 CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Pre-Construction Photographs, Aerial Photographs and Videos
2. Construction Photographs, Aerial Photographs and Videos
3. Post-Construction Photographs, Aerial Photographs and Videos
4. Informational Video
5. Public Design Commission (PDC) Photographs

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 31 25 – Web-based Project Management Information System

1.04 REFERENCES

A. Definitions

1. For the purposes of this Section, "Photograph" shall be defined as one digital camera image, which is approved by the Engineer for development into the products specified herein.

2. For the purposes of this Section, an "Aerial Photograph" shall be defined as one aerial view, approved by the Engineer, for development into the products specified herein.

B. Reference Standards

1. International Organization for Standardization

a. ISO 18902: 2013 - Imaging materials -- Imaging Materials – Albums, Framing and Storage Materials.

b. ISO-IEC 14496-14 Information technology -- Generic coding of moving pictures and associated audio information: MPEG-4 Part 14 (MP4 file format).

c. IPTC/XMP (International Press Telecommunications Council's/Adobe Extensible Metadata Platform) Standard

1.05 DESCRIPTION

A. The Contractor shall engage the services of experienced professional photographers and/or video recording firms, approved by the Engineer, to document the progress of Work by taking color job Photographs, Aerial Photographs and videos. The photographer shall take Photographs, Aerial Photographs and videos of the Project before start of construction work, during ongoing construction, and after completion of construction as directed by the Engineer and as needed for obtaining Public Design Commission (PDC) approval.

B. A designee of the Engineer will accompany the photographer for the taking of all photographs and videos.

C. Pre-Construction Photographs and Videos

1. The photographer, when directed by the Engineer, shall visit the Site prior to start of construction to take a total of 400 Photographs and make a 120 minute video showing existing conditions of the entire project site and any adjacent areas which could possibly be disturbed during construction.

2. 10 Aerial Photographs shall be taken which showcase the project site in relation to the surrounding neighborhood.

D. Construction Photographs and Videos

1. The photographer, when directed by the Engineer, shall visit the Site during construction on a monthly basis unless the Engineer requests different frequencies of the visits, to take a total of 1,500 Photographs for the project and to visit the site when directed by the Engineer to tape a total of 80 hours of videos. Photographs taken and video minutes taped shall be distributed

evenly among the visits and visits shall be distributed evenly over the course of the Project, all subject to the direction of the Engineer.

2. A total of 300 Aerial Photographs shall be taken with 2 views, at all phases of construction, as determined by the Engineer.

E. Post-Construction Photographs and Videos

1. The photographer, when directed by the Engineer, shall visit the Site at the completion of construction to take a total of 300 Photographs and make a 120 minute video showing the completed Work, the entire Project Site and any adjacent areas which were disturbed during construction.

2. Aerial Photographs shall be taken showing the completed Work, the entire project site and any adjacent areas which were disturbed during construction as follows:

a. TI-010 Disinfection Facilities

1) Flushing Bay CSO Retention Facility and DC-5 – 50 Aerial Photographs.

2) TI-010D Dechlorination Facility – 125 Aerial Photographs.

b. TI-011 Disinfection Facilities

1) TI-011 Disinfection Facility Site – 125 Aerial Photographs.

F. Informational Video

1. The Contractor shall engage a professional video recording firm to develop a finished 60-minute informational video as directed by the Engineer.

2. The video shall be developed by editing the videos made during the pre-construction, construction and post-construction stages of the project, as well as any additional taping needed to complete the documentation of Work at the Project Site.

G. Public Design Commission (PDC) Photographs (see City of New York Standard Construction Contract Article 47)

1. The photographer, when directed by the Engineer, shall visit the Site at the completion of construction to take a total of 50 Photographs of Work that received final approval by the PDC during design. The Work to be photographed for submission to PDC is as follows:

a. Exterior of the TI-010D Dechlorination Facility and sitework.

b. Exterior of the TI-011 Disinfection Facility and sitework.

2. Prior to taking PDC Photographs, all surrounding areas shall be cleared of any construction-related material and equipment, including but not limited to construction cones, construction signage, temporary fencing and other temporary facilities.

3. The Contractor may utilize the professional photographer firm described in Article 1.06 to take the PDC photographs. If the PDC photographs are

unacceptable by PDC, the Contractor shall hire a separate architectural photographer to re-take the PDC photographs at no additional cost to the City.

1.06 QUALITY ASSURANCE

A. Photographs shall be clear with proper exposure. New Photographs are to be taken immediately if Photographs of an adequate quality cannot be achieved. Photographs shall be of a quality to permit enlargements.

B. The professional photographer and professional video recording firm shall have a minimum of three (3) years of experience with duties similar to those specified herein. The qualifications of the professional photographer and professional video recording firm shall be subject to review by the Engineer.

C. All videos shall be made using professional-type video cameras and with adequate lighting.

1.07 SUBMITTALS

A. Submittals shall include, but not be limited to, the following:

1. Resume of the professional photographer proposed for this Work;
2. Resume and experience of the professional video recording firm proposed for preparing the informational video;
3. Plot plans indicating the location and unique sequential identifier of all Photographs.
4. Photo log of all Photographs and associated metadata in an Excel spreadsheet
5. One (1) set of all Photographs / Aerial Photographs taken for the Engineer's review and approval for processing further.
6. The Contractor shall provide the Engineer with updated images, key plans and Photograph logs on a monthly basis.

B. Submittals shall be made in accordance with Section 01 31 25 - Web-based Project Management Information System.

1. PDC Photographs shall be submitted in both digital format and print format.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. All Photographs, Aerial Photographs, and videos resulting from the Work under this Contract shall become the exclusive property of the City upon their creation.

B. Neither the Contractor nor the photographer nor the video recording firm shall retain any rights pertaining to the Photographs, Aerial Photographs, and videos nor

shall they reproduce or otherwise publish or disseminate any of the Photographs, Aerial Photographs, prints or videos taken under this Contract without the prior written approval of DEP.

C. The Photographs, Aerial Photographs, and videos shall be considered "work made for hire" under applicable provisions of the Copyright Act, and the City shall be the copyright owner thereof and of all aspects, elements and components thereof in which copyright protection might subsist. To the extent that such materials do not qualify as "work made for hire", the Contractor hereby irrevocably transfers, assigns and conveys exclusive copyright ownership in and to such materials to the City, free and clear of any liens, claims or other encumbrances. The agreements between the Contractor and the photographer and video recording firm shall contain a provision containing these requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Photographs

1. Digital cameras shall produce records with true optical resolution. Images shall not be resized or interpolated to a higher resolution from a lower resolution.

2. One set of digital images shall be submitted to DEP's web-based Project Management Information System.

3. Photographs should be embedded with metadata using the IPTC/XMP (International Press Telecommunications Council's/Adobe Extensible Metadata Platform) Standard. This includes:

a. Project number

b. Project name

c. Contract number and description

d. Unique sequential identifier

e. Description of Vantage point, indication location, direction and other pertinent information

f. General description of what the Photograph represents

g. Global Positioning System (GPS) location data

h. Phase of Construction (i.e. pre-construction, construction or post-construction)

i. Date and time Photograph was taken if not date stamped by camera

j. Name of photographer

k. Name of Department of Environmental Protection witness

4. The Contractor shall transmit one (1) electronic copy of each Photograph to the Engineer for use in preparing descriptions. The Photographs with descriptions will be returned to the Contractor for record management.

5. PDC Photographs

   a. Print PDC Photographs shall be 8-inch x 10-inch, archival-quality prints.

   b. Digital PDC Photographs shall be at least 300 DPI at 8-inch x 10-inch.

B. Aerial Photographs

1. One set of digital images shall be submitted to DEP's web-based Project Management Information System. Aerial Photographs shall meet the digital Photograph requirements of this Section, except that they shall be a minimum 50 megapixel file size.

C. Videos

1. Video recordings shall be ASTC format, 1080P (1920 x 1080) using MPEG-4 Program Stream encoding (ISO-IEC 14496-14 "Coding of audio-visual objects -- Part 14: MP4 File Format"), using professional video cameras with clear and succinct narrative. The narrative material shall be developed in conjunction with the Construction Manager, Contractor, and Engineer.

   a. All video recordings shall begin with a chapter index listing the contents in detail and providing direct access to each chapter.

   b. All video recordings must include on parallel tracks metadata (catalogue information) to include the date and time of recording, the name of the area being documented, the project name, direction of travel, the viewing side, project number, Contract number and description, name of photographer and Department of Environmental Protection witness. The date and time shall be on a track separate from the rest of the metadata and, when displayed, shall appear in the upper left hand corner of the picture. Time and date shall use the following format:

      Time: HH;MM;SS (using 24-hour clock time)
      Date: MM/DD/YYYY

   c. The project number, project name, Contract number and description, name of photographer and Department of Environmental Protection witness, when displayed, shall appear on the lower half.

2. Video output from camera used must be capable of producing full HD resolution (1920 x 1080). Geometric distortion should not exceed two (2) percent of picture height at any point in picture area.

3. All recording shall be done with adequate lighting. Written authorization by the Engineer to proceed with video documentation at any areas must be

done with consideration of existing environmental conditions. The designee of the Engineer will accompany the photographer during all taping sessions.

4. During the recording period, all records shall be turned over to the Engineer for review of the content and quality. Any portion of the recording deemed unacceptable by the Engineer shall be re- recorded by the Contractor at no additional cost to the City.

5. One copy of all acceptable recordings shall be furnished and shall be properly identified by container number, equipment, location and project name. A record of the contents of each recording shall be provided on a run sheet, identifying each chapter segment of the recording.

D. Informational Video

1. The informational video shall have titles and audio defining all aspects of Work activities. In consultation with the Engineer and the City, the video shall develop the basic design criteria, explain each phase of excavation or construction, extras or credits, safety highlights, concrete, steel and other suppliers, disposal of materials, dewatering, control of groundwater, and other such items.

2. Two copies of the acceptable informational video (flash drive or hard drive) shall be furnished and shall be properly identified and labeled. Identifying information furnished on the informational video shall be the same as specified for other videos in this Section.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Fabrication

1. Photographs

a. The file format for Photographs shall be color, uncompressed Tagged Image File Format (TIFF) produced by a digital camera with a minimum sensor size of 12 megapixel files or greater, and at an image resolution of not less than 5,000 pixels by 3,500 pixels at 300 dpi or greater

b. Photographic images shall be provided as 8 bit per channel RGB color images.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 01 33 00 – SUBMITTAL PROCEDURES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Submittal Categories
2. Schedule of Submittals
3. Letter of Transmittal
4. Contractor Responsibilities
5. Shop Drawings Submittal
6. Approval of Shop Drawings not a Waiver
7. Final Copy – Shop Drawings

B. The following index of this Section is presented for convenience:

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C. The following Schedule, attached after the "End of Section" designation, is a part of this Section:

1. Attachment 01 33 00-1 - Sample Schedule of Submittals

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 31 25 – Web-Based Project Management Information System

B. Section 01 32 10 – Progress Scheduling

C. Section 01 78 39 – Final Record Documents

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Submittals includes all types of drawings and other documents required to be prepared or assembled and submitted to the Engineer by the Contractor before, during, or after construction, such as, but not limited to, the following "submittal categories":

1. As-Built Drawings;
2. Bid Submittals;
3. Certifications;
4. Construction Progress Photos and Videos;
5. Baseline and Monthly CPM Progress Schedules
6. Final Record Documents;
7. Material Safety Data Sheets;
8. Mock Ups;
9. Operation and Maintenance Manuals;
10. Permits;
11. Plans (or Procedures);
12. Preliminary and Final Test Procedures
13. Product Data;
14. Reports;
15. Samples;
16. Schedule of Submittals;
17. Shop Drawings;

a. Shop Drawings includes all drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for the Contractor and submitted by the Contractor to illustrate some portion of the Work.

18. Shop Test Procedures;

19. Spare Parts;

20. Test Reports;

21. Warranties.

1.06 QUALITY ASSURANCE

A. Shop Drawings shall be submitted so that they can be approved within the first three (3) submissions. Starting with the fourth submission, liquidated damages will be assessed against the Contractor in accordance with Schedule A of the General Conditions.

1.07 SUBMITTALS

A. The Contractor shall submit a schedule of submittals in accordance with the requirements of this Section, for review and approval.

1. The Contractor shall resubmit an updated schedule of submittals to the Engineer for review and approval on the first day of each month until Substantial Completion, unless otherwise directed to submit less frequently by the Engineer.

2. The Schedule of Submittals shall demonstrate coordination with the CPM Schedule submitted under Section 01 32 10 - Progress Scheduling. Changes and updates to the CPM Schedule shall be reflected in the specified resubmissions of the Schedule of Submittals.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. All Submittals shall have identifying titles and bear the signature of the Contractor as evidence that they have been reviewed and approved by the Contractor and that they conform to the requirements of the Contract Documents. Submittals without this stamp of approval will not be reviewed by the Engineer and will be returned to the Contractor.

1. The stamp shall contain the following minimum information:

Project Name: _____

Contract No.: _____

Contractor's Name: _____

Date: _____

Item: _____

Section No(s).: _____ Section Title(s): _____

Article No(s). _____ Paragraph No(s).:_____

Contract Drawing No(s): _____

Location: _____

Submittal No.: _____ Review Cycle No.: _____

Shop Drawing Reference No.: _____

Source Company Name: _____

This submittal was reviewed for conformance with the Contract Document requirements and approved by: _____

2. All applicable Specification sections, subsections, articles, paragraphs and drawings shall be noted in the stamp.

B. Submittal Identification and Tracking: In order to identify and track each submittal as a separate and unique item, the Contractor shall utilize a submittal numbering system as follows:

1. Submittal Number:

a. The Submittal Number shall be a separate and unique number correlating to each individual Submittal that needs to be tracked as a separate and unique item.

b. The Submittal Number shall be a two-part number assigned by the Contractor in the following manner:

1) The first part of the Submittal Number shall consist of 6 to 10 digits that pertain to the applicable Specification section.

a) Include all spaces (and decimal, if applicable) as per the Specification section title.

2) The second part of the Submittal Number shall consist of three digits (the numbers 001 to 999) to number each separate and unique submitted under each Section.

3) A dash shall separate the two parts of the Submittal Number.

4) For example:

a) The submittal number for the third submittal under Section 09 91 00 – Painting, would be 09 91 00-003.

b) The submittal number for the first submittal under Section 40 05 59.16 01 – Stop Logs (Aluminum), would be: 40 05 59.16 01-001.

2. Review Cycle:

a. The review cycle shall be identified by a three-digit number indicating whether a Submittal is the initial submission (i.e., "000") or a resubmission of an earlier Submittal (i.e., "001" or higher).

1) The first resubmission, for example, would be assigned "001"; the second resubmission will be assigned "002"; etc.

b. Liquidated damages will be assessed upon rejection of any Submittal identified as "003" in the review cycle.

C. Submittals shall include appropriate references to all related and pertinent Contract Drawing(s) and Specification Section(s).

D. In submitting Shop Drawings for approval, all associated drawings relating to a complete assembly of various parts necessary for a unit shall be included. Shop Drawings shall not be submitted until the full set of associated drawings is complete, so that they may be checked in relation to the assembly proposed.

E. All items of electrical equipment constituting an operating system and any mechanical units involved therein or necessary for the functioning of such system shall be submitted at the same time and shall include clear diagrams showing circuit functioning and necessary details for field construction.

F. Partial, incomplete, or illegible submissions will be marked "Rejected" and returned to the Contractor without review, for resubmission.

G. Final Copy - Shop Drawings: The Contractor shall furnish all "Final Copy Shop Drawings" to the DEP as a condition precedent to the Commissioner issuing a written determination of Final Acceptance. Final Copy Shop Drawings shall be submitted in accordance with Section 01 78 39 – Final Record Documents.

3.02 IMPLEMENTATION

A. General:

1. All Submittals including, but not limited to, Shop Drawings and inquiries pertaining to engineering features or Specification and Contract Drawing interpretations, shall conform to the General Conditions and the requirements of this Section and Section 01 31 25 – Web-Based Project Management Information System.

2. Within 30 calendar days from the work commencement date specified in the Notice to Proceed (NTP), the Contractor shall prepare and submit for the Engineer's approval a Schedule of Submittals which it proposes to follow, listing Section references, names of Submittals required, and the dates on which the Contractor proposes to make the Submittals. The proposed dates of submittals must be chronologically complementing the CPM schedule.

a. No other Submittals shall be accepted for review until the Schedule of Submittals is received and approved by the Engineer. Submittals that are submitted prior to approval of the schedule of submittals shall be returned "Rejected".

b. The Schedule of Submittals shall be in the form of a table.

1) Each row in the schedule of submittals shall include, but not be limited to, the following data divided into columns:

a) The first part of the submittal number.

b) The second part of the submittal number.

c) The title of the submittal.

d) The review cycle.

(1) As the project progresses, data for resubmittals shall be added as separate rows under each submittal number.

e) The date of submission, anticipated (for future submittals) or actual (for past submittals).

f) The date the submittal is returned.

(1) For future or anticipated submittals, use "N/A".

(2) For past submittals, use the actual date the submittal is returned.

g) The disposition of the submittal:

(1) For future or anticipated submittals, use "N/A".

(2) For past submittals, use the actual disposition (e.g., FAS, FAC, R&R, etc.).

c. Refer to Attachment 01 33 00, Sample Schedule of Submittals, for an example schedule of submittals table.

d. The Schedule of Submittals is intended to be exhaustive, including all anticipated future submittals with reasonable estimates for submittal dates.

e. The Schedule of Submittals shall demonstrate coordination with the CPM Schedule submitted under Section 01 32 00 - Progress Scheduling.

3. Submittals shall be made as directed by the Engineer. All submittals shall be in the English language with U.S. customary units of measurement being used in all drawings and data.

4. The Contractor shall use the project Web-Based Project Management Information System to submit all documents as directed by the Engineer and as described in Section 01 31 25 – Web-Based Project Management Information System.

5. Samples shall be shipped directly to the Engineer. A copy of the transmittal with photographs (JPEG format) of the samples (minimum three (3) angles per sample) shall be entered into the web-based Project Management Information System.

B. Letter of Transmittal or Inquiry

1. A letter of transmittal shall accompany each submission. If data for more than one Section of the Specifications is being submitted, a separate transmittal letter shall accompany the material being submitted under each Section. To the extent possible, letters of inquiry concerning certain phases of the Contract shall also deal with only one Section of the Specifications.

2. At the beginning of each letter of transmittal and each letter of inquiry, provide a reference heading indicating the following:

Owner's Name: NYC Department of Environmental Protection
Project Name: _____
Contract Number: _____
Transmittal Number: _____
Section and Item Number: _____

3. If submittals show variation from the requirements of the Contract, the Contractor shall make specific mention of such variation in the Submittal package.

C. Contractor Responsibilities

1. The Contractor shall review all submittals before transmitting them to the Engineer for review and approval.

a. Prior to transmitting each submittal to the Engineer:

1) The Contractor shall ensure proper coordination of the Work submitted.

2) The Contractor shall ensure that each submittal is in accordance with the requirements of this Section.

3) The Contractor shall ensure that each submittal is in accordance with each and all applicable submittal requirements of the corresponding Specification section(s) and/or drawings.

4) The Contractor shall ensure that each submittal contains sufficient documentation and information, presented plainly and clearly, to verify each and all requirements that are contained within the Specification Section(s) or shown on the Contract Drawing(s) prior to transmission to the Engineer.

b. Regardless of what a manufacturer, fabricator, subcontractor, etc. transmits to the Contractor, it is the Contractor's exclusive responsibility to ensure completeness of the submittal package prior to transmitting the package to the Engineer for review.

1) Packages that are incomplete, whether by failing to include all materials required to be submitted by the pertinent Specification section(s) and/or contract drawings, or whether failing to transmit any and all information needed to verify every feature, detail, etc. that is specified and/or shown, may be returned "Rejected" for the Contractor to resubmit.

c. A note shall appear on the first page of each submittal indicating that the Contractor has made this check.

1) Shop Drawings not so checked and noted shall be returned to the Contractor with a disposition of 'Rejected' for noncompliance with the requirements of the Contract Documents.

2. Approval of Submittals shall not relieve the Contractor of the responsibility of furnishing materials and equipment of proper dimension, size, quality, quantity, and all performance characteristics to efficiently perform the requirements and intent of the Contract Documents. Approval shall not relieve the Contractor of responsibility for errors of any sort on the Submittals. The Contractor is also responsible for information that pertains solely to the fabrication processes or to the technique of construction and for the coordination of the Work of all trades.

3. Approval of any Submittal by the Engineer only determines its overall agreement with the information given in the Contract Documents. Approval of any Submittal by the Engineer does not constitute a representation that the Submittal was found to conform to all requirements of the Contract

D. Shop Drawing Submittals

1. The Contractor shall promptly prepare and submit Shop Drawings of all parts of the Work as specified herein. Shop Drawings which are full size shall be on "D" size, 22" x 34" ANSI standard drawing sheets. All Shop Drawings shall be drawn to scale.

2. Shop Drawings shall be numbered consecutively and shall accurately and distinctly present the following:

   a. All shop and erection dimensions;

   b. Arrangement and sectional views;

   c. Necessary details, including complete information for making connections between Work under this Contract and work under other contracts;

   d. Kinds of materials and finishes;

   e. Parts list and description thereof.

3. Each Shop Drawing shall be dated and contain:

   a. The name of the project and the Contract number;

   b. The descriptive names of equipment or materials covered by the drawing and the Contract item number or numbers under which it is or they are required;

   c. The locations or points at which the materials or equipment are to be installed in the Work.

4. Shop Drawings for equipment requiring electrical and/or mechanical connections shall show the units of equipment in the proposed position for installation and the details of attachments and connections required, with locations referred to each other and to the structure.

5. Whenever mechanical equipment, electrical equipment, tanks, pipe sections, structural and architectural details and other related items are to be permanently installed in the structures or are of sufficient weight and bulk to cause excessive stresses on the structural members and frame while being hauled, rigged, hoisted, blocked and placed in final positions, the Contractor shall submit, in advance of this Work, to the Engineer for approval, Shop Drawings showing the methods and sequence of the positioning operations, the size and material of all skids, blocks, falsework, runways, etc., the capacities of hand-operated and electric hoists and chain blocks, the positions of the hoists on the completed structural frame, temporary shores and supports, the capacities of winches and their position of attachment and similar and related rigging equipment required to effect the successful positioning of the permanently installed mechanical and electrical equipment.

6. Mechanical and electrical equipment shall not be moved across the floor of the structure without first covering the floor with timber of sufficient size so that the applied loads will be transferred to floor beams and girders of steel or concrete. If it is required to reduce bending stresses or deflection, the beams and girders shall be provided with temporary supports.

7. The Shop Drawings shall also show the loads at points of concentration, the stresses in the structures due to these temporary loads, the size and class of material of the temporary members and bracing installed or placed to minimize excessive stresses in the completed structures and computations to demonstrate that the temporary rigging equipment and accessories will not damage or injure any portion of the completed structure.

8. The approval by the Engineer of Shop Drawings for rigging and hoisting electrical and mechanical equipment and related items in final position will not relieve the Contractor of its responsibility to ensure the safety of the rigging operations, the equipment to be installed and its personnel nor will it relieve the Contractor from its responsibility not to damage completed structures, parts or members thereof or other installed equipment. The Contractor shall make good, repair or replace any damaged or injured items, structural, mechanical, electrical, architectural or landscaping, promptly and effectively to the satisfaction of the Engineer and at no extra cost to the City.

9. Supporting structures designed by Contractor: Supporting structures, which the Contractor is required to design, shall be of sufficient strength to safely withstand all stresses to which they may be subjected, within

permissible deflections, and shall meet the applicable requirements under NYCBC, ASTM A36 and AISC Specifications for structural steel.

10. Engineer's assumed design data: All structural steel, concrete and reinforcement indicated or specified to fully or partially support equipment or appurtenances and the areas immediately adjacent thereto, have been designed from data based on assumed average anticipated clearances and loadings. The final structural design in these locations will be based on definite data available only after the Engineer approves the equipment and appurtenances to be installed. Therefore, no Shop Drawings pertaining to such supporting steel or concrete structures shall be submitted until the Contractor is furnished with full data relative to the approved equipment and appurtenances.

11. Necessary major changes in framing will be covering by supplementary or revised drawings which will be furnished to the Contractor. All changes indicated or necessary to accommodate the equipment and appurtenances shall be incorporated into the Shop Drawings submitted for approval.

12. Shop Drawings for the work in paragraphs 9, 10, and 11 above shall be prepared by or under the direction of a qualified licensed Professional Engineer, currently registered in the State of New York, and shall bear the imprint of their seal and signature.

E. Shop Drawings Approval

1. Shop Drawings submitted to the Engineer shall contain complete data on the Work and full information on related matters.

2. In submitting Shop Drawings for approval, all associated drawings relating to a complete assembly of various parts necessary for a unit shall not be submitted until the assembly of drawings is complete so that they may be checked in relation to the assembly proposed. Where errors, deviations and/or omissions are discovered later, they shall be made good by the Contractor irrespective of any approval by the Engineer.

3. With Submittals, the Contractor shall notify the Engineer of all departures from the Contract Drawings and Specifications; otherwise, approval of such Submittals will not constitute approval of the departure. Approval of a Submittal will constitute approval of the subject matter thereof only and not of any other structure, material or apparatus shown or indicated.

4. If the Contract Documents specify that a submittal (or a portion thereof) shall bear the signature and seal by a registered professional engineer, then in order for said submittal to be considered complete, the requisite documents must bear the signature and seal of a registered professional engineer at the time of submittal.

   a. The submittal of draft documents for review without signature and seal is unacceptable. Such documents shall be considered

incomplete and shall be returned with a disposition of "Rejected" without review.

5. Materials or equipment shall not be ordered nor shall any Work be done by the Contractor before the materials, the equipment and the Shop Drawings as herein required have been approved by the Engineer.

6. After the Engineer completes the review, the Submittals will be marked with one of the following notations of dispositions:

- Furnish as Submitted (FAS)
- Furnish as Noted (FAN)
- Furnish as Corrected (FAC)
- Revise and Resubmit (R&R)
- Rejected (R)
- For Information Purposes Only (FIO)

a. If a Submittal is acceptable, it will be marked "Furnish as Submitted", "Furnish as Noted", or "Furnish as Corrected". If a Submittal is unacceptable, it will be marked "Revise and Resubmit" or "Rejected."

b. Upon return of a Submittal marked "Furnish as Submitted", "Furnish as Noted", or "Furnish as Corrected", the Contractor may order, ship or fabricate the materials included on the Submittal, provided they are in accordance with any corrections indicated.

1) Upon return of a Submittal marked "Furnish as Corrected", the Contractor shall make the corrections indicated, and resubmit the Shop Drawings to the Engineer.

2) Upon return of a Submittal marked "Furnish as Noted", the Contractor shall make the corrections indicated, but does not need to resubmit the Shop Drawing to the Engineer unless the Contractor disagrees with the corrections noted.

c. Upon return of a Submittal marked "Revise and Resubmit", the Contractor shall make the corrections indicated, clearly noting any revisions and repeat the initial approval procedure.

d. The "Rejected" notation is used to indicate material or equipment that is not acceptable. Upon return of a Submittal so marked, the Contractor shall repeat the initial approval procedure utilizing acceptable material or equipment.

e. The "Rejected" notation is also used for submittals where the Contractor did not review the submittal for completeness prior to transmission to the Engineer as specified in this Section.

f. Shop Drawings or other Submittals not bearing the Engineer's "Furnish as Submitted", "Furnish as Noted", or "Furnish as Corrected" notation shall not be issued to Subcontractors nor utilized for construction purposes. No Work shall be performed or equipment installed without a "Furnish as Submitted", "Furnish as Noted", or "Furnish as Corrected" drawing or Submittal.

7. In the event the Contractor obtains the Engineer's approval for the use of equipment other than that which is shown or specified in the Contract Documents, the Contractor shall, at its own expense and using methods approved by the Engineer, make all changes to the Work, including structures, piping, and electrical equipment and controls that may be necessary to accommodate this equipment.

8. Shop Drawings shall be submitted well in advance of the need for the material or equipment for construction and with ample allowance for time required to make delivery of material or equipment after the Submittal covering such is approved. The Contractor shall assume the risk for all materials or equipment which are fabricated or delivered prior to the approval of Shop Drawings. No materials or equipment will be permitted to be incorporated into the Work nor will such be included in monthly payment estimates until approval thereof has been obtained in the specified manner.

9. The Engineer will review and process all Submittals promptly. A reasonable time should be allowed for the Engineer's review and processing of Submittals, the Contractor's revisions and resubmissions of Submittals, and the Engineer's review and returning the approved Submittals to the Contractor.

10. It is the Contractor’s responsibility to review and confirm compliance with the contract documents prior to submitting each submittal. Any delays, due to the quality of submittals requiring multiple cycles for review and approval, will be the responsibilities of the Contractor.

F. Approval of Submittals not a Waiver

1. The approval of a Submittal shall not constitute a waiver of any of the requirements of the Contract nor shall the City be compelled to accept any Work unless it passes all the tests and requirements specified in the Contract Documents.

2. All deviations made during construction from final Shop Drawings previously annotated by the Engineer "Furnish as Submitted", shall be corrected on the Shop Drawings, and resubmitted to the Engineer showing conditions as constructed.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

ATTACHMENT 01 33 00-1
SAMPLE SCHEDULE OF SUBMITTALS

Submittal Number:		Name:	Review Cycle:	Date Submitted:	Date Returned:	Disposition:

NO TEXT ON THIS PAGE

SECTION 01 35 27 – ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for the Contractor to provide its employees and its Subcontractors a safe and healthful work environment and for performing all Work in compliance with all applicable environmental health and safety (EHS) laws, rules, and regulations.

1. The EHS performance of the Contractor and its Subcontractors is the responsibility of the Contractor. Since effective on-site management is essential for EHS performance, the Contractor shall evaluate the performance of its on-site EHS team on a continuous basis. Where deficiencies are found, the Contractor shall take appropriate action including removal of its personnel or its Subcontractors' personnel.

B. Attachments

1. Exhibit A – Standard Environmental, Health and Safety Requirements Specifications

2. Exhibit B – Bidder's EHS Safety Record and Program Review Questionnaire

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment

1.03 RELATED SECTIONS

A. Section 01 57 16 - Temporary Pest Control

B. Section 02 24 20 – Soil Sampling and Analysis

C. Section 31 23 16 - Excavation

1.04 REFERENCES

A. Definitions

1. "Competent Person" means one who is capable of identifying existing and 35 27predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees or the environment, and who has authority to take prompt corrective measures to eliminate them. A Competent Person has stop work authority.

2. "EHS Resources" shall mean the Contractor's EHS Professional(s) and its EHS Site Representative (EHS Rep), as approved by the BEDC EHS unit. This definition shall also apply to the Subcontractors' EHS Resources, where required. This definition also includes any consultant or other EHS personnel associated with the Project. Such EHS personnel are subject to evaluation and approval by BEDC EHS as set forth in this Section.

3. "Environmental Health & Safety Plan (EHASP)" shall mean the plan developed in accordance with all applicable EHS rules and regulations and these Specifications to identify and set forth policies and procedures to control the health and safety concerns and environmental impacts known and unknown at the Site. This plan is not to be confused with the Health and Safety Plan that may be required under 29 CFR 1910.120 for Hazardous Waste Operations and Emergency Response (HAZWOPER).

4. "Job Hazard Analysis" (JHA) shall mean a tool used to document a process by which the steps required to accomplish a work activity are outlined, the actual or potential hazards for each step are identified, and measures for the elimination or control of those hazards are developed.

5. "Hazard Identification" shall mean an existing condition that has the potential to harm people, cause damage to property or the environment, or some combination of these.

6. "Incident" shall mean an undesired occurrence that resulted in injury, illness, environmental release, fire, explosion, motor vehicle event, property damage, equipment failure, non-compliance, and/or adverse impact to operations/work.

7. "Near Miss" shall mean an undesired event in which no property or environment was damaged and no personal injury (i.e., work related harm, damage or loss to a person, including first aid cases as well as recordable injuries) was sustained, but where, given a slight shift in time or position, damage or injury easily could have occurred.

8. "Observation" shall mean an opportunity to improve that does not entail an event included as a hazardous identification, near miss, or incident.

9. "Qualified Individual" shall mean one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his or her ability to solve or resolve problems relating to the subject matter, Work or Project.

B. Reference Standards

1. 29 CFR 1926 - Safety and Health Regulations for Construction (Subpart Z – Toxic and Hazardous Substances), Standard No. 1926.1153 - Respirable Crystalline Silica

1.05 DESCRIPTION

A. General

1. In performing the Work of this Contract, the Contractor shall at all times be in compliance with all federal, state, City and local environmental, health and safety laws, rules, regulations, DEP Policies and BEDC EHS Standards.

2. The Contractor shall ensure that its employees and those of its Subcontractors working on a DEP project site under the Contract are clearly identifiable as Project Contractor employees. This may include the use of labeled safety vests or hard hats or other acceptable means in addition to complying with the identification badge requirements of Article 37 of the Standard Construction Contract. All on-duty employees and those of its Subcontractor issued DEP identification badges must visibly wear the badge at the waistline or above. The Contractor must supply a safe means for wearing badges such as break away lanyards or where the badge may be a safety hazard during the scope of Work, an exemption to wearing the badge will be made as approved by the EHS Regional Manager (RM). Exemptions will be documented in the EHASP and JHA.

3. The Contractor shall be responsible for the health and safety of its employees, Subcontractors, the public and all other persons at or around the Work Site. The Contractor shall be solely responsible for the adequacy of all construction methods, materials, equipment and the safe and environmentally compliant prosecution of the Work. Where possible, the Contractor shall

implement Best Management Practices to reduce injuries, accidents and environmental impacts.

4. The overall site management for EHS is performed by the Engineer in coordination with the DEP Construction Manager. The Construction Manager's EHS staff/consultant and Contractor's EHS staff shall work closely with the Engineer's designated EHS staff (i.e., coordinate to perform joint EHS activities, including inspections, incident investigations, etc.). The Contractor shall coordinate with the Engineer's EHS designee with regard to any Site rules or Site-specific requirements such as working hours, delivery times and operations coordination and sequencing.

5. The Contractor shall perform and document its due diligence in determining whether the Subcontractors it hires to perform Work under the Contract are capable of performing to the EHS standards set forth in this Section. At a minimum, the Contractor is required to perform an EHS evaluation of proposed Subcontractors prior to submitting them for DEP approval. The Contractor must have a Subcontractor EHS evaluation program that is at least as stringent as the DEP Contractor Selection and Management Policy available in the BEDC web-based PMIS. Poorly performing Subcontractors will affect the Contractor's performance evaluations and ability to obtain future contracts with DEP.

6. DEP requires a drug and alcohol free, healthful, safe and secure work environment. Contractor employees will report to work in an appropriate mental and physical condition for work. DEP reserves the right to require any Contractor or Subcontractor employee to submit to drug testing when cause for reasonable suspicion of a violation of this policy exists. Drug testing may occur when: a) there is reasonable suspicion that an employee is under the influence of alcohol or illegal drugs, or b) an employee has been in involved in an Incident, or involved in an unsafe practice, or c) as required by BEDC EHS Standards. The Contractor must prohibit any employee from being under the influence of any illegal drug or alcohol while at work, on duty, or operating a vehicle or construction equipment.

7. The Contractor shall implement an EHS Management Program which includes qualified Safety Professionals (SPs) and Environmental Professionals (EPs), collectively referred to as EHS Professionals, along with project management staff, with appropriate competencies to provide EHS direction, guidance, and oversight of all aspects of the performance of the Contract's detailed scope of Work.

8. The Contractor shall ensure that its EHS Resources have appropriate authority to execute their duties and responsibilities as set forth in this Section and under the Contractor's EHS Management Program.

9. The Contractor shall arrange for additional approved EHS Resources to be available during EHS staff absences. The Contractor must inform the Engineer, in writing, of anticipated absences.

10. Contractor EHS Resources:

    a. At a minimum, the Contractor shall provide the EHS Resources described below. The Contractor is required as part of its EHS Management Program to identify any EHS Resources necessary beyond the listed minimums.

    b. For all contracts that employ 100 or less employees on site at any time, the Contractor shall have at least one full-time site EHS Rep. The Contractor may submit a request in writing to the Engineer to waive the requirement of a separate EHS Rep at each site and permit other Contractor employees who are Qualified Individuals to monitor the EHS activities of the employees and to assume all of the responsibilities of the full-time site EHS Rep, if it can show that one EHS Rep can effectively manage multiple sites. The EHS Rep(s) shall have no other duties except those related to EHS on the Contract, and shall not be the project manager, engineer, superintendent or have any other title or project role other than EHS Rep.

    c. For all contracts that employ over 100 employees on site at any time, the Contractor shall have at least two full time EHS Reps. These EHS Reps shall have no other duties except those related to EHS on the Contract, and shall not be project managers, engineers, superintendents or have any other title or project role other than EHS Rep.

    d. The Contractor may submit a request in writing to the Engineer to waive the requirements of this Section and permit other Contractor employees who are Qualified Individuals to monitor the EHS activities of the employees on site and to assume all of the responsibilities of the full-time EHS Rep.

    e. The Contractor shall ensure that Subcontractors who consistently employ over 100 employees for more than two weeks at a time under the Contract shall have one full-time site EHS Rep. This EHS Rep shall have no other duties except those related to EHS on the Contract and shall not be the Project Manager, Engineer, superintendent or have any other title or project role other than as the Subcontractor's EHS Rep.

    f. If the Contract has more than one location, each location shall be treated as a separate contract for purposes of determining the number(s) of necessary EHS Reps in accordance with paragraphs b through d above.

    g. The Contractor's EHS staff shall be provided an appropriate office on the Project Site to maintain and keep available EHS records, up-to-date

copies of all pertinent EHS laws, rules, regulations and governing legislation, material safety data sheets, and the EHASP.

11. All site workers have the right to refuse unsafe work which is reasonably believed to present imminent danger to their own safety or the safety of others, the public or the environment, or to City property, without adverse consequences.

12. The Contractor and its Subcontractors shall stop Work and initiate immediate corrective action whenever a Work procedure or a condition at the work site is deemed unsafe by the EHS staff, DEP, Competent Persons, or the Engineer. All Contractor and Subcontractor employees working on site shall report any unsafe or noncompliant work condition(s) immediately to the EHS staff, Competent Persons, or the Engineer. If a stop Work order is issued to the Contractor by the Engineer for unsatisfactory EHS performance, the Contractor shall not make any claim against the City for any losses associated with the stop work order.

13. The Contractor and all Subcontractors are responsible for daily cleanup of their immediate Work areas in accordance with BEDC's Housekeeping Standard. Construction scrap and debris shall be removed daily during the course of construction, alterations and repairs. Contractor refuse shall not be allowed to accumulate so as to create trip hazards or block access routes and pathways. The Contractor shall implement procedures to ensure a high standard of housekeeping. All waste shall be disposed of in accordance with the appropriate regulations and applicable Specifications.

14. The Contractor shall ensure that any sand, soil, plaster, cement, mortar or the like is not deposited or washed into any drain or sewer unless specifically authorized under required permits.

15. When working with (i.e. the cutting, grinding, drilling, chipping, demolition/removal) masonry materials containing respirable crystalline silica (i.e. brick and concrete), the Contractor shall perform work utilizing specified engineering and work practice control methods in accordance with 29 CFR 1926.1153.

B. Environmental Health and Safety Plan (EHASP)

1. The Contractor shall have a written EHASP prepared and signed by both the Safety Professional and the Environmental Professional in accordance with the BEDC EHASP Standard. The EHASP must be signed by a principal or senior manager of the company and project management staff. The EHASP shall be submitted to BEDC for review and approval prior to the start of any work. JHAs will be developed as the Work progresses, in accordance with the BEDC JHA Standard, and will supplement the Contractor's EHASP.

C. Emergency Action Plan

1. The Contractor shall work with the Construction Manager and Other Contractors to develop a single cohesive construction EAP in accordance with BEDC's EAP Standard.
    a. The Contractor shall work with the Construction Manager and other Contractors to develop a single cohesive construction EAP in accordance with BEDC's EAP Standard.
    b. The Contractor is responsible for providing or supplementing the facility's existing, emergency alarm/siren/annunciation system to ensure that all Contractor personnel will be adequately notified of an alarm condition or required/test evacuation.
    c. The Contractor is responsible for evaluating and ensuring that all identified emergency resources are adequate and appropriate for the potential rescues/emergencies needed.

D. Spill Prevention Program (SPP)

1. The Contractor shall establish a Spill Prevention Program (SPP) for the prevention of releases of petroleum, hazardous substances or other pollutants. The SPP shall include awareness training for all personnel on measures designed to reduce, minimize and eliminate the potential for releases.
2. The Contractor shall establish sound work practices and implement appropriate measures to achieve release prevention and control of releases when they do occur.
3. Section 1.07 Submittals lists the requirements of the SPP.
4. The Contractor shall bear sole responsibility for all costs and delays resulting from any releases on the Project which occur as a result of the work activities.

E. Spill Prevention, Control, and Countermeasure (SPCC) Plan

1. Construction sites that will store, handle, or manage a combined aboveground storage capacity of 1,320 gallons of oil, or a completely buried oil storage capacity of over 42,000 gallons, are required to have an SPCC Plan. Contractors must follow 40 CFR part 112 Oil Pollution Prevention Regulation to determine if their project site qualifies for an SPCC Plan. All SPPC Plans require the certification of a Professional Engineer (P.E.). Section 1.07 Submittals lists the requirements for SPCC Plans.

1.06 QUALITY ASSURANCE

A. Qualifications

1. The Contractor shall ensure that, at all times, its employees and those of its Subcontractors have received OSHA 10-Hour Construction training or OSHA 30-Hour training within the last five (5) years.

2. The EHS Professional(s) shall possess a combination of safety and environmental skills as needed to manage the EHS hazards and issues presented by this Project. The EHS Professional may be one or more persons meeting the individual qualifications for Safety and Environmental Professionals as detailed below.

3. Safety Professional (SP): Persons recognized as a Safety Professional shall, at a minimum, possess the following education and experience:

   a. Certification as a Certified Safety Professional granted by the Board of Certified Safety Professionals and five (5) years of documented professional construction EHS management experience; or

   b. Certification as a Certified Industrial Hygienist granted by the American Board of Industrial Hygiene and five (5) years of documented professional construction EHS management experience; or

   c. A Bachelor of Science degree in safety, industrial hygiene, occupational safety and health, environmental health and science, or related field and ten (10) years of documented professional construction EHS management experience.

   d. All documented professional EHS management experience must be in the types of construction and conditions expected to be encountered on the site.

   e. For projects that require hazardous waste remediation or response, the SP is also required to have successfully completed a forty-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course.

4. Environmental Professional (EP): Persons recognized as an Environmental Professional shall, at a minimum, possess the following education and experience:

   a. A Bachelor's degree in environmental science, environmental engineering or other related engineering or science field and ten (10) years of documented professional environmental field, management and/or engineering experience. All documented professional environmental experience must be in the types of construction and conditions expected to be encountered under this Contract.

   b. The EP's knowledge and experience should include, but not be limited to, management and disposal of solid and hazardous waste, universal waste, hazardous materials management, chemical and petroleum bulk storage, used oil, chemical and petroleum spill control plans, lead/mercury/PCB and asbestos remediation and management, storm water and soil management, and environmental permit management.

   c. Where required for soil sampling plans and determining soil classifications the EP shall meet the NYSDEC definition for a

Qualified Environmental Professional (QEP). In addition, when soils are excavated for onsite or offsite reuse in NYS, the QEP shall be present onsite to monitor contractor compliance with soil management plans, such as the Field Sampling Plan and Soil Excavation, Reuse, Transport and Disposal Plan (SERTD Plan) specified in 02 24 20 – Soil Sampling and Analysis and 31 23 16 – Excavation, respectively.

5. EHS Rep: Qualifications of the EHS Rep(s) shall include a minimum of: ten years of relevant construction experience, five years of which were exclusively in construction EHS management and successful completion of the following training courses:
   a. BEDC EHS Standards;
   b. Thirty-hour OSHA construction safety and health training;
   c. For projects that require hazardous waste remediation or response, forty-hour HAZWOPER training;
   d. Resource Conservation Recovery Act/DOT hazardous waste/manifesting training
   e. Permit- required confined space;
   f. BEDC spill prevention and control;
   g. Control of hazardous energy sources (lockout/tagout);
6. The Safety Professional, Environmental Professional, and EHS Rep shall have extensive experience with hazard identification, evaluation and controls, and be knowledgeable of all applicable EHS requirements set forth by governing laws, rules and regulations as well as Best Management Practices. Where gaps in the training or experience are identified, DEP may require additional experience or training for approval.

B. Performance Evaluations

1. The Contractor, in conjunction with its Subcontractors, shall be evaluated semi-annually on their performance in implementing the Work of this Contract in accordance with this Section and all related EHS specifications, rules, regulations, laws, policies and procedures. The evaluations are based on the criteria established in DEP's Contractor Selection and Management Policy.
2. In conjunction with the Contractor evaluation form, the EHS Professional(s)and EHS Rep will be evaluated by BEDC EHS and these shall be included in the evaluations.
3. Any EHS Professional or EHS Rep who knowingly falsifies any data, result, audit, document, etc. will be removed from the Project and precluded from further DEP Work.

1.07 SUBMITTALS

A. Environmental Health and Safety Plan (EHASP)

1. The Contractor shall submit the draft EHASP to the Engineer for review and approval within thirty business days from issuance of the Notice to Proceed. In no case shall Work be allowed to commence without an approved EHASP.
2. Initial submission of the EHASP shall be provided as an electronic copy (either Word or Acrobat format) to the Engineer.
3. The EHASP submittal shall be reviewed and comments shall be provided to the Contractor upon completion of the review.
    a. The Contractor shall work with the Engineer to address all comments in order to obtain EHASP approval.
4. Upon receipt of final approval, the Contractor shall provide one hard copy and one electronic copy (either Word or Acrobat format) of the EHASP to the Engineer.
5. The EHASP shall be available to all of the Contractor's employees working on the Contract.
6. Review, acceptance and/or approval of the EHASP will not impose responsibility for the EHASP on any other party, nor will it relieve the Contractor from any of its EHS responsibilities.
7. The Contractor shall adhere to the requirements of BEDC Incident and Near Miss Reporting and Investigation Standard and shall immediately notify the Engineer of all Incidents involving employee injury and illness, and any other work-related Incidents or Near Misses, damage to equipment and structures, releases or adverse impacts to the environment, or other conditions as defined in the Standard.
8. The Contractor must notify the Engineer and BEDC EHS immediately of any regulatory inspections, notices of citations and penalties, Notices of Violation (NOVs), or any other outside agency violations. In addition, the Contractor shall furnish to the Engineer a copy of all correspondence from OSHA, NYSDEC, the Department of Buildings (DOB) or any other government regulatory agency, within one day of receipt, which may include, but are not limited to, employee complaints, notices of citations and penalties, environmental and NOVs. The Contractor must close out all NOVs and provide documentation to the Engineer that the NOV is closed/corrected as a condition precedent to obtaining final payment.

B. Emergency Action Plan (EAP)

1. Each BEDC project shall have a site-specific EAP in accordance with the BEDC Standard on Emergency Action Plan (EAP) Standard.

C. Contractor EHS Employees

1. The Contractor shall submit to BEDC EHS for approval, the names of the EHS Professional(s) and EHS Rep(s) to be employed. These include the SP, EP, ESP, EHS Rep and ESW as described in section 1.06.
    a. BEDC EHS may request and conduct an interview of the candidates prior to approval.
    b. The Contractor shall submit the resumes, copies of certifications, a signed certification of employee training, along with other qualifications of the EHS Professionals and EHS Rep. The resumes shall include items such as: experience, education, EHS courses completed, safety and environmental conferences attended, and certifications achieved. Documentation and/or personal references confirming the qualifications may also be required.
    c. The DEP may reject persons proposed as EHS Professionals or EHS Reps for failure to have adequate qualifications or for other cause at any point prior to and during the Contract period, as determined by the Engineer.

D. Risk Control Reports
1. The Contractor will forward to the Engineer any risk control reports generated by its insurance carrier or broker within one day of receipt.

E. Monthly Contractor EHS Report
1. The Contractor shall submit, on or before the 7th day of each month, a summary report of EHS activity for the prior month, including, but not limited to:
    a. EHS metrics reported on the metrics reporting form provided as part of the pre-construction package and as may be updated throughout the life of the Project.
    b. Chemical Inventory with HTSL (Hazardous and Toxic Substance List) and Subpart Z List.
    c. Petroleum bulk storage (PBS) inventory and registration certificates (if applicable).
    d. Local Law 77 and DEP Bureau of Environmental Compliance air permits.
    e. Summary of audit data including trending and analysis along with root cause and corrective actions/training identified.
    f. Summary of the regulatory inspections, notices of citations and penalties, NOVs, or any other outside agency violations (which occurred and were provided to BEDC in accordance with this Section).

g. Statements by the Safety Professional and Environmental Professional discussing their review of the monthly report(s) and recommendations for improvement, as necessary.

h. Detailed information regarding each pesticide application during the prior month, as specified in Section 01 57 16 - Temporary Pest Control.

2. The Engineer shall review the report to verify that the Contractor is effectively managing the EHS requirements under the Contract. If the Contractor has no, or limited Work in a given month, it shall inform the Engineer that no Work was performed or submit the required documentation for those days that Work was performed.

F. Spill Prevention Program (SPP)

1. At a minimum, the Contractor shall include within the SPP the following:

a. Proper materials handling, labeling and container storage inspection practices for all products including hazardous and universal waste.

b. All petroleum products, hazardous substances, or chemicals must be stored in designated areas and include secondary containment (with capacity to contain 110% of largest container) for all closed containers with a capacity greater than 5 gallons. Open containers of petroleum products, hazardous substances, or chemicals must be stored on secondary containment at all times.

c. Follow manufacturer recommended preventive Maintenance Procedures (MPs) and where none exist, develop in-house equipment specific MPs.

d. Inspection for and purging of residual materials in piping, tanks and other equipment prior to disassembly, demolition and disposal.

e. Supervision of fuel and chemical deliveries. These deliveries shall only be permitted during normal Project work hours or as otherwise approved by the Engineer.

f. The SPP shall include a detailed summary of anticipated petroleum and chemical storage. The information shall include capacity, contents, description and secondary containment provided.

g. If the spill is large and cannot be cleaned up by onsite personnel, provide the name and contact details for the spill cleanup contractor.

h. Include an emergency contact list and hierarchy of contacts in the SPP for spills and incident notification.

i. Provide means and methods for cleaning up anticipated spills.

G. Spill Pollution Prevention and Countermeasures (SPCC) Plan

1. Facilities or construction sites requiring a SPCC Plan as determined by 40 CFR 112 Oil Pollution Prevention Regulation shall submit the SPCC Plan to the CM/BEDC for review 14 days prior to the first delivery of petroleum product for storage, use, transfer or otherwise handing of oil.
2. Contractors must include requirements detailed in 40 CFR Part 112 Oil Pollution Prevention Regulations in the SPCC Plan. The Contractor's EP shall review the SPCC Plan and approve it with a signature.
3. Plans must be reviewed and certified by a Professional Engineer (P.E.). The P.E. not only reviews the plan but certifies it is accurate for the facility or construction site, is made in accordance with good engineering practices, and the facility has adequate inspections, training and maintenance practices to prevent spills.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. EHS Equipment

1. The Contractor shall provide the proper EHS and rescue equipment for all employees, adequately maintained and readily available, for any foreseeable contingency or situation under the Contract during the performance of the Work.
2. All equipment shall be stored in protected areas and maintained and calibrated in accordance with the manufacturer's recommendations and as specified in the EHASP. Where equipment is required to be inspected and or calibrated, documentation shall be maintained and available for review.

B. Personal Protective Equipment

1. All personnel employed by the Contractor and any visitors entering the job site shall be required to wear appropriate personal protective equipment

(PPE) required as specified in the EHASP and the BEDC EHS PPE Standard. The Contractor shall continuously provide and maintain adequate PPE.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. EHS Staff Duties

1. The Contractor's EHS staff is responsible for overseeing and managing the Contractor's safe and environmentally compliant performance of all Work.
2. EHS Professional(s)shall be required to initiate, review and implement measures to ensure the health and safety of all Contractor employees, and to protect property and the environment. Each EHS Professional is required to visit the Site and audit the Site conditions in accordance with the Contractor's EHS Plan or as directed by the Engineer.
3. The EHS Professional will be held accountable to adjust his/her workload to enable proper performance of all of their EHS responsibilities in accordance with all requirements of this Section and all applicable regulations. DEP may request that the Contractor remove the EHS Professional for not meeting the Contract requirements.
4. The EHS Professional shall visit the Site prior to developing the Contractor's EHASP. The EHS Professional will arrange a visit with the Engineer and perform an inspection of the Site to understand the full scope of Work to be performed under the Contract. Contract Documents relevant to writing the EHASP can be reviewed and obtained at this time. Facility/Site specific information must be provided, reviewed, and documented in accordance with the BEDC EHS Site Orientation Standard.
5. The EHS Professional shall visit all Work areas as frequently as necessary, but no less frequently than monthly, to verify that EHS compliance is being achieved. The EHS Professional shall review hazards, JHAs, and the foremen's and superintendent's preparation and communication of JHAs to workers. The EHS Professional shall review the Project team's compliance with and adherence to EHS requirements, as well as their proactive approach and planning for EHS.
6. The EHS Professional shall be available for consultation whenever necessary. Prior to and after each visit, the EHS Professional shall sign the visitors' log maintained at the Engineer's office.

7. The EHS Professional is expected to perform their inspections in concert with the EHS Rep, during which time the EHS Professional will not only inspect the Site, but shall also mentor and direct the EHS Rep. During the inspection, the EHS Professional will evaluate the Contractor and each subcontractor working under the Contract and clearly identify findings and who they are assigned to, using the EHS Professional checklist provided in the EHASP. Any findings that cannot be resolved immediately will be assigned to the EHS Rep for follow-up. The EHS Professional is expected to communicate with the EHS Rep to ensure all identified findings are closed out. The EHS Professional's inspection shall include programmatic issues such as adhering to the Contractor's EHS program, including, but not limited to, preparing and communicating JHAs and proactively minimizing EHS risks.

8. The EHS Rep will coordinate with the EHS Professional when questions arise requiring the EHS Professional's expertise. After each visit, the EHS Professional shall prepare a report, including photographs (where necessary), acceptable to the Engineer and BEDC EHS, detailing the findings. The report shall include those hazards and violations discovered during the site visit and when and how they were or will be closed out. Any EHS items not covered or documented by the inspection checklist will be noted in the comments section of the checklist. The report shall be submitted to the Engineer within one business day of the Site visit.

9. The EHS Rep shall be at the job Site full time whenever work is in progress during all shifts.

10. The EHS Professional's and EHS Rep's responsibilities are as follows:

    a. The EHS Professional is responsible for directing the Contractor's EHS program, ensuring implementation by the Contractor and all Subcontractors, and for directing and monitoring all activities of the EHS Rep. If the EHS Rep is not enforcing the EHASP, JHAs, or other elements of the EHS program, the EHS Professional shall either recommend retraining or removal of the EHS Rep from the Project by submitting a letter to the Engineer and the Contractor.

    b. The EHS Rep must review JHAs to verify that the Work activity's EHS issues and hazards are accurately identified, addressed, and communicated. JHAs shall be regularly communicated to affected employees and must be made available in the areas where the affected employees are working. The EHS Professional is responsible for reviewing JHAs at least monthly to verify that they adequately reflect the recognized hazards and controls of the tasks being performed. JHAs shall be provided to the Engineer or BEDC EHS when requested.

    c. Both the EHS Professional and the EHS Rep shall schedule and conduct EHS meetings and training programs as required. A specific

schedule of these meetings and an outline of topics to be covered shall be provided with the EHASP. The Engineer shall be advised in advance of the time and place of such meetings, and DEP personnel shall be invited to attend the meetings.

d. All Contractor employees shall be instructed by the EHS Professional and the EHS Rep on the recognition of hazards, safe Work practices and environmental precautions, the contents of the EHASP, and the use of environmental, personal protective and emergency equipment. Such training shall be documented, recorded, and provided as part of the EHS monthly report(s). EHS Reps and EHS Professionals will attend regularly scheduled meetings held by the Engineer and BEDC EHS including, but not limited to, the EHS Pre-Construction Meeting.

e. Determine that operators of specific equipment are qualified by training, certification and/or experience before they are allowed to operate such equipment. Ensure documentation of licenses, certifications and training by the appropriate agencies (for example OSHA, NYC DOB, NYC Fire Department, etc.) are on site and current, prior to start of Work.

f. Verify implementation of the BEDC Emergency Action Plan (EAP) Standard.

g. Develop an effective Site communication plan that includes, signage, and verbal and written communication of EHS issues and notices.

h. Post all appropriate notices regarding EHS regulations at Site location(s) which afford maximum exposure to all personnel at the job Site.

i. Post appropriate instructions and warning signs regarding all hazardous areas or conditions which cannot be eliminated. Identification of these areas shall be based on experience, site surveillance, and severity of hazard. Such signs shall not be used in place of appropriate workplace controls.

j. The EHS Rep is to conduct EHS inspections a minimum of twice per shift to ensure that all machines, tools and equipment are in a safe operating condition, and that all Work areas are free of safety and environmental hazards. The EHS Rep shall take necessary and immediate corrective actions, where feasible, to eliminate all unsafe acts and/or conditions, and submit to the Engineer each day a copy of the findings on the inspection check list report forms established in the EHASP. Detailed checklists will be tailored to the EHS hazards and conditions on the Site, and will include a comments section to include findings not specifically listed on the checklist.

k. Whenever DEP and its agents perform both announced and unannounced inspections of the Contractor’s EHS performance, a

member of the Contractor's on-site EHS team shall be available during the inspections. The EHS Professional will coordinate inspections with the Engineer and DEP inspectors upon request. The Contractor shall take immediate corrective action, where feasible, to eliminate hazards identified by the Engineer, DEP inspectors, or any other entity. The Contractor, if requested, shall develop and implement a plan detailing corrective actions necessary to mitigate the presence of noncompliant conditions and actions following Incidents, citations, NOVs, or identification of patterns of noncompliant conditions and acts.

l. Notify the Engineer and BEDC EHS immediately of all inspections by regulatory agencies, and submit to the Engineer and BEDC EHS copies of all EHS reports, citations, and NOVs from regulatory agencies and insurance companies within one workday of receipt.

m. Implement an effective fire protection and prevention program at the Site throughout all phases of the construction Work in accordance with BEDC's Fire Prevention Standard. The Contractor will ensure the availability of fire protection and suppression equipment adequate to control the degree of fire hazard encountered during construction.

n. Provide and document appropriate Site-specific orientation to Contractor employees, visitors, and Subcontractors communicating recognized hazards present at and surrounding the Site(s) and facility in accordance with BEDC's Site Orientation Standard and DEP's Contractor Selection and Management Policy.

o. Perform all tasks and responsibilities as identified in the EHASP.

3.02 APPLICATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. EPCRA and Related Hazardous Material Regulations

1. The Contractor shall maintain a monthly inventory of hazardous substances or extremely hazardous substances used or stored on Site in accordance with the BEDC-provided chemical inventory form. Documentation shall be maintained on Site and available for review.

2. The Contractor shall prepare and provide to the Engineer a Right to Know (RTK)/Emergency Planning and Community Right to Know Act (EPCRA) Annual Chemical Inventory Form for all hazardous and extremely hazardous substances that the Contractor used or stored during the previous calendar year. This shall be provided by January 15th of each year.

3. In addition to any requirements of the New York City Standard Construction Contract, in order to obtain Final Acceptance, the Contractor must satisfy all EPCRA reporting requirements for the final year of the Contract.

B. Temporary Protective Grounding Equipment

1. Temporary Protective Grounding Equipment (TPGE) shall be used at locations required by 29 CFR 1910.269. TPGE may be used at other locations, when specified in the EHASP.

2. TPGE shall not be used as a substitute for following lockout procedures.

C. Hot Work

1. The performance of Hot Work is prohibited unless performed under the issuance of a Hot Work permit from the Permit Authorizing Individual (PAI). The PAI shall be provided by the DEP.

   a. Where the DEP and Engineer are not routinely present, the Contractor may be allowed to obtain PAI certification for Contract employees.

2. The Contractor shall provide the Engineer with a JHA at least 72 hours prior to the performance of Hot Work. The JHA shall identify the following:

   a. The locations where the Work is to performed;

   b. Equipment to be used;

   c. Gases or vapors within or adjacent to the location that have the potential to create a combustible atmosphere;

   d. Controls required to mitigate or prevent the accumulation of gases or vapors in quantities that have the potential to create a combustible atmosphere; and

   e. Controls or methods to promptly discontinue the use of and de-energize equipment when a combustible atmosphere is detected.

3. For Hot Work in hazardous (classified) locations, refer to the requirements of Section 01 35 44 – Working in Hazardous (Classified) Locations.

D. Electrical Equipment Lockout

1. Contractor is required to lock out all electrical equipment utilizing lockable disconnecting means that provide mechanical isolation followed by verification of no voltage, as according to OHSA 1910/1926 and NFPA 70E; equipment tag out is not sufficient. If a lockable disconnecting means is not available at the identified equipment due to equipment design or operational condition, the Lockout process will continue elevating to the next level of the system, electrical or otherwise, until a lockable disconnecting means is available providing mechanical isolation. Complex electrical systems and network power distribution systems require lockable disconnecting means at all isolation points from the main power source through the downstream equipment loads (e.g. systems with A and B bus sources or other multiple power sources). The lock out requirement will be performed to the greatest extent possible in consideration of plant operational impacts. When the plant operational impacts are too significant to environmental compliance, an

alternative method may be utilized know as an Energized Electrical Work Permit (EEWP). An EEWP is a document, defined by NFPA 70E, that clearly describes the following: the circuit, equipment, and location of the job/task at hand; the work that is to be done; justification of why the circuit or equipment cannot be de-energized or the work deferred until the next scheduled outage; performed by an Electrical Safety Worker (ESW); signatory authorization by the Plant Chief or Facility Manager.

3.04 STARTUP / DEMONSTRATION

A. Visitors

1. Allowing visitors and members of the public to tour an active construction site is discouraged due to the potential exposures to hazardous conditions and materials associated with construction Work. However, where necessary, approved and authorized visitors of the Contractor, Subcontractors, or any other authorized agency, department, or other entity associated with the Contractor shall sign in at both the DEP/Contractor Security Booth and the Visitors' Log maintained at the Contractor's Site office. Visitors are required to receive Site orientation training, comply with all provisions of the EHASP, wear proper and appropriate PPE and be escorted at all times. All efforts should be made not to schedule site tours/visits at the time of the scheduled evacuation drills. Visitors must not be exposed to construction hazards without prior training with respect to those construction hazards.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

Exhibit A

Standard Environmental, Health and Safety Specifications
Rev 4, 6/23/2022

STANDARD ENVIRONMENTAL, HEALTH AND SAFETY SPECIFICATIONS

1. Scope

The goal of the New York City Department of Environmental Protection (DEP) is to run the safest operations and capital program in the country with the best environmental compliance record of any large water and wastewater utility. To achieve that goal, DEP strives to hire safe and environmentally compliant contractors and to systematically manage, monitor and evaluate contractors that are working on DEP projects and at DEP locations.

As such, DEP has developed procedures to ensure that contractors' environmental, health and safety (EHS) records and programs are evaluated when DEP is selecting a contractor or approving a subcontractor. These procedures require that all contractors are properly prepared and trained to safely complete the work and to adhere to all EHS laws, rules, and applicable standards as contractually required. DEP work sites are subject to requirements regarding qualification, supervision, and activities of contractors.

These contract requirements (Specifications) set forth the EHS eligibility standards for contract award as well as the applicable EHS training requirements and requirements specific to working on a DEP project. The Contractor must comply with applicable federal, state, and local codes and standards, including environmental and occupational safety and health requirements, as well as any additional special requirements invoked by other sections of the Contract.

Unless otherwise specified, these Specifications do not apply to:

- Contractors providing services with little likelihood of affecting DEP employee safety, DEP property, the public, and the environment, such as consulting services, light janitorial work, laundry, delivery (e.g., food and drink, furniture, filing cabinets), other supply services and shipping, or other products/services as determined by the contracting Bureau.
- Entities funded by DEP which do not directly provide labor or services to DEP, but which utilize funds to independently contract with others to provide services. Examples include other governmental agencies, grant recipients, and non-profit groups. Bureaus may require such entities to comply with the requirements of this policy by specifically adding these criteria into an agreement or contract;
- Other products or services, as determined by the contracting Bureau that do not have the potential to impact safety, public health or the environment.

2. Pre-Award

2.1 Contractor Safety Record Submittals

Within 5 business days of DEP request, the apparent low bidder shall provide the information specified below. Failure to provide the required information may result in a rejection of the bid.

2.1.1 NY Intrastate Experience Modification Rating (EMR) for past 3 years.

Bidder shall provide its NY Intrastate EMR for the past 3 years on its insurance broker's letterhead. EMR information provided by the New York State Insurance Rating Board is also acceptable. If the bidder does not have a NY Intrastate EMR, its out-of-state EMRs shall be submitted. DEP may also request a company's Workers Compensation Loss Runs to verify EMR.

Bidders that do not have an EMR shall provide, for the past 3 years, their: (a) Workers Compensation Loss Runs (this information shall be provided by their insurance broker); (b) OSHA Total Recordable Cases (TRC); and (c) Days Away, Restricted, or Transferred (DART) rates.

Note: if the bidder is not required to maintain such information, it shall provide an explanation for the exemption.

Bidders are expected to have an EMR of 1.0 or below. If a bidder's EMR is greater than 1.0 in any single year within the 3-year period, the bidder shall submit the following:

- An explanation and supporting documentation explaining why the EMR is greater than 1.0 and detailed steps that have been taken to improve the bidder's EHS performance.
- Five years of Workers Compensation Loss Runs (this information shall be provided by the insurance broker) and documentation of payroll during that same period.
- For each indicated loss, the bidder shall provide a summary of the loss facts and investigation, including a summary of corrective actions undertaken and modifications or development of EHS programs.
- If the bidder has been notified by the New York Compensation Insurance Rating Board (NYCIRB) within the past 3 years that they must participate in the Industrial Code Rule 59, Workplace Safety and Loss Prevention, program then the bidder shall provide a copy of their Consultation Report from a Certified Consultant, documentation of the implementation of the Report identified

corrective action(s) and recommendation(s), and a copy of the carrier required re-inspection. If the bidder elected to instead receive a worker's compensation premium surcharge, they shall so indicate.

2.1.2 Last 3 years of OSHA 300 Forms (Logs of Work-Related Injuries and Illnesses) and/or 300A redacted summary worksheets (as available, to verify accuracy of information provided).

Note: if the bidder is not required to maintain such information, it shall provide an explanation for the exemption.

If a bidder's EMR is greater than 1.0, the bidder shall submit their OSHA 300A redacted forms for the entire period covered by the work loss runs indicated in Section 2.1.1 above.

2.1.3 List of all federal, state and local regulatory agency (e.g., OSHA, NYSDEC, USEPA, USDOT, DEP, FDNY and NYCDOB, etc.) notices of violation, notices of deficiencies, and fines issued/received in the past 3 years; the letter listing these (or stating that no notices of violation, notices of deficiencies, and no fines have been issued/received in the past 3 years) shall be on company letterhead and certified as complete and accurate by the sworn, notarized statement of a principal or officer of the bidder.

2.1.4 List of reportable releases of chemical or petroleum products associated with the bidder's operations during, at a minimum, the last 3 years; the letter listing these (or stating that no reportable releases associated with the bidder's operations have occurred during the past 3 years) shall be on company letterhead and certified as complete and accurate by the sworn, notarized statement of a principal or officer of the bidder.

2.1.5 A written description of the bidder's EHS programs (and associated training), including any EHS programs and procedures employees will be required to follow while providing labor or services for DEP. Upon request by DEP, the bidder shall also provide a protocol for the EHS evaluation of any subcontractors that could be proposed by it for DEP approval.

2.1.6 A sworn, notarized certification from a principal or officer that, if the bidder is awarded the Contract, its EHS programs shall meet all OSHA, USEPA, NYS and local regulations, and the bidder shall abide by applicable DEP policies and procedures, as appropriate, and as provided by DEP. (Refer to Bidder's EHS Performance and Program Review Questionnaire/Checklist that is included with the bid submission materials in the Invitation for Bids package).

2.1.7 For bidders that are joint ventures, the above information must be provided and will be reviewed for the joint venture itself and the individual joint venture partners.

2.2 Responsiveness

The items submitted under 2.1 will be evaluated as the contractor's safety record. Further, the bidder's EHS submittals and training program descriptions must indicate that the bidder:

- understands its regulatory requirements
- has a proactive and acceptable EHS and training program in place
- has performed acceptably on prior DEP projects as applicable.
- has adequate EHS professionals available for the project
- has demonstrated an acceptable safety record for the time periods reviewed.
- has demonstrated an acceptable safety record on similar projects over the past three years; and
- has certified that its program and training comply with all regulatory requirements.

3. Proposed Subcontractors

3.1 The subcontractor approval process requires an information submittal that includes the proposed subcontractor's EMR, EHS program descriptions and certifications like those in sections 2.1 and 2.2.

3.2 The standards listed in Section 2.2, above, shall also apply to the approval of proposed subcontractors that would be performing a significant volume or aspect of the project.

4. Contractor Orientation

4.1 Prior to commencing any work at any DEP location, the Contractor shall be required to attend an orientation. After attending the initial orientation, the Contractor shall, in turn, provide an orientation to any of the Contractor's employees assigned to work at the DEP location. This training must also be provided to subcontractors, suppliers[1], and Contractor visitors who will be onsite.

4.2 During orientation, DEP will provide the Contractor with the most current:

4.2.1 Work site-specific hazardous conditions and related information (e.g., hazardous chemicals present at the work site, locations of Safety Data Sheets, and required safe work practices including minimum Personal Protective Equipment (PPE) requirements);

4.2.2 Facility-specific lockout/tagout requirements;

[1] This requirement does not apply to suppliers providing services or products that are determined by the Bureau administering the Contract to have little likelihood of affecting DEP employee safety, property, the public, or the environment.

4.2.3 Applicable sections of the work site's Emergency Action Plan and, at a minimum, the emergency contact numbers, facility map, notification procedures, evacuation procedures, evacuation routes, assembly areas, and description of alarms;

4.2.4 Access control procedure;

4.2.5 Location of restricted areas accessible from the work area or approaches to the work area (e.g., Process Safety Management/Risk Management Plan-covered processes, permit-required confined spaces, and other high-hazard areas) and procedures for working in and around restricted areas;

4.2.6 DEP's Workplace Violence Prevention Policy;

4.2.7 DEP's Possession of Firearms in the Workplace Policy;

4.2.8 All other applicable DEP policies and procedures that will, or may, be necessary for the work; and

4.2.9 Information on known constituents of concern in the work area, including areas known to contain, or having historically contained, lead, asbestos, PCBs, and mercury.

4.3 If provided one by DEP, the Contractor shall distribute to all workers who are to attend the orientation a hazardous material and safe work practices information package. If possible, it will be distributed at least two days prior to the orientation. The workers shall sign for the packages and indicate that they have reviewed the contents prior to their attending the orientation.

4.4 Prior to commencing any work, a responsible official of the Contractor shall certify that it understands its obligations to train its employees and that it has been informed of and will abide by applicable DEP policies and procedures while it is working at DEP work sites.

4.5 If the Contractor or a subcontractor needs to add additional or replacement worker(s) to its crews, the new worker(s) must be provided with the same information received by other workers and receive the orientation for the work site(s).

4.6 The Contractor shall use the Contractor Training Certification form provided by DEP (or an equivalent form), as the record of those Contractor and subcontractor employees who have completed the facility orientation.

5. Requirements During Work

5.1 When and where required by the DEP Bureau of Police and Security, the Contractor, and its subcontractors, and all their respective employees shall, always when working at the site(s), wear photo-identification badges.

5.2 The Contractor shall develop a work plan that identifies and addresses safety hazards and environmental requirements prior to starting any work.

5.3 PPE must be utilized in accordance with the work plan.

5.4 The Contractor and its subcontractors and all their respective employees shall, upon request, produce certificates, licenses, and other documentation that laws or regulations require them to obtain them to conduct activities they are performing (e.g., Asbestos Worker Certificate, FDNY Certificate of Fitness in New York City).

5.5 The Contractor's and its subcontractors' employees are restricted from entering all high-hazard process areas unless access is required to perform their work. In coordination with the Contract Supervisor, the Contractor or subcontractor employees entering such process areas must obtain permission from the on-duty operator or supervisor in person or by the telephone before entering these areas. Further, Contractor or subcontractor employees must inform the on-duty operator or supervisor in person or by telephone upon leaving and follow all other facility access control procedures.

5.6 Any worker who fails to abide by the EHS requirements presented in the safety orientation shall, at the sole discretion of the DEP, be denied access to the facilities and shall be replaced by the Contractor, as directed by DEP.

5.7 The Contractor shall immediately inform the DEP Contract Supervisor and the facility's most senior manager of all incidents and all near misses; and of any notices of violation (NOVs), notices of deficiencies (NODs), and fines issued by and/or received from regulatory agencies resulting from work performed. Initial written reports shall be submitted by the next day. Note that other specification sections in this Contract may include additional investigation and reporting requirements and must be consulted. The more stringent requirements will apply in the event of any conflict.

5.7.1 The Contractor must close out all NOVs, and all other violations/deficiencies, and pay the appropriate fines before final or subsequent payments can be made by DEP. The Contractor will not receive final payment if there are open violations or notices of non-compliance.

6. Evaluations of Contractor EHS Performance

6.1 DEP will perform evaluations of the Contractor's performance to ensure compliance with all EHS laws and regulations and DEP and facility EHS requirements. Such

evaluations will be considered when evaluating the Contractor's bids for future contracts.

6.2 The Contractor shall be rated on each category shown on the Contractor EHS Evaluation form a copy of which should be provided to the Contractor by the Contract Supervisor. ("NA" is acceptable where the requirement was not applicable). The Contract Supervisor may include other specific EHS categories under "Other" that are of particular importance to the project. The Contract Supervisor shall inform the Contractor prior to commencement of work when this is the case.

6.3 DEP considers compliance with and conformance to EHS requirements to be of the utmost importance, and recognizes that, on particular projects, the importance of compliance with certain requirements may carry more weight than others, as failure to comply may present a greater level of risk. The final rating for the job in such a case may be weighted more heavily on specific categories (one or two) if compliance with that/those program requirement(s) is paramount to worker safety and/or environmental protection. In this case, the Contractor shall be notified prior to the commencement of work or through the development of risk-based safety plans during the project.

6.4 The following rating scale shall be utilized in conducting the Contractor evaluations:

Excellent – Contractor exceeded EHS contractual, policy, and/or regulatory requirements. Work was accomplished with no observed deficiencies and no violations. Contractor proactively and effectively addressed potential risks. Contractor demonstrated EHS leadership and best practices and showed alignment with DEP's EHS goals.

Good – Contractor met or exceeded most EHS contractual, policy, and/or regulatory requirements. Work was accomplished with limited or minor observed deficiencies or minor violations. Correction and preventative actions taken by the Contractor were timely and effective.

Fair – Contractor met EHS contractual, policy, and/or regulatory requirements. Observed deficiencies or violations were satisfactorily corrected and did not indicate a pattern of repetition. The correction and preventative actions taken by the Contractor were completed in a timely manner.

Poor – Contractor did not meet some EHS contractual, policy, and/or regulatory requirements. EHS deficiencies and/or violations were identified, but the Contractor either did not identify corrective and preventative actions or proposed correction and preventative actions that appeared to be only marginally effective.

Unsatisfactory – Contractor did not meet a significant number of EHS contractual, policy, and/or regulatory requirements. EHS deficiencies and/or violations were identified, but Contractor did not develop a Corrective and Preventative Action Plan, or failed to implement a Corrective and Preventative Action Plan, or implemented an unsuccessful Corrective and Preventative Action Plan. Deficiencies and/or violations indicated a pattern of repetition.

6.5 A Contractor that disagrees with an overall evaluation of "Poor" or "Unsatisfactory" can submit a written request for reconsideration to the DEP Contract Supervisor within 10 business days after receipt of the written evaluation. The request for reconsideration must set forth all the relevant information and arguments and be accompanied by any documentation relied on in support of the request. The request for reconsideration will be reviewed by the Deputy Commissioner overseeing the Bureau or his or her designee. The Deputy Commissioner or designee will notify the Contractor of the determination of the request in writing. Such determination will be final.

6.6 If its evaluation (other than the final evaluation) is "Poor" or "Unsatisfactory," the Contractor must prepare a Corrective and Preventive Action Plan to correct and prevent recurrence of the deficiencies identified through the evaluation.

* * * * * *

Exhibit B

Bidder's EHS Safety Record and Program Review Questionnaire
Rev 4, 6/23/2022

DEP Contract Name or Number:		
Contractor Name:		
Location(s) and description of work to be performed (attach work summary from contract):		
Provide as part of the pre-award submittal:	☐	EMR Rating (1.0 or below)[1]
	☐	OSHA 300 logs and/or 300A redacted worksheets
	☐	Sworn, certified and notarized letter with information on all regulatory violations and reportable releases in the past 3 years
	☐	Sworn, certified and notarized letter from principal that if awarded the contract, its EHS programs shall meet all OSHA, US EPA, NYS and local regulations and shall abide by all DEP policies and procedures (with information on all reportable releases in the past 3 years
	☐	Written description of firm's EHS and training programs
Attach Table of Contents of Firm's EHS programs and describe below		
Describe employee EHS training below, including new employee training (or attach)		
Describe protocol for subcontractor approval and onboarding below (or attach)		

[1] Contractors with EMRs over 1.0 must provide the documents references in sections 2.1.1 of the DEP Contractor Selection and Management Policy Attachment A (Rev. 4).

Certifications
I certify that the EHS and Training Programs for:

(Company Name)_____

comply with applicable OSHA, USEPA, NYSDEC and NYC regulatory requirements and that the information presented on this form and attachments is accurate and complete. Our company is aware and understands its obligations under the OSHA, USEPA, state and NYC standards (if applicable).

Signature: _____ Title: _____

Print Name: _____ Date: _____

NO TEXT ON THIS PAGE

ATTACHMENT A

STANDARD ENVIRONMENTAL, HEALTH AND SAFETY SPECIFICATIONS

To be included in all contracts where applicable

STANDARD ENVIRONMENTAL, HEALTH AND SAFETY SPECIFICATIONS

1. Scope

The goal of the New York City Department of Environmental Protection (DEP) is to run the safest operations and capital program in the country with the best environmental compliance record of any large water and wastewater utility. To achieve that goal, DEP strives to hire safe and environmentally compliant contractors and to systematically manage, monitor and evaluate contractors that are working on DEP projects and at DEP locations.

As such, DEP has developed procedures to ensure that contractors' environmental, health and safety (EHS) records and programs are evaluated when DEP is selecting a contractor or approving a subcontractor. These procedures require that all contractors are properly prepared and trained to safely complete the work and to adhere to all EHS laws, rules, and applicable standards as contractually required. DEP work sites are subject to requirements regarding qualification, supervision, and activities of contractors.

These contract requirements (Specifications) set forth the EHS eligibility standards for contract award as well as the applicable EHS training requirements and requirements specific to working on a DEP project. The Contractor must comply with applicable federal, state, and local codes and standards, including environmental and occupational safety and health requirements, as well as any additional special requirements invoked by other sections of the Contract.

Unless otherwise specified, these Specifications do not apply to:

- Contractors providing services with little likelihood of affecting DEP employee safety, DEP property, the public, and the environment, such as consulting services, light janitorial work, laundry, delivery (e.g., food and drink, furniture, filing cabinets), other supply services and shipping, or other products/services as determined by the contracting Bureau.
- Entities funded by DEP which do not directly provide labor or services to DEP, but which utilize funds to independently contract with others to provide services. Examples include other governmental agencies, grant recipients, and non-profit groups. Bureaus may require such entities to comply with the requirements of this policy by specifically adding these criteria into an agreement or contract;
- Other products or services, as determined by the contracting Bureau that do not have the potential to impact safety, public health or the environment.

2. Pre-Award

2.1 Contractor Safety Record Submittals

Within 5 business days of DEP request, the apparent low bidder shall provide the information specified below. Failure to provide the required information may result in a rejection of the bid.

2.1.1 NY Intrastate Experience Modification Rating (EMR) for past 3 years.

Bidder shall provide its NY Intrastate EMR for the past 3 years on its insurance broker's letterhead. EMR information provided by the New York State Insurance Rating Board is also acceptable. If the bidder does not have a NY Intrastate EMR, its out-of-state EMRs shall be submitted. DEP may also request a company's Workers Compensation Loss Runs to verify EMR.

Bidders that do not have an EMR shall provide, for the past 3 years, their: (a) Workers Compensation Loss Runs (this information shall be provided by their insurance broker); (b) OSHA Total Recordable Cases (TRC); and (c) Days Away, Restricted, or Transferred (DART) rates.

Note: if the bidder is not required to maintain such information, it shall provide an explanation for the exemption.

Bidders are expected to have an EMR of 1.0 or below. If a bidder's EMR is greater than 1.0 in any single year within the 3-year period, the bidder shall submit the following:

- An explanation and supporting documentation explaining why the EMR is greater than 1.0 and detailed steps that have been taken to improve the bidder's EHS performance.
- Five years of Workers Compensation Loss Runs (this information shall be provided by the insurance broker) and documentation of payroll during that same period.
- For each indicated loss, the bidder shall provide a summary of the loss facts and investigation, including a summary of corrective actions undertaken and modifications or development of EHS programs.
- If the bidder has been notified by the New York Compensation Insurance Rating Board (NYCIRB) within the past 3 years that they must participate in the Industrial Code Rule 59, Workplace Safety and Loss Prevention, program then the bidder shall provide a copy of their Consultation Report from a Certified Consultant, documentation of the implementation of the Report identified

corrective action(s) and recommendation(s), and a copy of the carrier required re-inspection. If the bidder elected to instead receive a worker's compensation premium surcharge, they shall so indicate.

2.1.2 Last 3 years of OSHA 300 Forms (Logs of Work-Related Injuries and Illnesses) and/or 300A redacted summary worksheets (as available, to verify accuracy of information provided).

Note: if the bidder is not required to maintain such information, it shall provide an explanation for the exemption.

If a bidder's EMR is greater than 1.0, the bidder shall submit their OSHA 300A redacted forms for the entire period covered by the work loss runs indicated in Section 2.1.1 above.

2.1.3 List of all federal, state and local regulatory agency (e.g., OSHA, NYSDEC, USEPA, USDOT, DEP, FDNY and NYCDOB, etc.) notices of violation, notices of deficiencies, and fines issued/received in the past 3 years; the letter listing these (or stating that no notices of violation, notices of deficiencies, and no fines have been issued/received in the past 3 years) shall be on company letterhead and certified as complete and accurate by the sworn, notarized statement of a principal or officer of the bidder.

2.1.4 List of reportable releases of chemical or petroleum products associated with the bidder's operations during, at a minimum, the last 3 years; the letter listing these (or stating that no reportable releases associated with the bidder's operations have occurred during the past 3 years) shall be on company letterhead and certified as complete and accurate by the sworn, notarized statement of a principal or officer of the bidder.

2.1.5 A written description of the bidder's EHS programs (and associated training), including any EHS programs and procedures employees will be required to follow while providing labor or services for DEP. Upon request by DEP, the bidder shall also provide a protocol for the EHS evaluation of any subcontractors that could be proposed by it for DEP approval.

2.1.6 A sworn, notarized certification from a principal or officer that, if the bidder is awarded the Contract, its EHS programs shall meet all OSHA, USEPA, NYS and local regulations, and the bidder shall abide by applicable DEP policies and procedures, as appropriate, and as provided by DEP. (Refer to Bidder's EHS Performance and Program Review Questionnaire/Checklist that is included with the bid submission materials in the Invitation for Bids package).

2.1.7 For bidders that are joint ventures, the above information must be provided and will be reviewed for the joint venture itself and the individual joint venture partners.

2.2 Responsiveness

The items submitted under 2.1 will be evaluated as the contractor's safety record. Further, the bidder's EHS submittals and training program descriptions must indicate that the bidder:

- understands its regulatory requirements
- has a proactive and acceptable EHS and training program in place
- has performed acceptably on prior DEP projects as applicable.
- has adequate EHS professionals available for the project
- has demonstrated an acceptable safety record for the time periods reviewed.
- has demonstrated an acceptable safety record on similar projects over the past three years; and
- has certified that its program and training comply with all regulatory requirements.

3. Proposed Subcontractors

3.1 The subcontractor approval process requires an information submittal that includes the proposed subcontractor's EMR, EHS program descriptions and certifications like those in sections 2.1 and 2.2.

3.2 The standards listed in Section 2.2, above, shall also apply to the approval of proposed subcontractors that would be performing a significant volume or aspect of the project.

4. Contractor Orientation

4.1 Prior to commencing any work at any DEP location, the Contractor shall be required to attend an orientation. After attending the initial orientation, the Contractor shall, in turn, provide an orientation to any of the Contractor's employees assigned to work at the DEP location. This training must also be provided to subcontractors, suppliers[1], and Contractor visitors who will be onsite.

4.2 During orientation, DEP will provide the Contractor with the most current:

4.2.1 Work site-specific hazardous conditions and related information (e.g., hazardous chemicals present at the work site, locations of Safety Data Sheets, and required safe work practices including minimum Personal Protective Equipment (PPE) requirements);

4.2.2 Facility-specific lockout/tagout requirements;

[1] This requirement does not apply to suppliers providing services or products that are determined by the Bureau administering the Contract to have little likelihood of affecting DEP employee safety, property, the public, or the environment.

4.2.3 Applicable sections of the work site's Emergency Action Plan and, at a minimum, the emergency contact numbers, facility map, notification procedures, evacuation procedures, evacuation routes, assembly areas, and description of alarms;

4.2.4 Access control procedure;

4.2.5 Location of restricted areas accessible from the work area or approaches to the work area (e.g., Process Safety Management/Risk Management Plan-covered processes, permit-required confined spaces, and other high-hazard areas) and procedures for working in and around restricted areas;

4.2.6 DEP's Workplace Violence Prevention Policy;

4.2.7 DEP's Possession of Firearms in the Workplace Policy;

4.2.8 All other applicable DEP policies and procedures that will, or may, be necessary for the work; and

4.2.9 Information on known constituents of concern in the work area, including areas known to contain, or having historically contained, lead, asbestos, PCBs, and mercury.

4.3 If provided one by DEP, the Contractor shall distribute to all workers who are to attend the orientation a hazardous material and safe work practices information package. If possible, it will be distributed at least two days prior to the orientation. The workers shall sign for the packages and indicate that they have reviewed the contents prior to their attending the orientation.

4.4 Prior to commencing any work, a responsible official of the Contractor shall certify that it understands its obligations to train its employees and that it has been informed of and will abide by applicable DEP policies and procedures while it is working at DEP work sites.

4.5 If the Contractor or a subcontractor needs to add additional or replacement worker(s) to its crews, the new worker(s) must be provided with the same information received by other workers and receive the orientation for the work site(s).

4.6 The Contractor shall use the Contractor Training Certification form provided by DEP (or an equivalent form), as the record of those Contractor and subcontractor employees who have completed the facility orientation.

5. Requirements During Work

5.1 When and where required by the DEP Bureau of Police and Security, the Contractor, and its subcontractors, and all their respective employees shall, always when working at the site(s), wear photo-identification badges.

5.2 The Contractor shall develop a work plan that identifies and addresses safety hazards and environmental requirements prior to starting any work.

5.3 PPE must be utilized in accordance with the work plan.

5.4 The Contractor and its subcontractors and all their respective employees shall, upon request, produce certificates, licenses, and other documentation that laws or regulations require them to obtain them to conduct activities they are performing (e.g., Asbestos Worker Certificate, FDNY Certificate of Fitness in New York City).

5.5 The Contractor's and its subcontractors' employees are restricted from entering all high-hazard process areas unless access is required to perform their work. In coordination with the Contract Supervisor, the Contractor or subcontractor employees entering such process areas must obtain permission from the on-duty operator or supervisor in person or by the telephone before entering these areas. Further, Contractor or subcontractor employees must inform the on-duty operator or supervisor in person or by telephone upon leaving and follow all other facility access control procedures.

5.6 Any worker who fails to abide by the EHS requirements presented in the safety orientation shall, at the sole discretion of the DEP, be denied access to the facilities and shall be replaced by the Contractor, as directed by DEP.

5.7 The Contractor shall immediately inform the DEP Contract Supervisor and the facility's most senior manager of all incidents and all near misses; and of any notices of violation (NOVs), notices of deficiencies (NODs), and fines issued by and/or received from regulatory agencies resulting from work performed. Initial written reports shall be submitted by the next day. Note that other specification sections in this Contract may include additional investigation and reporting requirements and must be consulted. The more stringent requirements will apply in the event of any conflict.

5.7.1 The Contractor must close out all NOVs, and all other violations/deficiencies, and pay the appropriate fines before final or subsequent payments can be made by DEP. The Contractor will not receive final payment if there are open violations or notices of non-compliance.

6. Evaluations of Contractor EHS Performance

6.1 DEP will perform evaluations of the Contractor's performance to ensure compliance with all EHS laws and regulations and DEP and facility EHS requirements. Such

evaluations will be considered when evaluating the Contractor's bids for future contracts.

6.2 The Contractor shall be rated on each category shown on the Contractor EHS Evaluation form a copy of which should be provided to the Contractor by the Contract Supervisor. ("NA" is acceptable where the requirement was not applicable). The Contract Supervisor may include other specific EHS categories under "Other" that are of particular importance to the project. The Contract Supervisor shall inform the Contractor prior to commencement of work when this is the case.

6.3 DEP considers compliance with and conformance to EHS requirements to be of the utmost importance, and recognizes that, on particular projects, the importance of compliance with certain requirements may carry more weight than others, as failure to comply may present a greater level of risk. The final rating for the job in such a case may be weighted more heavily on specific categories (one or two) if compliance with that/those program requirement(s) is paramount to worker safety and/or environmental protection. In this case, the Contractor shall be notified prior to the commencement of work or through the development of risk-based safety plans during the project.

6.4 The following rating scale shall be utilized in conducting the Contractor evaluations:

Excellent – Contractor exceeded EHS contractual, policy, and/or regulatory requirements. Work was accomplished with no observed deficiencies and no violations. Contractor proactively and effectively addressed potential risks. Contractor demonstrated EHS leadership and best practices and showed alignment with DEP's EHS goals.

Good – Contractor met or exceeded most EHS contractual, policy, and/or regulatory requirements. Work was accomplished with limited or minor observed deficiencies or minor violations. Correction and preventative actions taken by the Contractor were timely and effective.

Fair – Contractor met EHS contractual, policy, and/or regulatory requirements. Observed deficiencies or violations were satisfactorily corrected and did not indicate a pattern of repetition. The correction and preventative actions taken by the Contractor were completed in a timely manner.

Poor – Contractor did not meet some EHS contractual, policy, and/or regulatory requirements. EHS deficiencies and/or violations were identified, but the Contractor either did not identify corrective and preventative actions or proposed correction and preventative actions that appeared to be only marginally effective.

Unsatisfactory – Contractor did not meet a significant number of EHS contractual, policy, and/or regulatory requirements. EHS deficiencies and/or violations were identified, but Contractor did not develop a Corrective and Preventative Action Plan, or failed to implement a Corrective and Preventative Action Plan, or implemented an unsuccessful Corrective and Preventative Action Plan. Deficiencies and/or violations indicated a pattern of repetition.

6.5 A Contractor that disagrees with an overall evaluation of "Poor" or "Unsatisfactory" can submit a written request for reconsideration to the DEP Contract Supervisor within 10 business days after receipt of the written evaluation. The request for reconsideration must set forth all the relevant information and arguments and be accompanied by any documentation relied on in support of the request. The request for reconsideration will be reviewed by the Deputy Commissioner overseeing the Bureau or his or her designee. The Deputy Commissioner or designee will notify the Contractor of the determination of the request in writing. Such determination will be final.

6.6 If its evaluation (other than the final evaluation) is "Poor" or "Unsatisfactory," the Contractor must prepare a Corrective and Preventive Action Plan to correct and prevent recurrence of the deficiencies identified through the evaluation.

* * * * * *

ATTACHMENT B

BIDDER'S EHS SAFETY RECORD AND PROGRAM REVIEW

QUESTIONNAIRE

DEP Contract Name or Number:		
Contractor Name:		
Location(s) and description of work to be performed (attach work summary from contract):		
Provide as part of the pre-award submittal:	☐	EMR Rating (1.0 or below)[1]
	☐	OSHA 300 logs and/or 300A redacted worksheets
	☐	Sworn, certified and notarized letter with information on all regulatory violations and reportable releases in the past 3 years
	☐	Sworn, certified and notarized letter from principal that if awarded the contract, its EHS programs shall meet all OSHA, US EPA, NYS and local regulations and shall abide by all DEP policies and procedures (with information on all reportable releases in the past 3 years
	☐	Written description of firm's EHS and training programs
Attach Table of Contents of Firm's EHS programs and describe below		
Describe employee EHS training below, including new employee training (or attach)		
Describe protocol for subcontractor approval and onboarding below (or attach)		

[1] Contractors with EMRs over 1.0 must provide the documents references in sections 2.1.1 of the DEP Contractor Selection and Management Policy Attachment A (Rev. 4).

Certifications
I certify that the EHS and Training Programs for:

(Company Name)_____

comply with applicable OSHA, USEPA, NYSDEC and NYC regulatory requirements and that the information presented on this form and attachments is accurate and complete. Our company is aware and understands its obligations under the OSHA, USEPA, state and NYC standards (if applicable).

Signature: _____ Title: _____

Print Name: _____ Date: _____

SECTION 01 35 44 – WORKING IN HAZARDOUS (CLASSIFIED) LOCATIONS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Hazardous (Classified) Locations

B. Combustible Gas Detection

C. Qualifications of Combustible Gas Detection Employees

D. Task Hazard Analysis

E. Hot Work Permit

F. Air Monitoring Notices and Reports

G. The following index of this Section is presented for convenience:

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3.02	Installation	10
3.03	Field Testing / Quality Control	10
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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 35 27 – Environmental, Health and Safety Requirements

1.04 REFERENCES

A. Combustible Gas Detection: Performed by use of a gas detector to detect the presence of flammable vapors and gases and to warn when concentrations in air approach the explosive range.

B. Hazardous (Classified) Locations: A location that is classified based on the properties of the flammable vapors, liquids, or gases, or combustible dusts or fibers, that might be present and the likelihood that a flammable or combustible concentration or quantity that is present.

C. Hot Work: Any work involving burning, welding, grinding, or similar operations that are capable of initiating fires or explosions.

D. Rated Equipment and Wiring:

1. Explosion Proof: Equipment and wiring that is enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor that may occur within it and of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and that operates at such an external temperature that a surrounding flammable atmosphere will not be ignited thereby.

2. Intrinsically Safe: Equipment and wiring that are incapable of releasing sufficient electrical energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture.

3. Approved Industrial Truck: A truck that is listed or approved by a nationally recognized testing laboratory for fire safety purposes for the intended use and designated for the Hazardous (Classified) Location in accordance with the OSHA regulation at 29 CFR 1910.178(b).

E. Lower Explosive Limit (LEL): The concentration of a combustible material in air below which ignition will not occur.

F. Upper Explosive Limit (UEL): The highest concentration of a combustible substance in a gaseous oxidizer that will propagate a flame.

1.05 DESCRIPTION

A. Hazardous (Classified) Locations

1. The Contractor's attention is directed to the fact that certain Work areas where process equipment, tanks or piping systems exist above or below the ground may be configured such that they may be classified to be Hazardous (Classified) Locations as defined in this Section.

2. Hazardous (Classified) Locations at the Work Site include, but are not limited to, the following areas:

a. Flushing Bay CSO Facility:

1) Channel No. 1 and 2

2) Storage Cells No. 1 through 15.

b. Diversion/Bulkhead Chamber No. 5 (DC-5)

c. Tallman Island Outfall No. 10 (TI-010)

d. Tallman Island Regulator No. 9 (TI-R09)

e. Tallman Island Outfall No. 11 (TI-011)

f. Storm sewers and catch basins.

g. Combined or sanitary sewers, junction chambers, and manholes.

h. Chemical manholes.

3. The Contractor shall be aware of the classification of all work areas and understand that the introduction of certain equipment and materials may cause an area to be re-classified as a Hazardous (Classified) Location.

4. The Contractor shall prevent unauthorized work from taking place in any Hazardous (Classified) Location:

a. Before entering any Hazardous (Classified) Location, the Contractor shall ensure that a safe working atmosphere exists;

b. When working within the Hazardous (Classified) Locations, the Contractor shall take suitable precautions to ensure a safe working atmosphere;

c. The Contractor shall take all necessary protective measures to ensure the safe completion of the Work.

5. Atmospheric monitoring to ensure the protection of employee health and safety must comply with the requirements of the Contractor's Environmental Health and Safety Plan (EHASP) as per Section 01 35 27 – Environmental Health and Safety Requirements.

B. Working in Hazardous (Classified) Locations:

1. All Hazardous (Classified) Locations and the extent of such locations shall be identified prior to the performance of Work in Hazardous (Classified) Locations.

2. Work in Hazardous (Classified) Locations shall be performed using only equipment and wiring rated and clearly marked for such use, unless approved Combustible Gas Detection equipment and qualified Combustible Gas Detection personnel are provided to ensure a safe working atmosphere for the duration of the time that employees are working in Hazardous (Classified) Locations.

3. The performance of Hot Work in Hazardous (Classified) Locations is prohibited unless performed under the issuance of a DEP Hot Work permit

from the Permit Authorizing Individual (PAI). The Engineer and/or DEP shall provide the PAI.

a. Where the Engineer and DEP are not routinely present on site, the DEP may authorize the Contractor to obtain PAI certification for a Contractor employee in order to issue hot work permits.

b. In active DEP facilities, the Hot Work permit will also be signed off by the DEP Operating Bureau Designee (OPD).

4. The Contractor shall provide the Engineer with a Job Hazard Analysis (JHA) at least 48 hours prior to the performance of Hot Work in a Hazardous (Classified) Location. The JHA shall identify the following:

a. The Hazardous (Classified) Locations where the Work is to be performed;

b. Equipment and wiring to be used in the Hazardous (Classified) Location;

c. Gases or vapors within or adjacent to the Hazardous (Classified) Location that have the potential to create a combustible atmosphere;

d. Controls required to mitigate or prevent the accumulation of gases or vapors in quantities that have the potential to create a combustible atmosphere;

e. Controls or methods to promptly discontinue the use of and de-energize non-rated equipment when a combustible atmosphere is detected.

5. The Contractor shall not use any non-rated equipment (e.g., powered industrial trucks not specifically rated for the areas to be used) in Hazardous (Classified) Locations without obtaining approval from the Engineer.

a. Where approval is provided the Contractor shall provide the Engineer with documentation that workers using non-rated equipment in the Hazardous (Classified) Location have been provided training and information on the applicable JHA and emergency procedures prior to working with non-rated equipment.

C. Combustible Gas Detection:

1. The Contractor shall arrange for Combustible Gas Detection to be performed by qualified Combustible Gas Detection personnel, as identified within this Section, anytime Work is to be performed in Hazardous (Classified) Locations with equipment and wiring that is not rated for such use. The Contractor shall certify that all Work in Hazardous (Classified) Locations is being performed in a safe atmosphere.

2. Prior to commencing the Work for Combustible Gas Detection, the Contractor shall submit for the approval of the Engineer a communications protocol detailing the type and sequence of warning signals to be utilized, and describing the evacuation procedure to be employed, whenever a hazardous condition occurs .

3. The Contractor shall ensure that Combustible Gas Detection equipment, which is listed by Underwriters Laboratories (UL) and rated for use in Hazardous (Classified) Locations, is calibrated, tested and maintained prior to use in a Hazardous (Classified) Location by qualified persons in accordance with the requirements of the equipment's manufacturer.

4. Prior to the start of Combustible Gas Detection, the Contractor shall:

   a. Ensure the gas detection manager has performed an analysis of the work area to evaluate the combustible gas hazards of the location, determine the arrangement of Combustible Gas Detection equipment and implement any further controls necessary to mitigate or prevent the accumulation of a combustible atmosphere (i.e., ventilation controls, equipment positioning, etc.).

   b. Calibrate all Combustible Gas Detection equipment in accordance with the manufacturer's requirements, and perform any necessary test functions (e.g., "bump test") at a minimum daily to ensure appropriate use of the equipment in accordance with the manufacturer's requirements.

   c. Where the use of non-rated equipment is approved as described within this Section, Position Combustible Gas Detection equipment to establish monitoring results at least 15 minutes prior to the use of any non-rated equipment in a Hazardous (Classified) Location. The following conditions must be present to allow for the initial use of non-rated equipment:

      1) An oxygen level greater than 19.5 percent and less than 23.5 percent concentration;

      2) A LEL less than 5 percent concentration.

   d. Ensure the JHA for performing Hot Work in a Hazardous (Classified) Location is prepared, reviewed and updated by the Contractor's gas detection manager prior to the start of Hot Work and any time:

      1) The scope of Work changes to introduce hazards or a potential for combustible gases or vapors to be present was not previously identified;

      2) The JHA's hazard evaluation does not adequately address the identified hazards;

3) Hazard controls of the JHA have changed or do not sufficiently mitigate or prevent the accumulation of a combustible atmosphere.

e. Provide written verification to the Engineer that all gas detection equipment has been properly calibrated and tested prior to the start of Work in any Hazardous (Classified) Location.

f. Provide written verification to the Engineer that all work areas where non-rated equipment and wiring being used is safe through the issuance of a Notice of Safe Atmosphere upon calibration and testing of gas detection equipment and prior to the use of non-rated equipment in a Hazardous (Classified) Location.

5. Continuously monitor the Hazardous (Classified) Location with documented readings every 15 minutes. Electronic data logging where gas detection equipment possesses such capabilities is adequate so long as readings are recorded at least every 15 minutes and results are capable of being provided to the Engineer as written documentation.

6. Combustible Gas Detection equipment shall be capable of providing a continuous digital output measuring:

   a. Oxygen in percent concentration;

   b. LEL in percent concentration.

7. A warning condition shall be declared to all affected persons in the area, and the Engineer, by radio, PA, or in person anytime the following condition exists:

   a. LEL greater than 5 percent.

8. Work shall be immediately stopped and non-rated equipment de-energized when any hazardous atmosphere is measured by gas detection equipment. A hazardous atmosphere is determined by the presence of any of the following:

   a. Oxygen levels less than 19.5 percent or greater than 23.5 percent concentration;

   b. LEL greater than 10 percent.

9. When a hazardous atmosphere is present, a hazardous condition shall be declared and the gas detection technicians shall immediately implement the following actions:

   a. Sound a portable air horn to warn all personnel that a hazardous atmosphere exists;

   b. Notify the Contractor and the Engineer by radio communication, PA, or in person that a hazardous condition has been declared;

c. Notify all persons in the potentially affected areas to immediately evacuate the area and discontinue use of non-rated equipment in Hazardous (Classified) Locations until the Engineer determines the conditions leading to the presence of a hazardous atmosphere, identified corrective actions to mitigate or prevent a re-accumulation of an unsafe atmosphere, and the atmosphere of the Hazardous (Classified) Location has returned to levels that personnel can safely resume operations in the area;

d. Issue a Notice of Unsafe Atmosphere to the Engineer and ensure access is precluded by the Contractor's personnel in areas where a hazardous atmosphere is present;

e. The Contractor shall make combustible gas detection equipment available to the Engineer during the investigation and corrective/preventative action review.

10. When the Contractor determines that a hazardous atmosphere no longer exists, Work may resume upon issuance of a Notice of Safe Atmosphere in accordance with the procedures identified in this Section.

11. Provide all required Combustible Gas Detection equipment in sufficient quantities, with backups.

a. The number of required equipment shall be determined by the gas detection manager and shall consider the size of work area, work to be performed, location of personnel, and configuration. Gas detection shall be adequate to identify potentially hazardous conditions in any area which could present a hazard to personnel.

1.06 QUALITY ASSURANCE

A. Qualification of Combustible Gas Detection Employees:

1. The Contractor shall ensure the following qualified personnel are available when performing Combustible Gas Detection:

a. A gas detection manager who meets at least one (1) of the following and has been approved by DEP:

1) Certified Industrial Hygienist (CIH) by the American Board of Industrial Hygienists (ABIH) with at least five (5) years of documented professional industrial hygiene and air monitoring management experience.

2) Certified Safety Professional (CSP) by the Board of Certified Safety Professionals (BCSP) with at least five (5) years of documented professional industrial hygiene and air monitoring management experience.

3) Bachelor of Science degree in industrial hygiene, occupational safety and health, or environmental health and science and ten (10) years of documented professional

industrial hygiene and air monitoring management experience.

b. Gas detection technicians shall be present as necessary to ensure the continuous monitoring for the presence of combustible gases and shall have no other responsibilities than those of a combustible gas detection technician. Technicians shall meet the following prior to operating Combustible Gas Detection equipment:

1) Trained in the calibration, testing, maintenance and operation of the Combustible Gas Detection equipment being used;

2) Have a minimum of six (6) months' experience in the monitoring of combustible gases and vapors;

3) Where confined spaces are involved, possess confined space training to include the responsibilities of the confined space entrant, attendant and entry supervisor.

c. The Engineer shall have the right to interview and review the qualifications of all personnel performing Combustible Gas Detection.

1.07 SUBMITTALS

A. At a minimum, submittals shall include:

1. Prior to the commencement of any Work of this Section, the following items shall be submitted to the Engineer:

a. Qualifications of the Combustible Gas Detection employees.

2. In addition, during the performance of Work, the Contractor shall submit the following items as required in this Section:

a. JHA;

b. Communications protocol;

c. Written verification of equipment calibration;

d. Written review and verification of conditions;

B. Air Monitoring Notices and Reports

1. The Contractor shall prepare and submit the following air monitoring notices and reports to the Engineer:

a. Notice of Safe Atmosphere:

1) When a previously determined hazardous atmosphere has been eliminated, and immediately after completing the procedures required above, the Contractor shall prepare and deliver a Notice of Safe Atmosphere to the Engineer;

2) If the Notice of Safe Atmosphere is issued to rescind a Notice of Unsafe Atmosphere, it shall identify the contributing factors leading to the unsafe atmosphere and the necessary corrective actions to prevent reoccurrence.

b. Notice of Unsafe Atmosphere:

1) This notice shall be prepared on site when a hazardous condition is detected and immediately after all notifications required above within this Section have been completed. The Notice of Unsafe Atmosphere shall specify the type(s) and concentration(s) of gas(es) detected, the nature of the gas hazard and the location where, and the time when the hazard has been detected;

2) This notice shall be presented to the Engineer immediately upon completion.

C. Daily Log Report

1. The daily log report shall be provided to the Engineer daily and provide the Combustible Gas Detection equipment's readings in 15 minute intervals. Location and other task specific information shall be included in the daily report.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 01 35 45 – HAZARDOUS MATERIALS CONTROL
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Known Hazardous Materials
2. Unforeseen Hazardous Materials
3. Hazardous Materials Investigation and Remediation
4. Hazardous Waste Management and Regulatory Compliance

B. The following index of this Section is presented for convenience:

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C. The following tables, attached after the End of Section designation, are a part of this Section:

1. Table 1 – Summary of Lead and PCB Analysis on Paints;
2. Table 2 – Summary of PCB Analysis on Miscellaneous Materials;
3. Table 3 – Summary of Asbestos Analysis;
4. Table 4 – Bulk Storage Tanks
5. Table 5 – Other Regulated Wastes;

6. Table 6 – Inaccessible Suspect Materials Requiring Further Investigation;
7. Table 7 – Summary of Analysis on Composite Soil Samples for TI-010 Chlorination;
8. Table 8 – Summary of VOC Analysis on Grab Soil Samples for TI-010 Chlorination;
9. Table 9 – Summary of Hazardous Waste Analysis on Soil for TI-010 Chlorination;
10. Table 10 – Soil Classification for TI-010 Chlorination;
11. Table 11 – Summary of Groundwater Analysis for TI-010 Chlorination;
12. Table 12 – Summary of Analysis on Composite Soil Samples for TI-010 Dechlorination;
13. Table 13 – Summary of VOC Analysis on Grab Soil Samples for TI-010 Dechlorination;
14. Table 14 – Summary of Hazardous Waste Analysis on Soil for TI-010 Dechlorination;
15. Table 15 – Soil Classification for TI-010 Dechlorination;
16. Table 16 – Summary of Groundwater Analysis for TI-010 Dechlorination;
17. Table 17 – Summary of Analysis on Composite Soil Samples for TI-011 Disinfection;
18. Table 18 – Summary of VOC Analysis on Grab Soil Samples for TI-011 Disinfection;
19. Table 19 – Summary of Hazardous Waste Analysis on Soil for TI-011 Disinfection;
20. Table 20 – Soil Classification for TI-011 Disinfection;
21. Table 21 – Summary of Groundwater Analysis for TI-011 Disinfection.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 27 00 – Measurement and Payment
B. Section 01 35 27 – Environmental, Health and Safety Requirements
C. Section 01 41 00 - Regulatory Requirements
D. Section 02 24 20 - Soil Sampling and Analysis

E. Section 02 82 05 – Asbestos Management

F. Section 02 84 10 – Mercury Management

G. Section 02 83 05 – Lead Management

H. Section 02 84 05 – PCB Management

1.04 REFERENCES

A. Definitions

1. Competent Person: One who is capable of identifying existing and predictable hazards in the work area or unsanitary, hazardous, or dangerous working conditions, and who has authority to take prompt corrective measures (29 CFR 1926.32(f)).

2. Large Quantity Generator (LQG): A facility that generates (in a calendar month) ≥1,000 kg of total hazardous waste or >1 kg of acute hazardous waste or >100 kg of acute hazardous waste spill residue or soil, or at any time stores hazardous and acute hazardous wastes in greater quantities (at any time) than 6,000 kg of hazardous waste, 1 kg acute hazardous waste, or 100 kg of acute hazardous waste spill residue or soil.

1.05 DESCRIPTION

A. Known Hazardous Materials

1. There are materials present within the designated Work areas that will require special handling and other safeguard measures in order to minimize chemical exposure hazards to site workers and to prevent environmental impacts to offsite areas. As applicable to its Work, the Contractor shall incorporate these minimum requirements into its Environmental, Health and Safety Plan (EHASP) or other applicable submittal to ensure a safe and healthful working environment. The EHASP shall be designed in accordance with Section 01 35 27 – Environmental, Health and Safety Requirements.

a. Upon completion of any additional material sampling at the Work Site(s), the Contractor's EHASP shall be updated as needed to incorporate new data generated by analysis of the samples.

2. These materials include lead-containing paints, PCB-containing paints and empty aboveground storage tanks as summarized in Tables 1 through 6 and Table 20 as provided at the end of this Section. Additional details pertaining to the hazardous materials investigation, including sample locations, are provided in the Hazardous Materials Mitigation Report, Rev.1, Contract WP-16 CSO-FC-DF, June 2025 and the Soil and Groundwater Investigation Report for TI-011 Disinfection, Contract CSO-FC-DF-DES, June 2025.

3. The Contractor shall not initiate or proceed with any Work in areas associated with the contaminated, potentially hazardous, or hazardous materials until these materials have been removed from these areas or

managed in accordance with the DEP Hazardous Waste Management Policy and the following Specifications:

a. Asbestos-containing material shall be handled in accordance with Section 02 82 05 – Asbestos Management.

b. Mercury-containing equipment and material shall be handled in accordance with Section 02 84 10 – Mercury Management.

c. Lead-containing paint shall be handled in accordance with Section 02 83 05 – Lead Management.

d. PCB-containing material shall be handled in accordance with Section 02 84 05 – PCB Management.

e. If not handled under the above Sections, universal waste and other regulated wastes shall be handled in accordance with Section 01 74 20 – Construction Waste Management.

4. The Contractor shall attend an initial site inspection, and any other meetings to review hazardous materials control issues in connection with the progress of the Work. The initial site inspection shall be as described below. Other meetings to monitor hazardous materials control issues associated with the Work, including any briefing of DEP personnel, including, but not limited to, facility managers and supervisors, shall be scheduled as necessary.

a. Initial Site Inspection: Within five (5) business days after approval of the environmental health and safety (EHS) Resources, or an agreed upon timeframe, the Contractor, the Engineer, and applicable DEP personnel shall perform an initial site inspection to review all the Work areas that will be affected by contaminated, potentially hazardous and hazardous materials. EHS Resources are defined in Section 01 35 27 – Environmental Health and Safety Requirements.

1) Initial site inspection shall be organized by the Contractor who shall contact DEP, and the Engineer to determine the representatives that should attend.

2) A minimum of one representative from each party shall be present for the inspection.

3) Competent Persons shall lead the site inspection.

4) Sampling outside of the Work to be performed may not be performed without DEP approval.

5) A site inspection report shall be distributed by the Contractor at the beginning of the site inspection. The site inspection report shall include drawing(s) and associated text that describes the work in sufficient detail to aid in the site inspection.

6) The Contractor shall note in the site inspection report any special requirements that they have to perform their Work during the inspection.

7) The Contractor shall prepare and distribute a summary of the site inspection and any comments noted during the inspection to all parties present at the site inspection.

8) In the event that the initial site inspection does not satisfactorily identify the contaminated, potentially hazardous, and hazardous materials potentially affecting the Work, follow-up inspection(s) shall be organized and held as required.

B. Unforeseen Hazardous Material

1. The Work Sites may contain unforeseen hazardous materials. When a potentially hazardous material that was previously unforeseen is discovered or an upgrade of its EHASP is necessary for managing unforeseen hazardous material, the Engineer will direct the Contractor to engage the services of a hazardous materials specialist to perform the necessary investigation, develop a remediation plan, and perform the remediation work. Additionally, the Engineer will direct the Contractor to update its EHASP as necessary.

2. The Contractor shall be responsible for identifying previously unknown and suspect hazardous materials as they are encountered via implementation of the approved sampling plan. Indication of the presence of hazardous materials, including but not limited to odorous or stained soils, sediment or liquids, mercury sources and suspect asbestos-containing materials must be immediately reported to the Engineer. All Work in the area shall stop until otherwise directed by the Engineer.

3. In the event that hazardous material is detected, the Engineer will provide the Contractor with a scope of work for the remediation services and direct the Contractor to obtain cost proposals for such work from at least three (3) hazardous material specialists unless otherwise required by the DEP depending upon the magnitude and timing of the work. The Contractor shall submit the proposals, indicating which hazardous material specialist the Contractor proposes to engage, to the Engineer within ten (10) business days of receiving the scope of remediation work. The Engineer shall review the proposals and approve such selection or direct the Contractor to submit an alternative selection or obtain additional proposals. Remediation work shall not commence until the Contractor receives written notice from the Engineer to proceed with the work. As directed by the Engineer, pre-remediation inspections and coordination may also be required, in a manner similar to the procedures for known hazardous materials.

4. Soils testing and analysis shall be performed in accordance with Section 02 24 20 - Soil Sampling and Analysis. In the event that hazardous levels of

lead are detected in soil, the DEP will provide the Contractor with a Community Air Monitoring Program (CAMP) to include particulate air monitoring. The Engineer will direct the Contractor to obtain cost proposals for work of the CAMP from at least three (3) experienced firms unless otherwise required by the DEP depending upon the magnitude and timing of the work. Within five (5) business days of receiving the CAMP, the Contractor shall submit the cost proposals to the Engineer, indicating which firm the Contractor proposes to engage. The Engineer shall review the cost proposals and approve such selection or direct the Contractor to submit an alternative selection or obtain additional proposals. CAMP work shall not commence until the Contractor receives written notice from the Engineer to proceed with the work.

5. The Contractor shall not initiate or proceed with any other Work in areas associated with contaminated, potentially hazardous, or hazardous materials until these materials have been removed from these areas or managed, in accordance with the following Specifications:

   a. Asbestos-containing material shall be handled in accordance with Section 02 82 05 – Asbestos Management.

   b. Mercury-containing equipment and material shall be handled in accordance with Section 02 84 10 – Mercury Management.

   c. Lead-containing paint shall be handled in accordance with Section 02 83 05 – Lead Management.

   d. PCB-containing material shall be handled in accordance with Section 02 84 05 – PCB Management.

   e. If not handled under the above Sections, universal waste and other regulated wastes shall be handled in accordance with Section 01 74 20 – Construction Waste Management.

6. Some of the remediation work may be critical to maintaining construction schedules. When this occurs, the Engineer will establish a time for completion.

C. Hazardous Waste Management and Regulatory Compliance

1. Hazardous Waste Contingency Plan and Hazardous Waste Minimization Plan

   a. If the location of the project is on a site which has a Large Quantity Generator (LQG) status or subsequently obtains LQG status during the course of the Work, then the Contractor shall conform to the requirements of the Hazardous Waste Contingency Plan and Hazardous Waste Minimization Plan for that site.

2. Hazardous Waste Storage Compliance

   a. The Contractor shall maintain compliance with hazardous waste storage requirements at the Work Site. Storage areas and

inspections of storage areas must comply with the hazardous waste regulations detailed within 6 NYCRR Parts 370 through 375.

3. Waste Management Records

   a. Disposal of wastes generated by remediation Work will be based on the results of testing and shall be at a site permitted to accept such waste by the U.S. Environmental Protection Agency (EPA) or an authorized state or local government agency. The Contractor shall provide remediation waste profiles for DEP signature as generator, permit documentation required for the selected Treatment, Storage, or Disposal Facility (TSDF) to receive these wastes, and the transporter's 6 NYCRR Part 364 Waste Transporter Permit(s) required to transport wastes to the TSDF. The Contractor will conduct due diligence of the TSDF, including a list of violations received. The Contractor shall submit a facility letter of acceptance. The Contractor shall also provide advance copies of the waste manifest(s) and Hazardous Waste Land Disposal Restrictions (LDR) Notification and Certification Form(s) for the Engineer's review and approval. The Contractor will keep and update a Hazardous Waste Inventory Log and will document weekly inspections by a Competent Person in the management of hazardous waste.

   b. On the date of shipment, the Contractor shall submit copies of the completed manifest, signed and dated by the initial transporter, in accordance with federal and state requirements, to the DEP for signature. Copies of completed and signed waste manifests from TSDF's shall be provided to the Engineer as soon as possible but no later than thirty (30) days of waste shipment offsite.

4. Changes to Hazardous Waste Generator Status

   a. The Contractor shall be aware that work activities may result in a change to the Work Site's hazardous waste generator status. Compliance with the revised generator status is required.

5. Hazardous Waste Regulatory Program Fees and Taxes

   a. The Contractor may be directed to pay the New York State Department of Taxation and Finance for special assessments on hazardous waste generated at the Project Site or the NYSDEC regulatory program fees charged to the facility operating at the Site. When directed by the Engineer, the Contractor shall pay the amount indicated within 48 hours of notification. The Contractor will be reimbursed for the amount paid, with no provision for overhead and profit, from the allowance provided for unforeseen hazardous materials remediation as specified in Section 01 27 00 – Measurement and Payment.

1.06 QUALITY ASSURANCE

A. Remediation plans for unforeseen hazardous materials shall comply with all applicable requirements of federal, state, and local hazardous waste regulations and shall include, but not be limited to the following:

1. Identification of hazardous and regulated/non-hazardous wastes associated with the Work.
2. Estimated quantities of wastes to be generated and disposed of.
3. Names and qualifications of each Subcontractor that will be testing, transporting, storing, and disposing of wastes. Include the facility location and a 24-hour telephone contact number and applicable transporter and TSDF permits, EPA Identification Numbers, and insurance certificates.
4. Names and qualifications (experience and training) of personnel who will be responsible for on-site management of hazardous wastes.
5. Detailed description of the containment and removal procedures.
6. Spill prevention and cleanup contingency measures to be implemented.
7. Work plan for waste management, on-site storage, removal and disposal.
8. Detailed schedule indicating the beginning and completion dates for each activity and each Work area, including time for clean-up, inspection, and monitoring activities.

1.07 SUBMITTALS

A. The following items shall be submitted as described above for the Engineer's approval:

1. Initial Site Inspection Report and Summary Site Inspection Report
2. Remediation Plan for Unforeseen Hazardous Materials, when required.
3. Three (3) cost proposals from hazardous materials specialists for remedial action work, when required.
4. EHASP upgrades as needed in accordance with Section 01 35 27 – Environmental, Health and Safety Requirements.

B. The Contractor, when requested by the Engineer, shall provide additional copies of all reports and related materials as may be needed for conferences with the Commissioner and other agencies having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Site Security Procedures
2. Site Video Surveillance
3. Security Guard Services

B. Contractor shall comply with all Site Security Procedures described herein.

C. The Contractor shall provide electronic safety and security equipment for physical security, access control, intrusion detection and video surveillance purposes as specified and directed by the Engineer.

D. The Contractor shall furnish personnel, uniforms, equipment and supplies necessary to provide Security Guard Services at the Site, as described herein. The services shall be provided as specified and as directed by the Engineer.

1. The "Site" referred herein refers to the various locations of work as described in Section 01 11 00 – Summary of Work and shown on the Contract Drawings. The Contractor is advised that multiple security guards may be required to provide coverage at the various locations of work.

E. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 11 00 – Summary of Work

1.04 REFERENCES

A. Definitions

1. Visitor: A person visiting the project Site who is not employed by the Department of Environmental Protection, New York Police Department, Fire Department of New York, emergency medical services, the Contractor, or Subcontracted to the Contractor.

1.05 DESCRIPTION

A. Site Video Surveillance

1. The Contractor shall provide Site video surveillance to cover the project area. Site video surveillance shall be provided 24 hours per day, 7 days per week, 365 days per year.

2. Site video surveillance recordings and live viewing capability shall be available via internet browser for the duration of the project and at the direction of the Engineer.

3. Access to Site video surveillance at all times shall be provided to the Engineer, DEP Police Chief, and DEP Police Deputy Chief.

4. Site video surveillance shall be password protected.

a. Each user must have a unique user ID and password to login. Shared or generic accounts are prohibited.

b. All user accounts should be standard accounts with the minimum necessary access. Administrative access should only be granted where absolutely required.

c. Passwords must be a minimum of 8 characters for regular account and 15 characters for administrator privilege account, containing at least one upper case letter, one lower case letter, one number and one special character.

d. Login credentials must be removed for any user whose responsibilities on the project change, making it unnecessary to have video access and/or those whose involvement with the project ends.

5. DEP will have the option to make Site video surveillance equipment and system permanent at end of construction.

B. Prior to the start of Work, the Contractor shall appoint a Security Point of Contact (SPOC) to liaise with DEP Bureau of Police and Security (BPS) on all security related matters. An alternate SPOC (ASPOC) shall also be appointed by the Contractor in the case of SPOC absence or unavailability. SPOC/ASPOC will be responsible for ensuring Site security compliance.

C. Security Guard Service

1. The Contractor will be directed in writing by the Engineer as to the date of commencement of the security services two (2) weeks prior to starting the actual services. Once the Security Guard Service starts, it shall remain in continuous operation until project close-out.

2. The Contractor shall employ Security Guard Services specifically and exclusively to safeguard the Site and prevent access by unauthorized persons in accordance with General Conditions, Article 9. The Security Services shall be provided 24 hours per day, 7 days per week, 365 days per year. The Security Services shall include at least one (1) uniformed security guard per shift.

3. Guards shall be stationed in roving patrol vehicles.

4. Guards shall be unarmed.

5. The security guard shall be provided based on an 8-hour shift. No security guard shall be scheduled by the Contractor for more than twelve (12) hours in any twenty-four (24) hour period, including placements at other assignments.

6. The Contractor shall be responsible for the necessary supervision of the guards and shall make unannounced visits to the property, for the purpose of monitoring each guard's performance.

   a. Supervision of all security personnel must also be provided by the entity that directly employs them.

7. All security personnel must pass a security clearance from the DEP Police Detective Bureau and obtain a DEP Non-Employee Photo Identification Card. DEP Non-Employee Photo Identification Cards will be issued by DEP Police Detective Bureau or at the DEP Security Office, 96-05 Horace Harding Expressway, Corona, NY.

   a. Security clearances are valid for one year after which re-clearance is required.

   b. DEP Non-Employee ID Card must be worn on the outermost garment and fully displayed by all security personnel while on Site.

   c. New York State Guard Licenses must be in possession of the guard while on duty and presented on demand when requested by an authorized person.

8. The Contractor shall ensure that meal breaks are provided for each guard and shall provide a relief guard during the guard's meal break.
   a. This requirement may be waived by the Engineer during non-working construction hours as long as the Site can be satisfactorily secured, i.e. gates/doors locked, interior alarm system activated.
   b. Guard will be required to punch out upon taking break, and punch in at the end of break.
9. Contractor and/or Security Guard Company shall have trained back-up guards and supervisors available to ensure continuous, uninterrupted service in the event a guard and/or supervisor is not present for duty.
10. All Work pursuant to this Contract shall be performed in compliance with all applicable Federal, State and local laws and regulations.
11. Security guard shall have a means of communications to contact 9-1-1, DEP Police where applicable, and any emergency contacts that DEP may provide at all times.
    a. If a cell phone is used for communication, this designated phone must remain with the post at all times while security coverage is being performed.

1.06 QUALITY ASSURANCE

A. Qualifications for Security Guards

1. The Contractor shall employ a Security Service Firm that is fully licensed under New York State Law to provide the required security guards. The Contractor shall provide a copy of a valid New York State Guard Service License prior to commencement of the Work.
   a. The Security Guard Firm may not subcontract any of the Work.
   b. The collaboration of two or more Security Guard companies as a joint venture is permissible as long as there is a common name and uniform with an established single responsible person in charge or all security personnel posted.
   c. Comply fully with the New York State General Business Law (GBL) Article 7 and 7-A Entitled Security Guard Act.
   d. Possess a valid license issued by the New York State Department of State ("NYSDOS License"), to act as a Private Investigator or Watch Guard and Patrol Agency.
   e. Be fully licensed under New York State Law General Business Law Article 7, Section 70, and Licenses Paragraph Number 2 entitled Private Investigators and Watch, Guard and Patrol Agencies, and Article 8 entitled Process Server to provide the required security guards. The Contractor shall provide a copy of the NYSDOS eleven

(11) digit unique identification number prior to commencement of the Work.

f. The City will immediately terminate the Subcontract and Contractor shall engage a new subcontractor if the NYSDOS License is suspended or revoked for any reason. The Contractor cannot substitute another Private Investigator and Watch, Guard or Patrol Agency License if the Subcontractor's NYSDOS license is suspended or revoked.

g. The Security Service Firm shall have been engaged in the business of providing uniformed security guard services for a minimum of five (5) years and shall provide details of this experience prior to commencement of the Work.

2. The Contractor shall ensure that all assigned security guards are licensed security guards registered under New York State law and meet the following criteria:

a. Guards shall be at least eighteen (18) years of age.

b. Possess a high school diploma or possess a General Equivalency Diploma.

c. Have at least one year of experience as a Uniformed Unarmed Security guard including a minimum of 1,750 hours of service preferably in a similar setting. This requirement can also be waived by the BPS Security Division at its discretion or for candidates with prior military service with an honorable discharge (DD214).

d. Possess a valid current New York State issued Driver License, Learner's Permit or Non-Driver I.D. card.

e. Have a current New York State Security Guard License

f. Possess and maintain valid Certification for the specific position to which they are assigned. Some examples include: FDNY Handle Motor Fuel-Gas Station P-15 Certification, Certificate of Fitness for Fireguard Shelters F-44, or MARSEC (Maritime Security)/TWIC Transportation Worker Identification Credential certifications. The Contractor is responsible for determining and complying with correct certification.

g. Guards shall be able to understand, speak, read and write English fluently. They shall be able to intelligently communicate with Visitors and prepare accurate written reports of any incidents.

h. All guards shall have undergone fingerprinting pursuant to New York Department of State, Division of Licensing Services regulations.

i. Guards shall be in excellent physical condition and shall supply medical certification of fitness and good health prior to assignment.

This shall include an annual medical examination including a urine drug screen test performed by a licensed testing laboratory approved by the City. The drug screen test shall test for the following substances: amphetamines, barbiturates, benzodiazepines, cocaine, marijuana, methadone, methaqualone, opiates, PCP's propazphene.

j. Guards shall have no record of mental illness, history of residence in a psychiatric institution, or history of drug or alcohol abuse.

k. Guards shall not have been convicted of a felony or other criminal offense which in the NYS Department of State determination would inhibit the guard's ability to perform the duties of a security guard in a reliable, competent and trustworthy manner in accordance with the Contract Documents.

l. Guards shall perform their duties in full uniform.

m. Guards shall possess an OSHA Construction Safety and Health certificate (10 hour minimum)

n. Guards must have the appropriate Fire Guard Certification applicable to the construction Site they are assigned to. Contractor is required to determine certification required by the local authority having jurisdiction. (Examples of such certifications include Certificate of Fitness (CoF) F01 – Citywide Fire Guard for Impairment, F02 - Fire Guard of Shelters, F60 – Fire Guard for Torch Operations, F92 – Supervise and Fire Guard Boatyards and Marinas).

3. Any security guard found not to meet the above qualifications shall be immediately replaced within 24 hours upon the direction of the Engineer. The replacement shall be made so that no interruption in security guard coverage takes place.

B. Training

1. Contractor shall ensure that all guards employed under this Contract receive training as per Article 7-A, Section 89-n of the New York State General Business Law and the New York State Security Guard Act of 1992.

2. All Site security personnel must have received the following training prior to posting:

a. State Required training:

1) 8 Hour Pre-Assignment

2) 16 Hour OJT (on the job training)

3) Current 8 Hour Annual

b. Training must also include the following:

1) Proper confrontation to include procedures for courteous reception and questioning of individuals; procedures to

restrict ingress and egress routes while maintaining a professional bearing and decorum; and procedures to conduct body and package searches in an appropriately non-aggressive and inoffensive manner.

2) Radio communication principals and radio use

3) Legal restriction of arrests, searches and seizures for New York State

4) Use of force for New York State

5) Procedures to be followed in reporting a violation of law to a duly constituted law enforcement agency

6) Procedures for reporting an unusual occurrence incident, including familiarization of the incident report and the "who, what, when, where and why" method of reporting

7) Recognition of security and safety hazards, and fire protection and prevention including fire alarm procedures

8) Appropriate use of installed fire equipment and emergency evacuation procedures

9) Emergency response and evacuation procedures;

10) Bomb threat procedures;

11) Fire alarm procedures and appropriate use of installed fire equipment

12) Ethics and law

13) Identifying and reporting sexual harassment and discrimination and workplace violence

14) Prohibition of Fraternizing with DEP's and contractor's staff and visitors

15) Terrorism Awareness Training

16) Observation and detection of potential hostile surveillance

17) Operation of an x-ray machine

18) Operation of proper screening with a magnetic wand

19) Operation of a magnetometer (walk through metal detector)

20) Operation of electronic barriers and gate

21) Control center operations where applicable

3. Copies of all applicable training materials, including examinations, must be provided anew to DEP whenever changed.

4. Records of training sessions must be maintained by the Contractor. Copies of training session records must be sent to DEP Project Manager within seventy-two (72) hours of the completion of training.

5. Prior to posting, all security guards must receive a site specific 2-hour orientation conducted by the DEP BPS Security Manager and/or authorized representative(s).

    a. This requirement may be waived on a site-by-site basis at the discretion of DEP BPS Director of Security and/or appointed authorized representative(s).

    b. Subsequent security guards assigned to the Site after the beginning of security coverage shall receive a similar orientation by the Contractor SPOC/ASPOC. The Contractor must appoint a "Trainer" to conduct orientations for future security personnel assigned to the Site.

6. 2-Hour Orientation - Requirements

    a. Security Personnel Requirements

        1) Roster of 6 security guards shall be sent to initial training, to account for future sick, vacation, resignations, etc. at the post

        2) Attendees shall possess a of NYS Security Guard License

        3) Inquire if any are active or retired Police Officers and of gun possession

        4) Authorized representative of security company shall be in attendance

        5) Prime Contractor SPOC or authorized representative shall be in attendance

    b. Other Requirements

        1) 24-hour means to communicate with 911 and DEP Police Ashokan, Eastview, or Hillview Precinct (if upstate or at designated In-City sites)

        2) Working flashlight must be available.

        3) 24-hour contact information for Security Company shall be provided.

        4) Means of time accountability shall be in place, i.e., time clock that is punched every hour and generates report.

7. 2-Hour Orientation Agenda must include at a minimum:

    a. Introduction

    b. General Requirements:

        1) Expectations and responsibilities for security officers

2) Review of requirements

c. Specific Post Orders

1) Requirements of the site(s)

2) Patrol / Access Control Procedures

3) What to look for

4) How to contact DEP Police (at sites where applicable)

5) Use of Log Book

6) Recording Key Punches

7) Reporting Spills

8) Evacuations

d. Tour of Site(s):

1) Familiarization of post and surrounding area

e. Distribution of Security Post Orders:

1) Contractor Security Point of Contact (SPOC)/(ASPOC)

2) Authorized Security Company Representative

3) Post

f. Acknowledgement Statement Form: Upon the completion of the orientation, the following must sign the form:

1) Security Guard(s)

2) Authorized Security Company Representative

3) Contractor (SPOC)/(ASPOC)

a) The originals shall be submitted to the Engineer.

8. Annual Training Requirements:

a. 8-Hour Annual In-Service Training (all security personnel both armed and unarmed)

b. 8-Hour Annual Firearms Training (all armed security personnel)

C. Qualifications for Security Guard Supervisors

1. In addition to meeting all the qualification requirements of a Uniformed Unarmed Security Guard, Supervisors shall meet all of the following qualifications:

a. Be at least 21 years old

b. Have at least one year of supervisory experience in any field; and

c. Have a minimum of two (2) years of additional experience in any one or any combination of the following:

1) Experience as a security guard with a documented successful work history

2) Experience as an armed guard/watchman

3) Experience in the Armed Forces, Military Reserves, National Guard or as a State Guard, with honorable discharge or equivalent

4) Experience as a probation officer, corrections officer, police officer, or park ranger, attendance at an accredited institution of higher learning in criminal justice, police science or a related field (completion of 24 credits may be substituted for one year of required service.

D. Standards of Conduct

1. Contractor(s) shall ensure and certify that all assigned staff complies with the following:

a. Meet the requirements of all federal, state and local laws, including the N.Y.S. General Business Law § 70 et seq. and § 89-e et seq., and any successor legislation, including but not limited to, the satisfactory completion of the specified fingerprint checks

b. Have no physical conditions that would hamper the performance of assigned duties

c. Be able to stand for a minimum of four (4) consecutive hours

d. Be free from communicable disease

e. Hear within normal speech range and volume

f. Possess a valid social security number

g. Not be under indictment for any felony or any other offense specified in the N.Y.S. General Business Law §§ 81 or 89-h

h. Be physically able to wear and to be properly trained in the use of all protective equipment

i. Possess mental alertness and emotional stability

j. Have passed a background investigation conducted by the Contractor(s), consisting of: FBI fingerprint check; seven (7) year prior employers check; out-of-state criminal records check; personal references check; New York State criminal background checks; and driver's license check

k. Have tested negative, both prior to employment and on an annual basis thereafter, to random Controlled Substance Use (CSU) testing, for the presence of the following substances and/or their metabolites on a clinical drug test administered by a lab licensed by the State of New York to administer such examinations: amphetamines; barbiturates; benzodiazepines; cocaine; cannabinoids; methadone;

methamphetamines; opiates; phencyclidine; propoxyphene; and tricyclic antidepressants. Copies of the test results must be placed in the employee's personnel file and be provided to the User Agency upon request.

l. Annual CSU testing required under these Contract(s) will be of a random nature, whereby CSU testing is carried out each year on a random date, without prior notification to the respective employee or their supervisor.

m. All CSU testing will be conducted in accordance with all legal standards, as required under Local, State and/or Federal laws for the industry.

n. All Security Personnel testing positive will be immediately removed from their post and eliminated from any future assignments under this Contract.

o. In the event a security guard is required to ingest prescription medication, it is the Contractor's responsibility to ensure that the guard is fit for duty and that the appropriate documentation is made available to the DEP. Such medication must be carried in the original prescription container, with the pharmacist's label affixed thereto. specifying the pharmacy name, prescription number, doctor's name, drug name and control number. Additionally, it is the Contractor's responsibility to ensure that guards are not assigned for duty while under the influence of any medication that could impair their ability to carry a firearm and/or perform required job duties.

1.07 SUBMITTALS

A. Within 14 days after the Notice to Proceed, the Contractor shall submit to the Engineer the Security Surveillance Plan for approval.

B. Within thirty (30) days of the Notice to Proceed, the Contractor shall submit to the Engineer the Security Service Firm for approval.

C. Within twenty-four (24) hours of retaining the Security Service Firm, the Contractor shall be required to maintain a personnel folder on each security guard employed under this Contract. Only guards for whom the following information is submitted may be assigned. The folder shall contain the following information:

1. Guard's name
2. Home address
3. Date of birth
4. Duplicate photo ID card
5. Social security number
6. Copy of employment application

7. Copy of New York State Division of Licensing Application Form 307
8. Copy of birth certificate
9. Copy of high school diploma or General Equivalency Diploma
10. Military record (if applicable)
11. Documentation of prior employment
12. Copy of New York State fingerprint card
13. Record of security training, pursuant to the Security Guard Act to include 8-hour annual training for the duration of the Contract.
14. Medical certification of fitness and good health
    a. Contractor and/or Security Guard Company shall ensure that all guards and supervisors undergo and pass a physical exam administered by a physician licensed to practice medicine in the State of New York. Such physical exams shall take place no earlier than twenty (20) days before Contractor and/or Security Services Company hires such guard or supervisor.
    b. Contractor and/or Security Services Company shall further ensure that all guards and supervisors currently employed by them, successfully pass an annual post hiring medical examination administered by a physician licensed to practice medicine in New York State. Such annual physical exams shall take place within (30) days of the anniversary date of the prior physical.
15. Drug screen test results for the past 12 months or since employment, whichever is shorter.
16. Result, if any, of criminal record check.
17. Proof of successfully passed security clearance from DEP BPS Police Detective Unit.

D. The above referenced files shall be made accessible and delivered to the Engineer within twenty-four (24) hours of the request.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Reporting
1. All unusual occurrences that require a security guard to take official action must be reported immediately to the police and the Engineer as appropriate.
2. It is the responsibility of the Contractor to keep all reports in a binder according to location.

B. Site Security
1. Additional Security
    a. Should the Contractor consider the security requirements outlined above inadequate, it may provide such additional security as it

deems necessary. The additional cost of such approved increased protection shall be paid by the Contractor.

b. Nothing contained herein shall diminish in any way the responsibility of the Contractor for safeguarding and protecting its own personnel, work, materials, tools and equipment.

c. Warning signs, lanterns and other devices shall be provided and maintained as required for protection of the public and Site working personnel. The cost of providing additional Site security shall be included by the Contractor in the price bid for the Contract.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Video Surveillance

1. Pan-Tilt-Zoom (PTZ) Cameras

a. Outdoor PTZ IP Security Camera

1) Resolution: 3840 x 2160 UltraHD 4K to 640 x 360.

2) Lens: f=3.9 – 46.8 mm, F1.8 – 2.0 autofocus, automatic day/night, horizontal field of view: 70.7° - 6.2°.

3) Minimum illumination: Color - 0.45 lux at 30 IRE F1.8, B/W – 0.03 lux at 30 IRE F1.8.

4) Pan/tilt/zoom: Pan: 360° endless, 0.05° - 750°/s. Tilt: plus 20 to minus 90°, 0.05° - 500°/s, 12x optical zoom and 12x digital zoom total 144 zoom.

5) Video compression: H.264 (MPEG-4 Part 10/AVC), Motion JPEG.

6) Casing: IK08, IK10 housing and mounting. IP66 and NEMA 4X-rated repaintable metal aluminum casing, polycarbonate clear dome.

7) Power: High Power over Ethernet, max. 37W, High PoE Midspan 1- port: 100-240V AV, max. 74 W.

8) Operating conditions: -40 °F to 140 °F, with 60-W midspan.

b. Outdoor Fixed IR Illuminated Bullet Camera

1) Resolution: 3712x2784 10 MP to 160x90.

2) Lens: Canon 12–48 mm, F1.7–4.0, 4K Horizontal field of view: 90°–21°, Vertical field of view: 49°–12°, 10MP Horizontal field of view: 86°–20°, Vertical field of view: 62°–15°, Autofocus (zoom triggered), auto-iris, automatic day/night.

3) Day and night: Automatically removable infrared-cut filter.

4) Minimum illumination: Color: 0.03 lux at 50 IRE F1.7, B/W: 0.006 lux at 50 IRE F1.7, 0 lux with IR illumination on

5) Video compression: H.264, Motion JPEG.

6) Casing: IP66-/IP67-, and NEMA 4X-rated, IK10 impact-resistant aluminum enclosure with integrated dehumidifying membrane, weather shield with black anti-glare coating Color: White NCS S 1002-B.

7) Power: Power over Ethernet (PoE) IEEE 802.3at Type 2 Class 4, Typical 13.3 W, max 24.0 W.

8) Operating conditions: -40 °F to 140 °F.

2. Analytics

a. Motion detection

1) Onboard Analytics: Include video motion detection.

3. Video Storage

a. Video storage shall be local recording to a DVR/NVR with both local and internet-based access.

b. Minimum recording retention time is 30 days.

c. Power: 24-hour power supply battery backup.

B. Security Guards

1. Uniform and Appearance

a. The Contractor shall furnish distinctive and appropriate complete uniforms to all security guards and supervisory security personnel at no cost to DEP. All assigned personnel must have standard, matching uniforms. All supervisors' uniforms must be distinctive from guards' uniforms, (i.e., contain different color shirt than guard) and contain rank insignia.

b. The uniform and appearance shall be as follows:

1) Uniform shirts (long sleeve or short sleeve, depending on weather conditions). The Contractor(s)' shoulder patch shall

be on the sleeves and a security square badge with name plate shall be worn on the front

2) Uniform trousers;

3) A black tie (snap or button type only);

4) Black shoes

5) For staff assigned indoors, a uniform blazer with the Contractor's shoulder patch on the left breast pocket and a metal badge with name plate to be worn on the front;

6) For staff assigned outdoors, a uniform jacket with the Contractor's shoulder patch on the sleeves and a metal badge with name plate to be worn on the front, and a cap with badge (baseball style caps are acceptable) – the cap must be worn front-facing and "squared," not tilted or slanted.

7) Appropriate clothing for inclement weather, i.e. rain boots, rain coat, winter hat (must clearly identify the wearer as a security guard).

8) Appropriate safety equipment that site requires in performance of duties, i.e. hard hat, safety vest, safety goggles, steel toed boots (must clearly identifies the wearer as a security guard.)

c. All items of uniform shall be maintained in a clean, well pressed condition.

d. Contractor must provide appropriate fitting uniform for guards who are pregnant.

2. Equipment

a. Working flashlight – with replacement batteries available

b. Post Log Book

1) Contractor shall provide log books according to specifications: 8.5 inches by 14 inches hard covered bound with lined pages inside

2) Must be present and remain at security post.

3) All log entries made by security officers must be in permanent black ink. Use of correction fluid such as Wite-Out is not permitted. Mistakes in entries are to have a single line drawn through them and initialed.

4) Security Supervisors and those charged with overseeing security at a site (SPOC/ASPOC) must sign their names and entry and exit times in the logbook in red ink.

5) Log books shall be continuously maintained by Contractor's personnel and shall contain the following chronological entries:

a) Signature of each employee coming on duty

b) Signature of each employee going to and from meal break

c) Signature of each employee going off duty

d) Results of all patrols

e) Documentation of all incidents, which must include the following:

(1) Time of incident(s)

(2) Description of incidents and their outcome

(3) An account of Security Guard actions during the incident(s)

(4) Names of persons and/or entities contacted, arrival and departure times of any police units, fire department and/or other respondents, and signatures of the Contractor(s)' supervisory personnel, and DEP Project Manager and DEP Director of Security and/or appointed authorized representative.

(5) Notations of Security Guard actions during the incident(s)

f) Names of persons and/or entities contacted, arrival and departure times of any police units, fire department and/or other respondents, and signatures of the Contractor(s)' supervisory personnel, and DEP Project Manager and DEP Director of Security and/or appointed authorized representative.

g) Notations of supervisory visits during any shift must include arrival and departure times, nature of visits and areas visited.

h) Notes of all occasions when vehicles or personnel representing the NYC Police Department, the NYC Sheriff's Department or the New York State Police are observed entering or are present at User Agency sites. Notes must include the license plate numbers or vehicle numbers, if possible, time spent on and off the grounds, and details of any conversations held;

i) Notes of any emergency situations that occurs and an account of all developments and their resolution; and

j) Documentation of inquiries from news media, radio, or TV. All inquiries from Press, news media, radio or TV, etc., shall be directed to contact the DEP Press Office at (718) 595-7867

6) Log books are the property of DEP and must be submitted to the designated DEP representative if so requested.

7) Only persons directly involved with security operations are authorized to read log book. Only authorized persons may remove log book from Site. Authorized persons are Bureau of Police and Security and OIG. Notification of removal and new location must be made to all parties above by authorized person removing log book

8) When completely filled, it must be turned over to most senior DEP Person in charge of security at the Site for proper storage (or DEP Resident Engineer).

C. Communication Equipment

1. Contractor shall possess device systems for use at each site as defined. In any facility or location where two or more guards are assigned to work simultaneously, the Contractor shall provide portable hand-held two-way radios for use by each guard. Contractor shall also provide appropriate training and accessories such as batteries, chargers, and carrying case. Such radios shall be fully operational at all times. The radio must be fully charged at the beginning of each shift. Such radios shall be licensed by the Federal Communication Commission (FCC) on a business or public safety band. Such radios and accessories shall be provided in sufficient quantities to ensure that there is at least one operable, fully charged radio and case for each guard and supervisor on each shift. DEP must approve all equipment prior to use.

2. DEP's BPS Deputy Commissioner and/or their authorized representative(s) may also require that one or more radios be made available to the DEP's management personnel, at no cost to DEP, to maintain contact with the Contractor's security guards on Site and to monitor their radio transmissions. Where radios are required for the DEP's personnel, such radios must be made to operate on the same frequency as that assigned to the guards and will include cases and fully charged operable radios on each shift. Upon completion of service, such radios will be returned to the Contractor.

3. In addition, Contractor shall supply least one (1) working cellular phone capable of transmitting and receiving calls at an assigned post for use by guards on duty. Contractor's personnel shall provide the phone number for

the post cell phones to the DEP before each shift. All expenses associated with the use of cellular phones are to be assumed by the Contractor.

4. At Sites with no radio or cellular communication capability, Contractor shall provide a communication methodology to meet the DEP minimum requirements for guards to contact 911 and necessary notifications at no additional cost to the City.

5. All communication equipment must be in good operating condition and shall be supplied with a necessary back-up source.

6. The communications equipment must be tested regularly to ensure its functionality at the Site. If not functioning, the Contractor is required to replace it within four hours. Testing and equipment replacement must be noted in the post log book.

D. Electronic Timekeeping/Guard Tour System

1. Provide Timekeeping/Guard Tour system (electronic, turnkey acceptable if conditions do not warrant electronic) that is accessible to DEP BPS Security Division when requested.

2. Must be able to operate in an all-weather environment.

3. Records of all tours are the property of DEP and must be made available and accessible to DEP Project Manager and BPS Security Division when requested.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 APPLICATION

A. Security Guard Duties and Responsibilities

1. Security guards shall use discretion, courtesy, tact, and necessary force when protecting DEP locations.

2. Reporting to Post – all security guards reporting to post shall:

a. Arrive at scheduled starting time neat and professional in appearance.

b. Be in complete uniform displaying company logo.

c. If arriving at post for first-time contact the most senior DEP person on Site responsible for security or Contractor SPOC/ASPOC

d. Obtain any other necessary information from prior shift.

e. Review Post Log Book from previous shift and print their name. Identify and be familiar with:

1) Summary of incidents that took place the previous shift

2) Ongoing situations

3) Actions pending

4) Special instructions

5) Check all required post equipment to make sure it is in working order. Report to most senior DEP person on Site responsible for security, prime contractor SPOC/ASPOC, and your company supervisor any equipment not working. Enter all information in Post Log Book.

f. Safeguard all keys and equipment used during the normal course of their duties:

1) A working phone both landline and/or cellular or Nextel

2) A working two-way radio if used

3) A working flashlight

4) Whistle

5) Log Book

6) Pen(s)

7) All job-related contract information including postings

8) Any other equipment assigned related to job duties, i.e. keys

3. Post Assignment:

a. Be familiar with all site-specific post orders (can be found at security post)

b. Follow Log Book procedures as outlined.

c. Shall protect persons or property from:

1) Harm

2) Theft

3) Other unlawful activity

d. Respond to a security system alarm

e. Observe, detect, and report unlawful or unauthorized activity

f. Control, by street or other patrol service, access to property including:

1) Employees
2) Contractors
3) Visitors
4) Vehicles
5) Traffic

g. Enforce security policies, rules, regulations and procedures.

h. Areas of responsibilities can include:

1) Site buildings
2) Existing assets
3) Trailers
4) Grounds
5) Appurtenances, and occupants

i. Protect areas of responsibility against:

1) Fire
2) Vandalism
3) Theft
4) Loitering
5) Trespass
6) Burglaries/Unlawful Entry
7) Bodily harm
8) Building systems malfunctions and deficiencies (water leaks, open windows, lights out)
9) Hostile surveillance
10) Terrorism threats

j. Assist in emergency evacuations, both drill and actual – know evacuation routes and primary/secondary assembly areas.

k. Respond to emergencies, summoning assistance and obtaining professional assistance, in accordance with DEP Site procedures, in the event of injury or illness to anyone on the protected premises

l. Assist DEP and public safety personnel in case of any emergency such as fire, bomb threat, assault, or civil disturbance.

m. Prepare reports to be submitted to DEP on accidents, fires, thefts, breaches in a building's security/ protection, building incidents and potentially hazardous conditions.

n. Perform other such duties as may be prescribed such as:

1) Attend to parking facilities

2) Escort duties

3) Observe/ screen Visitors

4) Issue passes

5) Check IDs

6) Operating vehicle barrier gates, magnetometers, security x-ray machines and handheld security wands

7) Controlling gates, doors and lighting as required

o. Conduct patrols as required and dictated by site-specific post orders.

p. Upon intrusion by an unidentified person, Security Guards shall make an inquiry as to the authorization to enter the premises and take the necessary action as follows:

1) Provide the individual with temporary identification, or

2) Request the intruder to vacate the premises, or

3) If a threatening situation or criminal activity occurs, notify 911 and DEP Police (if location is upstate or at a designated In-City Site) and other contacts as proscribed by site specific post orders.

q. Security guards going off duty shall pass along all relevant information and instructions to the relieving security guard prior to leaving any post.

r. A post is never to be left unattended without official permission except if at end of tour and no relief is scheduled.

s. Access control: Follow Site specific access control policies:

1) Identify all persons entering and leaving Agency construction locations and may be required to operate X-ray or scanning equipment in the course of maintaining access control, including the inspection of bags, packages, parcels, etc.

2) Perform vehicle inspections (interior, trunk, undercarriage, etc.) during heightened security alerts, or when instructed to do so. Any vehicle entering or exiting a DEP site is subject to a search.

3) Check for valid DEP identification cards of all personnel attempting to enter the Site on foot or in vehicle. Admit only those who are permitted to use this entrance.

4) Verify a person's right to enter the Site with appropriate DEP Site personnel and/or prime contractor SPOC/ASPOC if identification card cannot be presented or is expired. Confiscate any expired identification cards and return to DEP Security Office if post is In-City or DEP Police Detective Bureau if post is Upstate or at designated In-City Sites

5) Do not assume that anybody wearing an official-looking uniform or is driving a vehicle that appears official has a valid reason to enter the Site. Inquire with appropriate DEP Site personnel and/or Prime Contractor SPOC/ASPOC

6) Make sure that all non-Site personnel (including DEP Employees who do not work at the Site) sign in

7) Deliveries – Follow Site specific delivery procedures. Confirm and verify all deliveries with appropriate DEP Site personnel and/or prime contractor SPOC/ASPOC. Do not automatically assume that anybody wearing an official-looking uniform has a reason to enter the Site. Inquire with appropriate DEP Site personnel or Contractor SPOC/ASPOC

8) Deny access to unauthorized persons at all specified locations.

9) Removal of Property – Confirm a person's right to remove property from the Site. If uncertain, verify with appropriate DEP Site personnel or Contractor SPOC/ASPOC.

10) Check that Contractors are scheduled to work. Verify names of all contractor personnel, identification, and have all sign in. Have them wait to be escorted by a DEP person or Contractor SPOC/ASPOC unless directed otherwise by appropriate DEP Site personnel or Contractor SPOC/ASPOC.

t. Report all irregularities, suspected irregularities, hazards, and potential hazards to most senior DEP person on Site and /or Contractor SPOC and DEP Police (if location is upstate or at a designated in-City Site):

1) This means:

a) any situation that is not typically part of the normal course of operations observed, heard, or smelled at the Site;

b) Could possibly cause harm to a person;

c) Damage to Site property; or

d) Broken or malfunctioning equipment.

2) Immediately report all safety violations to DEP Project Manager or authorized representative(s)

3) Suspicious Behavior – defined as unexplained conduct. Report all suspicious, unusual, or dangerous activities to DEP Police (if location is upstate or at a designated In-City Site). Report also to most senior DEP person on Site and/or Contractor SPOC/ASPOC

a) This includes vehicles, people, sounds, smells, and spills.

4) In Emergencies, Dial 911 and DEP Police (if location is upstate or at a designated In-City Site at 1-914-593-7500 or 1-888-426-7433 without delay). Also notify most senior DEP person on Site and/or prime contractor SPOC

u. Press Inquiries / Requests for Information – Do not speak to any news/media/ or press person or any inquisitive citizen regarding any matter or matter of security pertaining to DEP: Instead:

1) Refer to DEP Press Office at (718) 595-7867

2) Notify DEP Police (if location is upstate or at a designated In-City Site) and/or most senior DEP person on Site, and/or prime contractor SPOC.

3) Log all observations and/or incidents occurring in the Post Log Book. Include names of all people notified with and if necessary all 911/EMS operator numbers and police badge numbers.

v. Answer all questions from the DEP regarding events witnessed at their work location whether or not those events directly involved the performance of their official duties.

w. Submit sworn statements regarding any incident witnessed by the guard involving the commission of a crime or the threat thereof.

x. Surrender to Office of Inspectors General (OIG) and law enforcement any documents, weapons or other evidence obtained while performing their official duties or while witnessing any events at their work locations during their assigned hours of work.

y. Cooperate fully with DEP and law enforcement in regard to any investigations, administrative, and/or judicial proceedings resulting from said investigations

4. Provide name, company, and location while reporting anything or answering post telephones or radios.

5. Upon completion of shift immediately leave the Site and do not remain in the work area.

B. Prohibited Post Behavior

1. While not an exhaustive list, below are examples of behaviors and item possession that could subject the security guard to immediate and prompt removal from the Contract and even arrest and criminal prosecution.

   a. Reporting to work intoxicated or under the influence of any illegal drugs

   b. Consuming or possessing alcohol or illegal drugs

   c. Smoking inside the Security Booth, roving patrol vehicles, or onsite except in designated smoking areas

   d. Being in possession of any non-job related issued weapon, even if legal. No firearms are permitted on DEP Property even with carrier's permit (exception are appropriately issued weapons to armed guards that are formally approved)

   e. Sleeping of any kind or other inattentive behavior

   f. Being in non-designated areas of the Site and / or unauthorized use to Site equipment

   g. Being on Site when not on duty; guard must vacate Site when shift ends

   h. Having personal visitors

   i. Making personal phone calls except in an emergency

   j. Leaving post without proper notification and authorization

   k. Failure to follow job-related directions

   l. Possessing or operating any device that distracts from post responsibilities

   m. Plugging in of any non-job issued electronic equipment to a Site outlet

   n. Revealing details about security procedures or unusual incidents to unauthorized persons

   o. Speaking to the press or unauthorized persons

   p. Any other conduct or items possessed not listed above that might compromise job performance.

C. Fire Guard Duties and Responsibilities

1. Fire Guards' responsibilities include reducing the threat of fires in a variety of locations within a facility. They are also responsible for ensuring that all fire safety regulations are obeyed.
2. Fire Guards are required when fire sprinklers are not installed or when fire sprinklers are malfunctioning, including at construction Sites.
3. Fire Guards must be present when an automatic fire protection system is shut down while being repaired.
4. Fire guards shall have ability to manually operate each alarm station on the premises.
5. Duties include, but not limited to:
    a. Assist in the evacuation of the location in the event of fire or other critical situation.
    b. Provide clear and concise instructions to building occupants to ensure safe and orderly evacuations.
    c. In the case of a fire, responsible for activating the fire alarm; notifying the Fire Department and, if applicable, the facility's Fire Safety Director.
    d. Direct fire fighters to the scene of the fire.

D. Security Guard Supervisor's Duties and Responsibilities

1. Supervisors shall direct and monitor the performance of security guards at the Sites, as directed by DEP, to ensure that security guards are performing their duties in accordance with the Contract.
2. Supervisors assigned under the Contract shall be the person designated, in writing, to have the authority and training to supervise all levels of employees on a day-to-day basis.
3. The Contractor and/or the Security Services Company shall be responsible for the necessary supervision of the Guards and shall make unannounced visits to the properties for the purpose of monitoring each guard's performance. A Supervisor's Report, summarizing their findings (including times and dates of visit), shall be submitted to the DEP Project Manager on a monthly basis.
4. The Contractor and/or Security Services Company shall provide a supervisor who shall randomly visit the Site at least once per week alternating between all three shifts. The supervisor shall sign in the log book in red ink at the security post provided upon arrival, the DEP visitor log in the DEP Trailer, and communicate with DEP Project Manager. The supervisor will ensure all employees are present, attentive to their duties, and in conformance with the requirements of the Contract.
5. Supervisors shall make unannounced inspections of guards at the Site a minimum of at least once within a twenty-four (24)-hour rotation in order

to ensure that the guards are acting in conformance with terms and conditions of the Contract.

6. Supervisors shall monitor to ensure that the guards are properly uniformed, alert and aware of and performing the required duties.

7. Supervisors shall not simultaneously perform the duties of security guard.

8. A written report, to include the date, time, and results of supervisory inspections shall be transmitted electronically to DEP Project Manager within three (3) days following each inspection. Supervisors shall note their times of arrival and departure in the log book provided by DEP as well as in their Memo Book and must punch in and out on a time clock, if/when required.

E. Rejection/Dismissal of Staff

1. Designated officials of DEP (Project Manager and/or authorized representative(s) may reject staff for any reason.

2. DEP may reject, dismiss or request removal of any personnel supplied by the Contractor and/or Security Guard Company from their assignment by notifying the Contractor. Upon such notification, Contractor shall be required to remove the employee(s) immediately or by such time as is designated by DEP.

3. Any guard or supervisor who has been rejected by DEP shall not be redeployed to any other DEP Site without written permission of BPS Security Division.

4. Guards and supervisors dismissed from duty must be replaced within four (4) hours of dismissal.

3.03 FIELD TESTING / QUALITY CONTROL

A. Recordkeeping

1. Contractor(s) shall maintain business records pursuant to Rules and Regulations of Title 19 NYCRR, Section 170.8, entitled Business Records for Private Investigator, Watch, Guard and Patrol Agencies. The personnel record for each employee assigned to work hereunder must contain the following and be available for review upon request by DEP.

2. Name and home address

3. Employment application

4. Date of birth

5. Unique employee identification number

6. Color photograph (from photo ID card)

7. Birth certificate

8. High school diploma or GED
9. NYS fingerprint card
10. Record of basic training as required by the NYS Security Guard Act of 1992; FDNY; etc.
11. Medical exam certificate
12. Clinical drug test results to include urine analysis
13. Results of annual drug screening
14. Results of background investigation
15. Color copy of a valid current armed security guard license issued by the State of New York (where applicable)
16. Color copy of a valid current security guard license issued by the State of New York
17. Color copy of a valid current New York State driver's license, or New York State Non-Driver ID Card for those security guards not operating a motor vehicle or who do not have a Driver License
18. Pursuant to the Title 19 NYCRR, Section 170.5, entitled "Principal Business Address," all Contractors shall maintain a principal place of business within New York State, which shall contain the employee and business records for any licensed activities conducted within New York State. A residence may not be considered as a principal business address.
19. The Contractor must provide above records to DEP Project Manager and DEP BPS Security Division upon request.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 35 63 – SUSTAINABILITY CERTIFICATION PROJECT REQUIREMENTS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the Envision requirements of this Project. Work includes environmental and sustainable practice requirements related to the Institute for Sustainability Infrastructure's (ISI) Envision Rating System. A goal of this Project is to construct a facility that meets ISI's Envision Rating System.

B. The intent is for Envision goals to be achieved in a manner that ultimately provides a safe and healthy environment for building occupants and community members with minimal negative impact on the local, regional and global environment.

C. Attachments

1. Attachment A: Sustainability Construction Envision Documentation

2. Attachment B: Environmental Materials Reporting Form

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the

applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 14 00 – Work Restrictions
B. Section 01 52 10 – Temporary Field Office Trailers
C. Section 01 52 40 – Field Office Equipment and Supplies
D. Section 01 74 20 – Construction Waste Management
E. Section 03 21 00 – Reinforcing Steel
F. Section 03 30 10 – Low Carbon Cast-in-Place Concrete
G. Section 03 32 00 – Joints in Concrete
H. Section 03 35 00 – Concrete Finishing
I. Section 03 45 00 – Precast Architectural Concrete
J. Section 03 60 00 – Grouting
K. Section 05 05 13.01 – Galvanizing
L. Section 05 12 00 – Structural Steel Framing
M. Section 05 21 00 – Steel Joist Framing
N. Section 05 31 23 – Structural Roof Decking
O. Section 05 50 00 – Metal Fabrications
P. Section 05 51 00 – Metal Stairs
Q. Section 05 52 13.07 – Aluminum Pipe Railings
R. Section 05 53 01.03 – Aluminum Floor Gratings
S. Section 07 44 33 – Metal Faced Panels
T. Section 07 90 00 – Joint Protection
U. Section 09 91 00 – Painting
V. Section 09 96 35 – Chemical Resistant Concrete Coating
W. Section 10 14 01 – Identifying Devices
X. Section 31 23 23 – Fill
Y. Section 31 25 10 – Dust, Soil Erosion and Sediment Control
Z. Section 31 62 23.13 – Concrete-Filled Steel Piles
AA. Section 32 12 16 – Asphalt Paving
BB. Section 32 12 16.01 – Asphalt Paving for NYCDOT ROW
CC. Section 32 14 13 – Precast Porous Concrete Panel
DD. Section 32 31 19 – Decorative Metal Fences and Gates

EE. Section 40 05 31 – Thermoplastic Process Pipe

FF. Section 40 05 32 – Double Containment Chemical Piping

1.04 REFERENCES

A. ISI's Envision Version 3 (V3) as released on April 17, 2018, is the Envision framework used and referenced herein.

B. "Pathway A" refers to the Envision V3 compliance pathway being utilized for this Project. Pathway A includes a submission to ISI during 90% Design and a follow-up submission to ISI Post-Construction. The first submission is herein referred to as the ISI Design Submission.

1.05 DESCRIPTION

A. General

1. The Contractor shall comply with sustainability requirements as indicated in this Section, other Specifications and Contract Drawings. The Contractor shall meet all sustainability requirements as stipulated in Attachment A through the New Material Sustainable Implementation Plan, and the Envision Evidence Documentation.

2. Contractor role within Envision certification:

a. The Contractor shall develop a New Material Implementation Plan and the Envision Evidence Document, which will be submitted the Design Engineer for use as Evidence to support a "Gold" certification.

b. The ISI Design Submission is generated by the Engineer and included in the bid exhibit documents. The ISI Design Submission is expressly excluded from and is not a part of this Contract and is available for information purposes only.

c. The Contractor shall submit evidence as listed in Attachment A - Sustainability Construction Envision Documentation. The Contract Documents are not intended to limit alternative means of achieving Envision requirements. Suggestions from the construction team during Project meetings for implementing sustainability goals are encouraged.

3. All new materials shall be procured in accordance with the Environmentally Preferred Purchasing guidelines per Local Laws 118-121 of 2005.

1.06 QUALITY ASSURANCE

A. The Contractor shall have an Envision Qualified Professional on staff who shall be responsible for Envision issues compliance and coordination.

1. The Envision Qualified Professional shall be an Envision Sustainability Professional (ENV SP). The Envision Qualified Professional shall be responsible for sustainability considerations described in this section

including the New Materials Sustainable Implementation Plan and the Envision Evidence Documentation.

1.07 SUBMITTALS

A. New Materials Sustainable Implementation Plan

1. The Contractor shall develop and implement the New Materials Sustainable Implementation Plan for the Project, where new materials refer to any item, supply, equipment, or other physical object being newly purchased for the single-use or long-term use for the duration of the Project.

2. The New Materials Sustainable Implementation Plan shall provide a method for how the Contractor plans to meet the requirements stipulated in Attachment A for recycled material, regional material, and sustainably sourced content.

3. The Contractor shall prepare and submit the New Materials Sustainable Implementation Plan for review and approval by the Engineer thirty (30) days after receipt of Notice to Proceed and prior to the selection of any new materials.

4. The Contractor shall use the Sustainable Material Content Plan (SMCP) as reference for the development of the New Materials Sustainable Implementation Plan. The SMCP is generated by the Engineer and included in the bid exhibit documents. The SMCP is expressly excluded from and is not a part of this Contract and is available for information purposes only.

5. The following equations shall be used to calculate values to input in the Environmental Materials Reporting Form (EMRF) (Attachment B):

a. Equation 1: Percent Recycled Content

$$Percent\ Recycled\ Content = \frac{Estimated\ Material\ Weight\ from\ Recycled\ Source}{Estimated\ Total\ Material\ Weight} \times 100$$

b. Equation 2: Overall Percent Recycled Content

$$Overall\ Percent\ Recycled\ Content = \frac{Estimated\ \ Total\ Material\ Weight\ from\ Recycled\ Sources}{Estimated\ Total\ Project\ Material\ Weight} \times 100$$

c. Equation 3: Percent Regional Content

$$Percent\ Regional\ Content = \frac{Estimated\ Material\ Weight\ Sourced\ Regionally}{Estimated\ Total\ Material\ Weight} \times 100$$

d. Equation 4: Overall Percent Regional Content

$$Overall\ Percent\ Regional\ Content = \frac{Estimated\ Total\ Material\ Weight\ Sourced\ Regionally}{Estimated\ Total\ Project\ Material\ Weight} \times 100$$

e. Equation 5: Percent Sustainably Sourced Content

$$Percent\ Sustainably\ Sourced\ Content = \frac{Estimated\ Material\ Weight\ Sustainably\ Sourced}{Estimated\ Total\ Material\ Weight} \times 100$$

f. Equation 6: Overall Percent Sustainably Sourced Content

$$Overall\ Percent\ Sustainably\ Sourced = \frac{Estimated\ Total\ Material\ Weight\ Sustainably\ Sourced}{Estimated\ Total\ Project\ Material\ Weight} \times 100$$

6. The New Materials Sustainable Implementation Plan shall include estimates of recycled material content, regional material content, and sustainably sourced content as described:

   a. Recycled material content estimate:

      1) Identify the percentage of recycled content of at least five (5) materials which will meet the recycled content requirements as stipulated in Attachment A.

      2) The total recycled material shall be estimated by including the total proposed weight in tons of all new materials and supplies procured for the Work, excluding mechanical equipment, electrical equipment, and plumbing equipment and their components, and excluding plants, soils, rocks, and water.

      3) The estimated recycled content shall be calculated in tons per Attachment B – EMRF.

   b. Regional material content estimate:

      1) Identify the percentage of regional content of at least five (5) materials which will meet the regional content requirements as stipulated in Attachment A.

      2) Regional content shall be defined per material by a distance of the supplier from the Site requirement in radii as the crow flies from the Project Site, as listed in Table 1.

Table 1: Regional Content Requirements

Material	**Distance from the Site Requirement**
Soils and mulches	50 miles
Aggregates, Sands	50 miles
Concrete	100 miles
Plants	250 miles
Other materials (excluding equipment)	500 miles
Mechanical, electrical, plumbing	N/A

      3) The total regional material content shall be estimated by including the total proposed weight in tons of all new materials and supplies procured for the Work, excluding mechanical equipment, electrical equipment, and plumbing equipment and their components.

4) The estimated regional content shall be calculated in tons per Attachment B - EMRF.

c. Sustainably sourced content estimate:

1) Identify the percentage of sustainably sourced content of at least five (5) materials which will meet the sustainably sourced content requirements as stipulated in Attachment A.

2) Sustainably sourced content shall be defined as procuring materials, supplies, and equipment from a manufacturer that is demonstrably protective of human health and the environment. Demonstrably protective may include third party sustainability certification programs, environmental product declarations, or corporate sustainability policies. Examples of qualifying requirements include but are not limited to:

a) Environmental management systems consistent with ISO (International Organization for Standardization) 14001

b) Product-specific type III Environmental Product Declaration (EPD) conforming to ISO 14025, 14044.

c) Third-party verified sustainability program (e.g., Forest Stewardship Council (FSC), Green Seal, EcoLogo, Underwriters Laboratory, National Biosolids Partnership (NBP), Concrete Sustainability Council (CSC), etc.)

d) Third-party verified corporate sustainability report consistent with the Global Reporting Initiative (GRI) Sustainability Report or equivalent.

3) The total sustainably sourced material shall be estimated by including the total proposed weight in tons of all new materials, supplies, and equipment procured for the Work.

4) The estimated sustainably sourced content shall be calculated in tons per Attachment B - EMRF.

B. Envision Evidence Documentation

1. The Envision Project Manager shall prepare and submit the initial, monthly and final Envision Evidence Documentation.

2. Initial Sustainability Construction Documentation for materials containing recycled, regional, and/or sustainably sourced content listed under Article 1.03 RELATED SECTIONS.

a. Completed EMRF (Attachment B) to be submitted for each individual material

3. Monthly and Final Sustainability Construction Documentation shall be submitted for materials containing recycled, regional, and/or sustainably sourced content listed under Article 1.03 RELATED SECTIONS.

   a. The Monthly Sustainability Construction Documentation shall be submitted to the Engineer on the 1st day of each month following Notice to Proceed.

   b. At Project closeout, the Sustainability Construction Documentation shall be completed and submitted to the Engineer.

   c. The Monthly and Final Envision Evidence Documentation shall include the following items:

      1) A cover sheet that describes updates since the last submission, how the new materials reporting documentation differs from the New Materials Sustainable Implementation Plan, and a projection of how the Project is projected to meet the requirements stipulated in Attachment A.

         a) The Contractor shall meet the requirements stipulated in Attachment A.

      2) The EMRF (Attachment B) and supplementary articles, including shop drawings, specifications, and receipts/invoices for materials containing recycled, regional, and/or sustainably sourced content. The Contractor shall work with the vendor to obtain the supplementary articles. The Contractor shall save such original documents for the life of the Project plus two (2) year (s). The specifications shall include the following, as applicable:

         a) Name of the product

         b) Name of the manufacturer

         c) Weight of the material

         d) Percentage of recycled content (either post-industrial or post-consumer recycled content)

         e) Location of the manufacturer

         f) Manufacturer's sustainable qualifying documentation

   d. Construction waste information shall be collected per requirements described in Section 01 74 20 – Construction Waste Management.

   e. Local Law 77: DEP Monthly Report Form 1, as described and included as Attachment A in Section 01 14 00 – Work Restrictions.

   f. Local Law 77: DEP Monthly Report Form 2, as described and included as Attachment A in Section 01 14 00 – Work Restrictions.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not used.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not used.

1.10 WARRANTY

A. Not used.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not used.

2.02 MATERIALS / EQUIPMENT

A. Not used.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not used.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not used.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not used.

3.02 APPLICATION

A. Not used.

3.03 FIELD TESTING / QUALITY CONTROL

A. Envision Qualified Professional duties:

1. The Envision Qualified Professional shall attend a minimum of three (3) on-site coordination meetings. The Envision Qualified Professional shall make available for review at each meeting a set of Contract Drawings and specifications, the New Materials Sustainable Implementation Plan, the updated Envision Evidence Documentation.

    a. The first meeting will be a preconstruction meeting to review the New Materials Sustainable Implementation Plan and establish roles including the Envision Qualified Professional and the Engineer.

    b. The second meeting will be a pre-closeout meeting to review the Envision Evidence Documentation for completeness and identify any outstanding issues relating to requirements stipulated in Attachment A.

c. The third meeting will be a closeout meeting to review the completed Envision Evidence Documentation.

3.04 STARTUP / DEMONSTRATION

A. Not used.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not used.

END OF SECTION

Attachment A

Sustainability Construction Envision Documentation

Indicator	Minimum Required Level[1]	Envision Credit Reference	Reporting Template
Recycled Material	35%[2]	RA1.2	Attachment B
Regional Material	94%[3]	-	Attachment B
Sustainable Procurement	77%[4]	RA1.1	Attachment B
Waste Reduction	100%[5]	RA1.4	Section 01 74 20 – Construction Waste Management, and Section 01 35 27 – Environmental Health and Safety Requirements

1. Minimum required level was established based on project-specific goals
2. Based on all new materials or supplies, procured during the Work, excluding mechanical, electrical, and plumbing equipment and their components, and excluding plants, soils, rocks, and water
3. Based on all new materials or supplies, procured during the Work, excluding mechanical, electrical, and plumbing equipment
4. Based on all new materials, supplies, equipment, or anything procured during the Work
5. Total material streams contributing to Project diversion goal must be recycled, reused, and/or salvaged

Attachment B

Environmental Materials Reporting Form (EMRF)

Material	Type/ Product	**Recycled Content**			**Regional Content**				**Sustainably Sourced Content**				
		Total weight (tons)[1]	Total Recycled Material Content (%)[2]	**Total Recycled Content (tons)**	Total weight (tons)[3]	Source of material (miles from project site)	Total Regional Material Content (%)[4]	**Total Regional Content (tons)**	Total weight (tons)	Manufacturer/ Supplier Certifications[5]	Certificate Obtained? (yes/no)	Total Sustainably Sourced Content (%)[6]	**Total Sustainably Sourced Content (tons)**
Total			-			-	-			-	-	-	
Percentage of Recycled, Regional, or Sustainably Sourced Content by weight[7]													

1. Total weight of material for recycled content shall not include landscaping material such as planting soil, mulch or sodding, and mechanical, electrical, and plumbing equipment, as stipulated in Article 1.07.A.6.a.2
2. Per Article 1.07.A.5.a Equation 1
3. Total weight of material for regional content estimates shall not include mechanical, electrical, and plumbing equipment, as stipulated in Article 1.07.A.6.b.3
4. Per Article 1.07.A.5.c, Equation 3 and Article 1.07.A.6.b Table 1: Regional Content Requirements
5. May include third party sustainability certification programs, environmental product declarations, or corporate sustainabilty policies; option to include "no certification" if the manufacturer / supplier is not demonstrably protective of human health and the environment
6. Count as sustainably procured content if "yes" cerification has been obtained; Per Article 1.07.A.5.e, Equation 5
7. Per Article 1.07.A.5.b-e, Equation 2 (recycled), Equation 4 (regional), and Equation 6 (sustainably sourced); final percentages shall be greater than or equal to the Minimum Percentage by weight as provided in Attachment A

NO TEXT ON THIS PAGE

SECTION 01 41 00 – REGULATORY REQUIREMENTS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Inspection by City, State and Federal Government

B. Permits, Licenses, Work Approvals and Certificates

C. Electrical Inspections, Department of Buildings

D. Existing Utilities

E. Existing Flows

F. Diversion of Water

G. Disposal of Water

H. Conformance to Industrial Code

I. Conformance to Other Codes and Standards

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PART 3	EXECUTION	6
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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the

applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 57 00 – Temporary Controls

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Inspection by the City, State and Federal Government

1. The Contractor shall provide proper facilities for access to and inspection of the Work at all times for authorized representatives of the City, State and federal governments, the latter two in the presence of the Engineer.

B. Permits, Licenses, Work Approvals and Certificates

1. Unless otherwise specified in this Section, the Contractor shall obtain, pay for and comply with all necessary permits, licenses, approvals, certificates of inspection, and controlled inspection reports, and shall give all notices and pay all legal fees to local, City, State and federal departments having jurisdiction in connection with the Work of this Contract.

2. DEP has initiated applications for some permits. The Contractor shall be responsible for following up on and updating these permit applications, as needed, and for initiating and obtaining all other required permits necessary for the performance of this Contract, for renewing permits before they expire, and for maintaining these permits by paying for them regularly and complying with their requirements during the period of performance of the Work.

a. Permits that have been initiated and/or acquired by DEP during the design phase are listed below.

1) New York City Public Design Commission Approval

2) New York State Department of Environmental Conservation General Permit for Stormwater Discharges During Construction

3) NYCDEP – City Environmental Quality Review Environmental Assessment Statement

4) NYCDEP – Not an Asbestos Project Notification (Form ACP5)

5) NYCDOB – Plan Approval (General Construction, Structural, and Mechanical Systems Filings)

6) NYC DOT OCMC – Street Opening Permit

7) NYC DOT Revocable Consent

b. Permits to be initiated and acquired for construction include, but are not limited to the following:

1) FEMA - Elevation Certificate (at end of construction phase)

2) NYSDEC - Minor Facility Registration: Permit to Construct

3) NYSDEC - Waste Transporter Permit

4) NYSDEC - Hazardous Substance Bulk Storage Registration (Chemical Bulk Storage Registration)

5) NYSDEC - United States Environmental Protection Agency (USEPA) Identification Number

6) NYSDOT - Divisible Load Overweight Permits (Form PERM 92)

7) DSNY - Certification of Load Data

8) FDNY - Hazardous Chemicals

9) NYCDEP - Air Pollution - Work Permit

10) NYCDEP - Permit to Install Manhole

11) NYCDEP - Trailer Connection Permit

12) NYCDEP - Approval of Backflow Prevention Devices (Form GEN 236) and Backflow Prevention Test and Maintenance Report

13) NYC DOB – Permit to Construct (Demolition, Plumbing, Electrical, and Fire Alarm Systems)

14) FDNY – Fire Alarm System

3. All Work performed under the Contract shall conform to the applicable rules and regulations of the Electrical Division, New York City Department of Buildings; the Building Laws of the City of New York; New York City Fire Department; NYC DOT and all other City/Local, State and Federal government Departments having jurisdiction.

4. Upon completion of the various stages of construction, the Contractor shall schedule inspections and obtain certificates of approval and/or acceptance from the various agencies and departments having jurisdiction and shall deliver these certificates to the Engineer.

C. Electrical Inspections, Department of Buildings

1. The Contractor, as mandated by law, shall make application for a certificate of electrical inspection to the NYC Department of Buildings (DOB) for electrical Work furnished under this Contract. Proof of filing for the

certificate shall be submitted to the Engineer in the form of notification email issued by the DOB at the time of application. Such proof shall be submitted within fifteen (15) days after the date upon which the Contractor is notified by the City to commence Work.

2. After completion of the Work, the Contractor shall notify the local Borough Office via DOBNOW Inspections, requesting that a final inspection be made.

3. Prior to final Substantial Completion, the Contractor shall provide evidence to the Engineer that a Certificate of Inspection, which is signed by the Borough Superintendent of the DOB Electrical Division has been filed in the Office of the Comptroller of the City and certifies that:

   a. All material and workmanship comply in every respect with the rules and regulations of the Electrical Division, Department of Buildings and the New York City Electrical Code.

   b. All materials and workmanship comply in every respect with the Contract Documents approved by the Electrical Division, Department of Buildings and fulfill the intent thereof.

D. Existing Utilities

1. All subsurface utility and structure information shown on the Contract Drawings were obtained from various plans, maps and field investigations; however, they are not guaranteed to be complete or accurate. It shall be the Contractor's responsibility to locate all such necessary utilities or structures by using field investigation methods acceptable to the Engineer prior to the start of construction. No separate payment will be made for field investigations.

2. During the progress of the Work, the Contractor shall protect from damage any existing utilities or services within the Work areas until, they have been re-routed, disconnected or capped off.

E. Existing Flows

1. The Contractor shall, as approved by the Engineer, provide and construct flumes, temporary sewers, dams and all incidental and related facilities necessary to divert or otherwise take care of groundwater and surface drainage, and to prevent any sediments from being conveyed into the existing storm sewer inlets, combined sewer inlets or watercourses.

F. Diversion of Water

1. The Contractor shall, as approved by the Engineer, provide and construct flumes, temporary sewers, dams and all incidental and related facilities necessary to divert or otherwise take care of groundwater and surface drainage, and to prevent any sediment from being conveyed into the existing storm sewer inlets or watercourses. All such structures, methods, and practices shall be in accordance with the existing stormwater pollution

prevention plans (SWPPPs) at the site(s) of the Work and with the permits (e.g., NYSDEC) obtained for the site(s) and regulations governing such activity.

G. Disposal of Water

1. Water from open cut and/or sheeted excavations, manholes, structures, trenches, or from whatever source, shall be disposed of in accordance with regulations of authorities having jurisdiction, permits and methods approved by the Engineer. All such structures, methods, and practices shall be in accordance with the existing SWPPPs at the site(s) of Work and with permits (e.g., NYSDEC) obtained for the site(s) and regulations governing such activity.

H. Conformance to Industrial Code

1. The Contractor's attention is directed to requirements of the Industrial Code of the State of New York, Department of Labor, Board of Standard and Appeals, latest edition and amendments or supplements thereto (the Code). New York State Industrial Code rules applicable to the Work include, but are not limited to, the following:

a. Rule No. 2: Exit enclosures, vertical opening and floors in factory buildings.

b. Rule No. 8: Construction, guarding, equipment, maintenance and operation of elevators, dumbwaiter, escalators, hoists and hoistways in factories, and mercantile establishments.

c. Rule No. 16: Floor and stair surfaces, railings and toeboards.

d. Rule No. 19: Guarding of dangerous machinery, vats and pans.

I. Conformance to Other Codes and Standards

1. All devices, materials and installations shall conform to the current latest edition of the applicable requirements of the New York City Administrative Code, the National Electrical Code (NFPA 70), ANSI, ASTM, IEEE, NEMA, OSHA, UL and the Contract Documents and the documents specified elsewhere in the specifications. In the event of a conflict between any codes or laws of the City of New York and any other applicable code or standard, the City of New York codes and laws shall take precedence.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Abbreviations and Acronyms
2. Definitions
3. Reference Standards

B. The following index of this Section is presented for convenience:

Article	Title	Section Page
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1.01	Summary	1
1.02	Payment	1
1.03	Related Sections	2
1.04	References	2
1.05	Description	2
1.06	Quality Assurance	3
1.07	Submittals	3
1.08	Delivery, Storage, and Handling	3
1.09	Spare Parts, Special Tools, and Supplies	3
1.10	Warranty	3
PART 2	PRODUCTS	3
2.01	Manufacturers	3
2.02	Materials / Equipment	3
2.03	Fabrication / Assembling / Finishes	3
2.04	Source Quality Control / Shop Tests	3
PART 3	EXECUTION	3
3.01	Examination / Preparation	3
3.02	Installation	3
3.03	Field Testing / Quality Control	3
3.04	Startup / Demonstration	3
3.05	Adjusting / Protection / Cleanup	3

C. The following tables, located after the "End of Section" designation, are a part of this Section:

1. Table 01 42 00-1 – Abbreviations
2. Table 01 42 00-2 – Acronyms
3. Table 01 42 00-3 – Standards Developing / Publishing Organizations

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the

applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. References applicable to all Specification Sections are listed in Tables 01 42 00-1 through -3, located after the "End of Section" designation, and include the following:

B. Use of the abbreviations or acronyms in Tables 01 42 00-1 through -3 is optional.

1. Reference to a technical society, organization, body, or code may be made in the Specifications by using the acronyms listed in Table 01 42 00-3 or by using the full organization name.

C. Use of Reference Standards:

1. All Work shall comply with the standards referenced, except as follows:

a. Where more stringent requirements are shown or specified, and/or

b. Where more stringent requirements are required by Law.

2. Referenced standards shall be current as of the time of bidding the Contract Documents, unless otherwise specified.

3. Whenever reference is made to the furnishing of materials or testing thereof to conform to the standards of any technical society, organization, or body, the reference shall be construed to mean the latest standard, code, specifications or tentative specification adopted and published, unless otherwise specified by the Engineer.

4. When no reference is made to a code, standard or specification, the standards of the ASTM or the IEEE shall govern.

5. Where an item of equipment is specified to be explosion- proof, it shall be so certified by an independent agency recognized by the insurance industry, namely, UL, FM, etc. In all cases, materials shall be of the quality and character which, in the opinion of the Engineer, are best suited for the purpose for which they are required.

6. The Contractor shall obtain copies of the referenced standards when required by the Contract Documents.

D. Additional references and definitions may be defined in individual Sections, and these additional references and definitions shall be applicable only to the Work specified under those Sections.

1.06 QUALITY ASSURANCE

A. To ensure proper use of reference standards in the preparation of Shop Drawings, the Contractor shall employ qualified personnel with at least five (5) years' construction project experience including the use of industry standards and compliance with construction codes and regulations.

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

TABLE 01 42 00-1
LIST OFABBREVIATIONS

alternating current	a-c
ampere	A
antemeridian	a.m.
Architectural Barriers Act	ABA
Americans with Disabilities Act	ADA
Americans with Disabilities Act Accessibility Guidelines	ADAAG
ante meridian	a.m.
average	avg
biochemical oxygen demand	BOD
five-day biochemical oxygen demand	BOD_5
brake horsepower	bhp
British thermal unit	Btu
building information model	BIM
carbonaceous biochemical oxygen demand	CBOD
five-day carbonaceous biochemical oxygen demand	$CBOD_5$
chemical oxygen demand	COD
Centigrade (or Celsius)	C
chlorinated polyvinyl chloride	CPVC
chlorofluorocarbons	CFC
Code of Federal Regulations	CFR
computer-aided drafting and design	CADD, or CAD
consecutive calendar day(s)	ccd
cubic inch	cu in
cubic foot	cu ft
cubic yard	cu yd, or CY
cubic feet per minute	cfm
cubic feet per second	cfs
day(s)	d
decibel	db
degree Centigrade (or Celsius)	degrees C, ^oC, or deg C
degrees Fahrenheit	degrees F, ^oF, or deg F
diameter	dia
direct current	d-c
dollars	$
each	ea
efficiency	eff
Fahrenheit	F
feet	ft
feet per hour	fph, or ft/hr
feet per minute	fpm
feet per second	fps, or ft/sec

TABLE 01 42 00-1
LIST OFABBREVIATIONS
(Continued)

figure	fig
flange	flg
foot-pound	ft-lb
gallon	gal
gallons per hour	gph, or gal/hr
gallons per minute	gpm or gal/min
gallons per second	gps or gal/sec
gram	g
grams per liter	g/L
Hertz	Hz
horsepower	hp or HP
hour	hr
human-machine interface	HMI
inch	in.
inches of mercury	in. Hg
inches water gage	in. w.g.
inch-pound	in.-lb
inside diameter	ID
iron pipe size	IPS
thousand pounds	kips
thousand pounds per square inch	ksi
kilovolt-ampere	kva
kilowatt	kw
kilowatt-hour	kwhr or kwh
linear foot	lin ft or LF
liter	L
Leadership in Energy and Environmental Design (USGBC)	LEED
maximum	max
mercury	Hg
milligram	mg
milligrams per liter	mg/l or mg/L
milliliter	ml
millimeter	mm
million gallons per day	mgd or MGD
million gallon	MG
minimum	min
national pipe thread	NPT
net positive suction head	NPSH

TABLE 01 42 00-1
LIST OFABBREVIATIONS
(Continued)

net positive suction head available	NPSHA
net positive suction head required	NPSHR
nitrogen oxide (total concentration of mono-nitrogen oxides such as nitric oxide (NO) plus nitrogen dioxide (NO_2)	NOx
nominal pipe size	NPS
number	no.
operator interface terminal	OIT
ounce	oz
ounce-force	ozf
outside diameter	OD
parts per hundred	pph
parts per million	ppm
parts per billion	ppb
polyvinyl chloride	PVC
post meridian	p.m.
pound	lb
pounds per square inch	psi
pounds per square inch absolute	psia
pounds per square inch gauge	psig
pounds per square foot	psf
process control system	PCS
programmable logic controller	PLC
revolutions per minute	rpm
second	sec
specific gravity	sp gr, or SG
square	sq
square foot	sq ft, sf, or ft^2
square inch	sq in., or in^2
square yard	sq yd, or SY
standard	std
standard cubic feet per minute	scfm
thousandth of an inch	mil
total dynamic head	TDH
totally-enclosed fan-cooled	TEFC
volt	V
volts alternating current	vac
volts direct current	vdc
volatile organic compounds	VOC

TABLE 01 42 00-2
LIST OFACRONYMS

AA	Aluminum Association
AASHTO	American Association of State Highway and Transportation Officials
ABS	American Bureau of Shipping
ACI	American Concrete Institute
ACRI	Air Conditioning and Refrigeration Institute
AFBMA	Anti-Friction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AHDGA	American Hot Dip Galvanizers Association
AISC	American Institute of Steel Construction
AISE	Association of Iron and Steel Engineers
ANSI	American National Standards Institute
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM Des.	American Society for Testing and Materials Designation
AWS	American Welding Society
AWWA	American Water Works Association
BEC	Bureau of Electrical Control
CFR	Code of Federal Regulations
CRSI	Concrete Reinforcing Steel Institute
DEMA	Diesel Engineer Manufacturers Association
DIPRA	Ductile Iron Pipe Research Association
DOD	Department of Defense
FED Spec.	Federal Specification
FM	Factory Mutual
IEEE	Institute of Electrical & Electronics Engineers
IPCEA	Insulated Power Cable Engineer's Association
ISO	International Organization for Standardization
MIL -Spec	Military Specification (Department of Defense)
MTA	Metropolitan Transportation Association
NAVY Spec.	Navy Department Specification
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NIST	National Institute of Standards and Technology
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
NYCBC	New York City Building Code
NYCEC	New York City Electrical Code
NYCDOT	New York City Department of Transportation

TABLE 01 42 00-2
LIST OFACRONYMS
(Continued)

OSHA	Occupational Safety & Health Administration (U.S. Department of Labor)
PANYNJ	Port Authority of New York and New Jersey
PPS	Power Piping Society
SAE	Society of Automotive Engineers
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Steel Structures Painting Council
UL	Underwriters Laboratories, Inc.
UNS	Unified Numbering System of Alloys
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USEPA	Unites States Environmental Protection Agency

TABLE 01 42 00-3
STANDARDS DEVELOPING / PUBLISHING ORGANIZATIONS

AIR-CONDITIONING, HEATING, & REFRIGERATION INSTITUTE (AHRI) 2111 Wilson Blvd. Suite 500 Arlington, VA 22201 Phone: 703-524-8800 Fax: 703-562-1942 ahrinet.org	THE ALUMINUM ASSOCIATION (AA) 1400 Crystal Dr. Arlington, VA 22202 Phone: 703-358-2960 aluminum.org
AMERICANHORT 2130 Stella Ct. Columbus, OH 43215 Phone: 614-487-1117 americanhort.org	AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) 444 North Captial St., NW Suite 249 Washington, DC 20001 Phone: 202-624-5800 transportation.org
AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA) 330 N. Wabash Ave. Suite 2000 Chicago, IL 60611 Phone: 202-367-1155 americanbearings.org	AMERICAN BUREAU OF SHIPPING (ABS) ABS World Headquarters ABS Plaza 16855 Northchase Dr. Houston, TX 77060 Phone: 281-877-6000 Fax: 281-877-4976 eagle.org
AMERICAN CONCRETE INSTITUTE (ACI) 38800 Country Club Dr. Farmington Hills, MI 48331-3439 Phone: 248-848-3700 Fax: 248-848-3701 concrete.org	AMERICAN CONCRETE PIPE ASSOCIATION (ACPA) 8445 Freeport Pkwy. Suite 350 Irving, TX 75063 Phone: 972-506-7216 Fax: 972-506-7682 concretepipe.org
AMERICAN GALVALNIZERS ASSOCIATION (AGA) 6881 South Holly Cir. Suite 108 Centennial, CO 80112 Phone: 720-554-0900 Fax: 720-554-0909 galvanizeit.org	AMERICAN GAS ASSOCIATION (AGA) 400 North Capitol St., NW Suite 450 Washington, DC 20001 Phone 202-824-7000 aga.org

TABLE 01 42 00-3
STANDARDS DEVELOPING / PUBLISHING ORGANIZATIONS
(Continued)

AMERICAN GEAR MANUFACTURERS ASSOCIATION (AGMA) 1001 N. Fairfax St. Suite 500 Alexandria, VA 22314-1587 Phone: 703-684-0211 Fax: 703-684-0242 agma.org	AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC) 130 East Randolph St. Suite 2000 Chicago, IL 60601-2001 Phone: 866-275-2472 aisc.org
AMERICAN IRON AND STEEL INSTITUTE (AISI) 25 Massachusetts Ave., NW Suite 800 Washington, DC 2001 Phone 202-452-7100 steel.org	AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) 1899 L St., NW 11th Floor Washington, DC 20036 Phone: 202-293-8020 Fax: 202-293-9287 ansi.org
AMERICAN PETROLEUM INSTITUTE (API) 1220 L St., NW Washington, DC 20005-4070 Phone: 202-682-8000 api.org	AMERICAN SOCIETY OF HEATING, REFRIGERATING and AIR-CONDITIONING ENGINEERS (ASHRAE) 1791 Tullie Cir., NE Atlanta, GA 30329 Phone: 404-636-8400, 800-527-4723 Fax: 404-321-5478 ashrae.org
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) 2 Park Ave. New York, NY 10016-5990 Phone: 800-843-2763 asme.org	AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE) 18927 Hickory Creek Dr., Suite 220 Mokena, IL 60448 Phone: 708-995-3019 Fax: 708-479-6139 asse-plumbing.org
AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) P.O. Box C700 West Conshohocken, PA 19428-2959 Phone: 610-832-9500 Fax: 610-832-9555 astm.org	AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE) 1801 Alexander Bell Dr. Reston, VA 20190 Phone: 800-548-2723 asce.org

TABLE 01 42 00-3
STANDARDS DEVELOPING / PUBLISHING ORGANIZATIONS
(Continued)

AMERICAN WATER WORKS ASSOCIATION (AWWA) 6666 W. Quincy Ave. Denver, CO 80235 Phone: 303-794-7711, 800-926-7337 Fax: 303-347-0804 awwa.org	AMERICAN WELDING SOCIETY (AWS) 8669 NW 36 St. # 130 Miami, FL 33166-6672 Phone: 305-443-9353, 800-443-9353 awsnow.org
AMERICAN WOOD PROTECTION ASSOCIATION (AWPA) P.O. Box 361784 Birmingham, AL 35236-1784 Phone: 205-733-4077 Fax: 205-733-4075 Secure Fax: 205-733-4078 awpa.com	ASPHALT INSTITUTE (AI) 2696 Research Park Dr. Lexington, KY 40511-8480 Phone: 859-288-4960 Fax: 859-288-4999 asphaltinstitute.org
ASSOCIATION FOR IRON AND STEEL TECHNOLOGY (AIST) 186 Thorn Hill Rd. Warrendale, PA 15086-7528 Phone: 724-814-3000 Fax: 724-814-3001 aist.org	NEW YORK CITY DEPARTMENT OF BUILDINGS BUREAU OF ELCTRICAL CONTROL (BEC) 1 Centre Street Room 2324 New York, NY 10007 Phone 212-669-8338 buildingviolation.com/newyork.html
NEW YORK CITY BOARD OF STANDARDS AND APPEALS (BSA) 250 Broadway 29th Floor New York, NY 10007 Phone: 212-386-0009 www1.nyc.gov/site/bsa/index.page	THE BRICK INDUSTRY ASSOCIATION (BIA) 12007 Sunrise Valley Dr. Suite 430 Reston, VA 20191 Phone: 703-620-0010 gobrick.com
CALIFORNIA REDWOOD ASSOCIATION (CRA) 347 Healdsburg Ave. Suite L Healdsburg, CA 95448 calredwood.org	CAST IRON SOIL PIPE INSTITUTE (CISPI) 2401 Fieldcrest Dr. Mundelein, IL 60060 Phone: 224-864-2910 cispi.org

TABLE 01 42 00-3
STANDARDS DEVELOPING / PUBLISHING ORGANIZATIONS
(Continued)

THE CHLORINE INSTITUTE (CI) 1300 Wilson Blvd. Suite 525 Arlington, VA 22209 Phone: 703-894-4140 Fax: 709-894-4130 chlorineinstitute.org	CODE OF FEDERAL REGULATIONS (CFR) U.S. Government Publishing Office 732 N. Capitol St., NW Washington, DC 20401-0001 Phone: 202-512-1800, 866-512-1800 Fax: 202-512-210 ecfr.gov/cgi-bin/ECFR
COMPRESSED GAS ASSOCIATION (CGA) 14501 George Carter Way Suite 103 Chantilly, VA 20151 Phone: 703-788-2700 Fax: 703-961-1831 cganet.com	CONCRETE REINFORCING STEEL INSTITUTE (CRSI) 933 North Plum Grove Rd. Schaumburg, IL 60173-4758 Phone: 847-517-1200 Fax: 847-517-1206 crsi.org
CONVEYOR EQUIPMENT MANUFACTURERS ASSOIATION (CEMA) 5672 Strand Ct. Suite 2 Naples, FL 34110 Phone: 239514-3441 cemanet.org	U.S. ARMY CORPS OF ENGINEERS (USACE) Engineer Research and Development Center (Formerly Waterways Experiment Station) 3909 Halls Ferry Rd. Vicksburg, MS 39180-6199 Phone: 601-634-2355 erdc.usace.army.mil/Library/
DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA) P.O. Box 19206 Golden, CO 80402 Phone: 205-402-8700 dipra.org	FM APPROVALS 1151 Boston-Providence Turnpike P.O. Box 9102 Norwood, MA 02062 Phone: 781-762-4300 Fax: 781-762-9375 fmapprovals.com
GENERAL SSERVICES ADMINISTRATION FEDERAL SPECIFICATIONS (FS) 1800 F St., NW Washington, DC 20405-0001 Phone: 703-605-2566 Fax: 202-219-3004 fedspecs.gsa.gov/FedSpecs_Federal_Specifications_page	HYDRAULIC INSTITUTE (HI) 6 Campus Dr. Floor 1 North Parsippany, NJ 07054 Phone: 973-267-9700 Fax: 973-267-9055 pumps.org

TABLE 01 42 00-3
STANDARDS DEVELOPING / PUBLISHING ORGANIZATIONS
(Continued)

ILLUMINATING ENGINEERING SOCIETY (IES) 120 Wall St. 17th Floor New York, NY 10005-4001 Phone: 212-248-5000 Fax: 212-248-5017 ies.org	INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE) Phone: 800-701-4333 ieee.org
MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS) 127 Park St., NE Vienna, VA 22180-4602 Phone: 703-281-6613 msshq.org	METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA) 1300 Sumner Ave. Cleveland, OH 44115-2851 Phone: 216-241-7333 Fax: 216-241-0105 mbma.com
Materials and Equipment Acceptance (MEA) Division, New York City Department of Buildings 280 Broadway 7th Floor New York, NY 10007 Phone: 212-566-5000 www.nyc.gov	MILITARY SPECIFICATIONS (MIL-SPECs) DLA Document Services, Building 4/D 700 Robbins Ave. Philadelphia, PA 19111-5094 Phone: 215-737-8000 quicksearch.dla.mil
NATIONAL ASSOCAITION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM) 800 Roosevelt Rd. Building C, Suite 312 Glen Ellyn, IL 60137 Phone: 630-942-6591 Fax: 630-790-3095 naamm.org	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) 1300 N. 17th St. Suite 900 Arlington, VA 22209 Phone: 709-841-3200 nema.org
NATIONAL ELECTRICAL CODE (NEC or NFPA 70) See National Fire Protection Association	NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) 1 Batterymarch Pk. Quincy, MA 02169-7471 Phone: 800-344-3555 Fax: 800-593-6372 nfpa.org

TABLE 01 42 00-3
STANDARDS DEVELOPING / PUBLISHING ORGANIZATIONS
(Continued)

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST) 100 Bureau Dr. Stop 1070 Gaithersburg, MD 20899-1070 Phone: 301-975-2758 nist.gov	NATIONAL READY MIXED CONCRETE ASSOCIATION (NRMCA) 900 Spring St. Silver Spring, MD 20910 Phone: 240-485-1165 nrmca.org
NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA) 10255 W. Higgins Rd. Suite 600 Rosemont, IL 60018-5607 Phone: 847-299-9070 Fax: 847-299-1183 nrca.net	NATIONAL SANITATION FOUNDATION INTERNATIONAL (NSF) 789 N. Dixboro Rd. Ann Arbor, MI 48105 Phone: 734-769-8010, 800-673-6275 Fax: 734-769-0109 nsf.org
NEW YORK CITY DEPARTMENT OF BUILDINGS 2014 CONSTRUCTION CODES: BUILDING CODE 280 Broadway New York, NY 10007 Phone: 212-566-5000 www1.nyc.gov/site/buildings/codes/2014-construciton-codes.page#bldgs	NEW YORK CITY DEPARTMENT OF BUILDINGS 2011 ELECTRICAL CODE 280 Broadway New York, NY 10007 Phone: 212-566-5000 www1.nyc.gov/site/buildings/codes/electrical-code.page
U.S. DEPARTMENT OF LABOR – OCCUPATIONAL SAFETY AND HEALTH (OSHA) 200 Constitution Ave., NW Washington, DC 20210 Phone: 800-321-6742 OSHA.gov/law-regs.html	PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA) 800 Roosevelt Rd. Building C, Suite 312 Glen Ellyn, IL 60137 Phone: 630-858-6540 Fax: 630-790-3095 ppfahome.org
PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI) 200 W. Adams St. Suite 2100 Chicago, IL 60606 Phone: 312-786-0300 pci.org	PORCELAIN ENAMEL INSTITUTE (PEI) P.O. Box 920220 Norcross, GA 30010 Phone: 770-676-9366 Fax: 770-409-7280 porcelainenamel.com

TABLE 01 42 00-3
STANDARDS DEVELOPING / PUBLISHING ORGANIZATIONS
(Continued)

SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA) 4201 Lafayette Center Dr. Chantilly, VA 20151-1219 Phone: 703-803-2980 Fax: 703-803-3732 smacna.org	SOCIETY OF AUTOMOTIVE ENGINEERS (SAE) 400 Commonwealth Dr. Warrendale, PA 15096 Phone: 724-776-4841 Fax: 724-776-0790 sae.org
STEEL DECK INSTITUTE (SDI) P.O. Box 426 Glenshaw, PA 15116 Phone: 412-487-3325 Fax: 412-487-3326 sdi.org	STEEL DOOR INSTITUTE (SDO) 30200 Detroit Rd. Westlake, OH 44145 Phone: 440-899-0010 Fax: 440-892-1404 steeldoor.org
THE SOCIETY FOR PROTECTIVE COATINGS (SSPC) 800 Trumbull Dr. Pittsburgh, PA 15205 Phone: 877-281-7772 Fax: 412-444-3591 sspc.org	STEEL TANK INSTITUTE and STEEL PLATE FABRICATORS ASSOCIATION (STI/SPFA) 944 Donata Ct. Lake Zurich, IL 60047 Phone: 847-438-8265 steeltank.com
STEEL WINDOW INSTITUTE (SWI) 1300 Sumner Ave. Cleveland, OH 44115-2851 Phone: 216-241-7333 Fax: 216-241-0105 steelwindows.com	TILE COUNCIL OF NORTH AMERICA (TCNA) 100 Clemson Research Blvd. Anderson, SC 29625 Phone: 864-646-8453 Fax: 864-646-2821 tcnatile.com
UNDERWRITERS LABORATORIES (UL) 333 Pfingstem Rd. Northbrook, IL 60062 Phone: 847-272-8800 Fax: 847-509-6249 ul.com	WESTERN WOOD PRODUCTS ASSOCIATION (WWPA) 1500 SW 1st Ave. Suite 870 Portland, OR 97201 Phone: 503-224-3930 Fax: 503-224-3934 wwpa.org

SECTION 01 43 05 – CONTRACTOR'S WORK QUALITY
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Contractor's Quality Assurance / Quality Control Management Plan
2. Defective Work, Equipment or Materials
3. Welding Certification and Welding Inspection
4. Inspection and Testing of Concrete
5. Leakage Tests
6. Contractor's Surveyor

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 43 10 – Quality Assurance Inspection

B. Section 01 43 15 – Witness Shop Testing

1.04 REFERENCES

A. AWS – D1.X American Welding Society

B. ASME American Society of Mechanical Engineers

C. NYS Steel Construction Manual

1.05 DESCRIPTION

A. Contractor Quality Assurance / Quality Control Plan

1. The Contractor shall establish, execute and submit to the engineer a Quality Assurance / Quality Control (QA/QC) Management plan for the services and equipment which will be supplied under this Contract. The plan shall provide the Contractor with adequate measures for verification and conformance to defined requirements by its personnel and all subcontractors, fabricators, suppliers, and vendors.

2. The Contractor shall provide a suitable space for the Engineer and the Engineer's authorized representatives conveniently located near that part of each plant where materials or equipment to be furnished under this Contract are being manufactured, assembled, or shop tested. Each space shall be furnished with facilities for the making and keeping of records and correspondence. The reasonable use of a photocopier, telephone, and email shall be provided, as required by the Engineer.

B. Defective Work, Equipment or Materials

1. Any defective or imperfect Work, equipment, or materials furnished by the Contractor which is discovered before the Final Acceptance of the Work, or during the warranty period, shall be removed immediately even though it may have been overlooked by the Engineer and approved for payment. The Contractor shall repair such defect, without compensation, in a manner satisfactory to the Engineer.

2. Unsuitable materials and equipment may be rejected, notwithstanding that such defective Work, materials and equipment may have been previously overlooked by the Engineer and accepted or approved for payment.

3. If any workmanship, materials or equipment shall be rejected by the Engineer as unsuitable or not in conformity with the Specifications or Contract Drawings, the Contractor shall promptly replace such materials and equipment with acceptable materials and equipment at no additional cost to the City. Equipment or materials rejected by the Engineer shall be tagged as such and shall be immediately removed from the Site.

4. The Engineer may order tests of imperfect or damaged Work equipment, or materials to determine the required functional capability for possible acceptance, if there is no other reason for rejection. The cost of such tests shall be borne by the Contractor, and the nature, tester, extent and supervision of the tests will be as determined by the Engineer. If the results of the tests indicate that the required functional capability of the Work, equipment, or material was not impaired, the Work, equipment or materials may be deemed acceptable, in the discretion of the Engineer. If the results of such tests reveal that the required functional capability of the questionable Work, equipment or materials has been impaired, then such Work, equipment or materials shall be deemed imperfect and shall be replaced. The Contractor may elect to replace the imperfect Work, equipment or material in lieu of performing the tests.

5. If, in the making of any test, it is ascertained by the Commissioner that the material or equipment does not comply with the Contract, the Contractor will be notified thereof, and it will be directed to refrain from delivering said material or equipment, or to promptly remove it from the site or from the Work and replace it with acceptable material at no additional cost to the City. Upon rejection of any material or equipment submitted as the equivalent of that specifically named in the Contract, the Contractor shall immediately proceed to furnish the named material or equipment.

6. All welding must conform to the requirements of AWS D1.X, ASME Code or New York State Steel Construction manual as applicable and as approved by the engineer. For work performed within NYC limits, all field welding required under this Contract shall be performed by New York City certified welders in accordance with the latest provisions of the New York City Building Code. Additional certification requirements are as follows:

    a. Certification for Welding – For all field- and shop-welding, the following welding qualification provisions shall apply:

        1) For all field welding, all required permits and safety plans shall be in place and adhered to.

        2) All shop welding shall be performed in accordance with the relevant work-specific requirements in the Specifications and Contract Drawings.

        3) If existing certification is not approved or not submitted, then the welders/welding shop/tack welders must be qualified in accordance with the above procedures and tests, as administered by an inspection agency approved by the Engineer. All costs associated with the required tests for certification and/or retests, if any, shall be borne by the Contractor. The Quality Assurance Section shall be given a notice of not less than 5 business days prior to such tests and may elect to witness any or all of these tests.

4) Any deviation from the above shall not be permitted without a written waiver from the Engineer or the Engineer's designee.

b. Welding inspection in New York City shall be in accordance with the latest rules of the New York City Building Code. Additionally, for welding inspection in New York City and outside of City limits the following shall apply:

c. All welds shall be inspected visually by the engineer in accordance with Section V of the ASME Code, or D1.1, Clause 6, Table 6.1 as approved by the engineer.

C. Inspection and Testing of Concrete

1. Inspection and testing of concrete shall be in accordance with the relevant work-specific requirements in the Contract.

D. Leakage Tests

1. All new pipelines and appurtenant structures and all new liquid containing structures shall be field tested for leakage after installation in accordance with the relevant work-specific requirement in the Contract.

E. Contractor's Surveyor

1. The Contractor shall retain the services of a licensed land surveyor, registered in the State of New York, to perform survey work including but not limited to establishing line and grade required for the Work, in advance of the construction; and to perform other surveying services for the Work. The surveyor shall be subject to the approval of the Commissioner. Survey drawings shall be submitted to the Engineer for approval.

2. The Contractor shall field verify all existing survey monuments including benchmarks within the area of the Work. All existing survey monuments and benchmarks shall be protected from damage during the performance of the Work. If any damage occurs to existing survey monuments or benchmarks, the Contractor shall notify the Engineer, survey, and replace in kind.

3. The Contractor shall furnish, install and maintain survey platforms, targets, benchmarks, stakes, monuments and similar facilities to be used by the Contractor in its performance of the Work and by the Engineer in the performance of its inspection services.

4. The Contractor shall perform all survey Work required before, during and after the construction Work; and shall re-establish same if disturbed and bear the entire expense of rectifying work improperly installed due to not maintaining, not protecting, or removing without authorization such established platforms, targets, benchmarks, stakes, and monuments.

5. The Engineer shall be notified before the establishment of any line, elevation or grade.

6. Survey Before Completion of Structure.

   a. The Contractor shall file with the New York City Department of Buildings in the borough where Work is being done, or with the New York City Department of Small Business Services, or the local AHJ, a survey by a licensed surveyor showing the location of the new structure before completion of the structure, pursuant to Section 28.118.4 of the New York City Building Code or applicable local codes or regulations for projects outside New York City. One copy of the application and the survey shall be furnished to the Engineer.

   b. This survey shall show the location of the structure, the elevation of the first tier of beams or of the first floor, the finished grades of the open spaces on the plot, the established curb level, and the location of all other structures on the plot, together with the location and boundaries of the lot or plot upon which the structure is constructed.

1.06 QUALITY ASSURANCE

A. A Quality Management Plan must be submitted for review and approval.

1.07 SUBMITTALS

A. Quality Assurance / Quality Control Management Plan

1. Within 15 days after the commencement work date given in the Notice to Proceed (NTP), the Contractor shall provide its QA/QC management plan to the Engineer for approval. The Engineer's review and acceptance of the Contractor's QA/QC plan shall not relieve the Contractor from any of its obligation to perform the Work.

2. Inspection of the Work by the Engineer is made solely for the benefit of the City. The inspection of the Work shall not relieve the Contractor of any of its obligations to fulfill the Contract as herein prescribed, and defective Work shall be repaired or replaced at the Contractor's sole expense. The Contractor's assigned QA/QC personnel are subject to the Engineer's review and continued acceptance. No Work covered by the QA/QC plan shall start until the Engineer's written acceptance of the Contractor's QA/QC plan has been obtained.

3. The QA/QC plan should consist of the following quality elements:

   a. Roles and Responsibilities, communication protocols

   b. Management and Production Inspections

   c. Off-Site Supplier Quality

   d. Vendor Capability Inspections

   e. Notification and Coordination with DEP

   f. Inspection Instructions

   g. Traceability

h. Pre-Activity Meeting
i. Initial Inspections
j. Witness Shop Testing and QA Inspections

B. QA Acceptance / Shipping / Material Marking and Identification
1. On-Site Receiving and Materials / Equipment Control
2. Material / Equipment Receiving
3. CMTRs / Certificate of Compliance
4. Traceability
5. On-Site Storage, Care, and Maintenance
6. QA/QC Process and Operational Procedures
7. Submittal Management
8. Request for Information (RFI)

C. Five-Phases of Inspection Procedures
1. Phase 1 – Client Pre-Activity Meeting
2. Phase 2 – Initial Inspections
3. Phase 3 – On-Going Inspections
4. Phase 4 – Witness Shop Test Inspection and QA Inspections
5. Phase 5 – Final Inspections – Punch lists

D. Inspection and Test Plan (ITP)
1. 1. Build Work Plan Procedure
2. Checklist and Hold Point Procedure
3. Witness and Hold Points
4. Control of Measuring and Calibrated Test Equipment Procedure
5. Reporting and control non-conforming work

E. Control and Responsibility
1. Non-Conformance Reporting (NCR) Disposition
2. QC Verification
3. Documentation

F. Root Cause Analysis (RCA) Process
1. Thresholds for RCA
2. Process
3. Preventive Action Plan

4. Implementation
5. Measurement of Effectiveness

G. Continuous Improvement
1. Recognition and Accountability
2. Measurement and Monitoring
3. Performance and Issues Matrix
4. Management Reviews
5. Audit and Assessments

H. Welding Control
1. Full Compliance with Specifications and Applicable Codes

I. Additional Submittals
1. When requested by the Engineer, the Contractor shall submit the following information prior to entering into a supply or service contract.
a. Contract number, supplies or services to be provided and a general description of the proposed item(s), such as trade name, type, etc. The name and address of the manufacturer or Service Company and the location of the plant at which supplies will be manufactured and tested as required, or at which the services will be performed.
b. Experimental and test data required to support the claimed performance of the supplies.
c. A description of the testing plant, including the hydraulic, electrical and other facilities, in sufficient detail to show that the plant is adequately equipped for performing the tests, if such testing is required.
d. Any additional information that the Engineer may deem necessary in order to determine the ability of the supply or service company to produce the item as called for by the Specifications.

1.08 DELIVERY, STORAGE, AND HANDLING

A. All materials and equipment must be received, stored in a safe and adequate environment as per approved procedures.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. All Work of assembly, installation, and construction shall be done in a neat, first class, and workman like manner. Material, fixtures, fittings, supplies, equipment or Work required by the Contract Drawings that does not agree with the Specifications will not be accepted, and the Contractor shall supply the required quality. In asking for prices on, or placing orders for, materials, fixtures, fittings, supplies, and equipment intended for use or installation under this Contract, the Contractor shall provide the manufacturer or dealer with such complete information from these Specifications as may in any case be necessary. In every case, the Contractor shall quote in full to each such manufacturer or dealer the text of this subparagraph, as well as the text of such other portions of the contract, as are appropriate.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Notice of Intent to Commence Manufacture

1. The Contractor shall give notice in writing to the Commissioner sufficiently in advance of its intention to commence the manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction as detailed in Section 01 43 10 – Quality Assurance Inspection and Section 01 43 15 – Witness Shop Testing. Such notice shall contain a request for inspection, the date of commencement and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, the Commissioner will: arrange to have a representative present at such times during the manufacture as may be necessary to inspect the materials; or notify the Contractor that the inspection will be made at a point other than the point of manufacture; or notify the Contractor that inspection will be waived.

2. In those instances, where the DEP inspector(s) arrive at the agreed-upon location, at the agreed-upon date and time, and find that the article(s) to be inspected are not ready for inspection, the inspector(s) shall return to their home office and all expenses incurred shall be borne by the Contractor and

shall be deducted from the Contractor's next payment, unless otherwise determined by DEP.

B. Field Measurements

1. The Contractor shall take all necessary measurements in the field to determine the exact dimensions for all Work and verify all pertinent data and dimensions shown on the Contract Drawings.

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. All materials and equipment must be protected and wrapped during transport, storage, and post installation.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 43 10 – QUALITY ASSURANCE INSPECTION
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:

1. Quality Assurance Inspection

2. Inspection Expenses

B. The following index of this Section is presented for convenience:

C.

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 43 05 - Contractor's Work Quality

B. Section 01 31 25 - Web-Based Project Management Information System

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. List of Equipment Subject to Quality Assurance (QA) Inspection

1. DEP's Bureau of Engineering Design and Construction, Quality Assurance Section intends to perform QA inspection for specific items being supplied under this Contract.

2. The selected equipment is subject to QA inspection by the Quality Assurance Section during any or all stages of manufacture. The Contractor shall adhere to the QA inspection requirements indicated in the respective Specifications for the items designated for QA inspection. The related Specifications for each item furnishes specific inspection requirements for that item.

3. See Table 1 - List of Equipment Scheduled for Quality Assurance Inspection, attached at the end of this Section.

B. QA Inspection of Contract Items

1. The City may, as deemed necessary, perform QA inspection of any items that have not been designated as such in the Contract. The City also may remove items from the list of items designated for inspection, at its discretion.

2. The Engineer may require, at their discretion, inspection of any item required by the Contract at any stage of manufacture, assembly, inspection or testing. Inspection or shop witness testing may be required even when not explicitly requested in the Contract Documents. The Engineer shall have access at all times, while work under this Contract is being performed, to all parts of the Contractor's or manufacturers' plants or other locations where the equipment, materials, fittings, supplies or any other articles required under this Contract are manufactured, assembled, tested, or inspected; and the Engineer shall be permitted to witness any or all of these operations as they may deem necessary to determine that all work is being performed in accordance with the Contract specifications and the approved shop drawings.

3. In the event that the City chooses to perform QA inspection of any items in the Contract, the City will issue a notice to the Contractor that identifies the items and provides direction to the Contractor to facilitate the inspections. This notice will be followed by formal inspection instructions for the QA inspection of each item.

4. For all equipment, the Contractor shall be subject to all requirements described for the manufacture of equipment in the Contract. Regardless of the level of QA inspection activities required by the City, the Contractor

shall be responsible to submit, at a minimum, all documentation and samples that are required in the applicable Specification.

C. Requirements for Inspection of Equipment Designated for QA Inspection by the City

1. The Contractor is responsible for facilitating the inspection process and shall coordinate the same by contacting the Chief of the Quality Assurance, DEP Bureau of Engineering Design and Construction.

2. For items designated for QA inspection, the following statement shall appear on the face of purchase orders and shop drawings issued by the Contractor for work to be incorporated in this Contract. The Contractor shall also instruct the approved manufacturers or dealers to place this statement on purchase orders and shop drawings issued by them for such work.

D. *"This order is subject to inspection by the Bureau of Engineering Design and Construction of the Department of Environmental Protection of The City of New York and shall not be processed until inspection instructions have been issued by the Engineer. Please contact the Chief of Quality Assurance, DEP Bureau of Engineering Design and Construction, 96-05 Horace Harding Expressway, Corona, New York 11368. 718-595-3000"*

1. For items designated for QA inspection, the Contractor shall submit each purchase order to the Engineer when placed with the manufacturer or dealer. Submittals of preliminary/initial shop drawings, with detailed assembly drawings and bill of materials, shall be provided to the Quality Assurance Section as soon as they are available, or have been sent to the Engineer for review. Upon receipt of the purchase order and shop drawings, the Quality Assurance Section will issue inspection instructions to the Contractor (a copy of which will also be sent to the manufacturer/supplier.)

2. For items designated for QA inspection, the Contractor shall not proceed with the work until the inspection instructions have been issued. Once the receipt of the inspection instructions has been acknowledged and verified, the Contractor shall provide advance notice of readiness for inspection at the required witness points. Advanced notice shall be provided in accordance with Article 3.02D. The inspection instructions will indicate what specific phases of manufacture, QA inspections, and/or tests that the Quality Assurance Section inspectors intend to witness.

3. The Contractor shall provide Quality Assurance Section with the approved shop drawings as soon as possible after receiving approval from the Engineer. The Quality Assurance Section reserves the right to issue revisions/clarifications to the original inspection instructions based on the approved drawings, and/or as deemed necessary.

4. The requirements for inspection are in addition to and separate from any specified witness shop testing and shall in no way affect procedures or requirements with respect to the same.

5. The Engineer may reject any item or material if manufactured prior to inspection or where the requirements specified in the inspection instructions are not followed.

E. Selection of Inspection Agencies

1. The Engineer will select and designate all persons, firms or corporations to make or witness each and every and all inspections, tests or analyses, with or without reports unless indicated otherwise in the Specifications.

2. If a retest is required, the cost shall be borne by the Contractor.

3. When Quality Inspections are waived by the Engineer, the manufacturer's data and the interpreted results thereof, accompanied by a certificate of authenticity sworn to by a responsible official of the manufacturing company, shall be submitted to the Engineer for approval.

4. All equipment and material shall be identified with serial numbers and/or approved permanent type identification marks.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Certified Material Test Reports

1. When no direct test, inspection, or analysis of materials, products or equipment is required to be performed at the point of manufacture, and when the Commissioner so requires, the Contractor shall furnish authoritative evidence in the form of Certified Material Test Reports (CMTRs) that the materials, products, or equipment to be used in the Work have been manufactured and tested in conformity with the applicable material specification. The CMTRs shall indicate the results of physical tests and chemical analyses made directly on the same heat or heats from which any and all materials are furnished under this Contract. The costs of furnishing CMTRs and the results of tests or analyses shall be borne by the Contractor and shall be deemed to be included in the overall price bid for the Contract.

2. When materials or manufactured products comprise such small quantities that it is not practicable to make physical tests or chemical analyses directly on the materials or products furnished, a certificate stating the results of such tests or analyses of similar materials or products which were concurrently produced may, at the discretion of the Commissioner, be considered as the basis for the acceptance of such materials or manufactured products Delivery, Storage, and Handling

B. Submittal of Samples of Materials for Testing

1. When required or requested by the Engineer, specified samples of materials, equipment, and appliances, identified in a manner acceptable to the Engineer shall be submitted by the Contractor for approval by the Engineer. The samples shall be submitted sufficiently in advance of the time when the materials are to be used so that rejections thereof will not delay the approved construction schedules. Approved samples will be labeled and dated.

2. As directed and specified below, the Contractor shall be required to furnish and deliver to the DEP Bureau of Engineering Design and Construction Quality Assurance Chemical Laboratory located at 96-05 Horace Harding Expressway, Corona, New York 11368-5107, or any other designated location, samples of metals from vendor's plants engaged in the manufacture of mechanical equipment and structural components.

3. A minimum of two (2) un-machined material samples of sufficient size shall be supplied from each material heat lot for the components identified as requiring samples for independent verification of both chemical and physical test results. Material samples shall be provided in accordance with the applicable material specifications (ASTM, etc.) and shall be provided with unique product markings in the form of a stamped-on heat number, etc. that is traceable to the applicable CMTR.

4. Samples shall be taken in the presence of the Engineer and at the location point determined by the Engineer, from material, equipment, or appliances at the work-site or at the manufacturing or testing facilities of the Contractor's vendors or sub-vendors during the normal eight-hour shift, unless otherwise approved.

5. Approved samples will be retained for record purposes at a location designated by the Engineer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. All materials & equipment must be received, stored in a safe & adequate environment as per approved procedures

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Contractor to Maintain Traceability during Stages of Fabrication and Testing

1. The Contractor shall be responsible to maintain traceability of most equipment components such as castings, structural members, plate, forgings, piping, machining, etc., and all other articles required under this Contract during all stages of fabrication and testing.

B. Contractor Responsible for all Tests

1. The chemical and physical tests, including the optional tests, called for in the ASTM, federal and other specifications cited in this Contract shall be made as specified, unless otherwise approved.

C. Testing Compliance

1. Contractor's testing personnel shall make the necessary inspections and tests.

2. The reports thereof shall be in such form as will facilitate checking to determine compliance with the Specifications and shall indicate all the analyses and/or test data and interpreted results thereof.

D. Contractor to Provide Engineer with Advance Notice of Sampling and Testing

1. The Engineer shall be informed in advance of all times of sampling and testing, and shall witness these operations if the Engineer so desires.

2. A minimum notice of two (2) weeks shall be provided for items of domestic manufacture and eight (8) weeks for items of foreign manufacture.

E. Testing Performed in Engineer's Presence

1. When requested or specified, testing and examinations of all kinds and any weighing required under this Contract shall be done in the presence of the Engineer unless otherwise approved.

2. Testing shall be scheduled during the normal eight (8) hour day shift with adequate advance notice of intent to schedule tests shall be given to the Engineer.

F. Contractor to Provide Engineer with Calibrated Instruments

1. The Contractor shall provide, for use by the Engineer, all measuring devices, instruments, and other appliances that the Engineer may deem necessary to carry out the designated inspection of the work. All such instruments and devices shall be calibrated, as per manufacturer's instructions, and shall bear the calibration marks, stamps, or seals of an approved testing body or agency with reference standards traceable to those held by the National Institute of Standards and Technology, or other approved standard. The Contractor shall maintain all instruments and devices in good working order and shall recalibrate them when so directed by the Engineer. The cost, if any, of providing and maintaining such equipment shall be considered part of the normal expense of conducting business and therefore non-reimbursable.

G. Contractor to Provide Utilities, Equipment, and Services to Assist Testing

1. Electric power, instruments, gages, threaded fasteners, bulkheads, blind flanges, gaskets, piping, equipment, materials, tools, other appurtenances, services necessary for the various specified shop and field tests, scales for weighing, and assistance for measuring or weighing any of the materials shall be provided by the Contractor.

H. Contractor's Responsibility for Testing Laboratory

1. The Contractor shall provide the services of approved testing laboratories to perform such physical and chemical tests and such examinations as required, if the manufacturer's testing facilities are not approved. In such a case, the Contractor shall provide and prepare test specimens and promptly submit reports of all tests.

I. Contractor's Responsibility for Schedule Reports

1. The Engineer shall be provided with detailed daily and weekly schedules of manufacturing plant operations pertaining to Work, sufficiently in advance of such operations, so that adequate preparation can be made for inspecting the Work. The sequence of operations for the complete manufacturing process as well as periodic production status reports shall also be provided. Any Work performed without such sufficient advance notice to the Engineer is subject to rejection.

J. Approval of Work Subject to Contractor's Inspection Reports

1. Completion of all requests for the approval of completed Work shall be accompanied by the Contractor's own inspection report of such Work, submitted on the form or forms previously approved and with the applicable approved shop drawings. Any equipment part which has been manufactured and/or assembled using uninspected or unapproved parts or materials shall be disassembled, as ordered by the Engineer, in order that it

may determine the acceptability of such parts or materials by means of any tests or examinations it may require. The cost of such ordered disassembly and subsequent reassembly shall be borne by the Contractor.

K. Approval of Inspection Activities prior to Shipping

1. Upon completion of the designated QA inspection activities at the facility where the inspection has occurred, the Contractor shall obtain from the Engineer a formal release from inspection indicating that no further inspection is required prior to shipping.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. All materials and equipment must be protected & wrapped during transport, storage & post installation.

END OF SECTION

Appendix

TABLE 1
LIST OF EQUIPMENT SCHEDULED FOR QA INSPECTION

Specification Reference		Equipment Scheduled for QA Inspection
Section No.	Section Title	
05 05 23.02	Miscellaneous Metal Fastenings	Metal Fasteners
05 12 00	Structural Steel Framing	Structural Steel Framing
05 21 00	Steel Joist Framing	Steel Joist Framing
05 31 23	Steel Roof Decking	Steel Roof Decking
05 50 00	Metal Fabrications	Metal Fabrications
05 51 00	Metal Stairs	Metal Stairs
05 52 13.07	Aluminum Pipe Railings	Aluminum Pipe Railings
05 53 01.03	Aluminum Floor Gratings	Aluminum Floor Gratings
05 59 16	Fabricated Metal Access Hatches	Fabricated Metal Access Hatches
06 51 05	Pultruded FRP Structural Shapes	Pultruded FRP Structural Shapes
06 74 13	Pultruded FRP Gratings and Plates	Pultruded FRP Gratings and Plates
06 74 20	Fiberglass Ladders	Fiberglass Ladders
06 81 13	Glass-Fiber-Reinforced Plastic Railings	Glass-Fiber-Reinforced Plastic Railings
23 31 14	Metal Ducts and Accessories	Metal Ducts and Accessories
31 62 23.13	Concrete-filled Steel Piles	Concrete-filled Steel Piles
40 05 06	Couplings, Adapters, and Specials for Process Piping	Couplings, Adapters, and Specials
40 05 07	Hangers and Supports for Process Piping	Hangers and Supports for Process Piping
40 05 19	Ductile Iron Process Pipe	Ductile Iron Process Pipe
40 05 53	Process Valves Four-Inch Diameter and Larger	Process Valves Four-Inch Diameter and Larger
41 22 23.19	Monorail Hoists	Monorail Hoists
43 23 31.03	Vertical Centrifugal Pumping Units (Wet Pit Sump Service)	Vertical Centrifugal Pumping Units (Wet Pit Sump Service)
43 26 13	Submersible Grinder Pump	Submersible Grinder Pump
43 33 44	Peristaltic Hose Pumping Units	Peristaltic Hose Pumping Units
43 33 54	Peristaltic Tube Pumping Units	Peristaltic Tube Pumping Units
43 41 45	Fiberglass-Reinforced Plastic Tanks	Fiberglass-Reinforced Plastic Tanks
43 41 45.01	Modifications to Fiberglass-Reinforced Plastic	Side Manways

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified, and required, to perform all Witness Shop Tests. The Contractor shall be responsible for all expenses for scheduled Witness Shop Testing.

B. The following index of this Section is presented for convenience:

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C. The following schedule, attached after the End of Section designation, is a part of this Section:

1. Schedule 01 43 15–1, Witness Shop Test Schedule.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 43 10 – Quality Assurance Inspection

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. All equipment listed in Schedule 01 43 15-1, Witness Shop Test Schedule, located after the End of Section designation, shall undergo witness shop testing as specified.

B. Witness Shop Testing of Additional Items: The City reserves the right to require Witness Shop Tests for additional items that are not listed in Schedule 01 43 15-1 or designated as requiring Witness Shop Tests in the Contract Documents.

1. When additional Witness Shop Tests are required by the Engineer, any additional costs resulting therefrom shall be paid either:

a. Out of a specified allowance, or

b. By change order procedure.

C. Advance Notice for Witness Shop Testing:

1. The Contractor shall notify the Engineer in advance of all scheduled witness shop tests as follows:

a. Sixty consecutive calendar days (60 ccd) in advance for witness shop tests in the continental United States.

b. Ninety consecutive calendar days (90 ccd) in advance for witness shop tests outside the continental United States.

2. The Contractor's advance notification shall include, at a minimum, the following information, which will be submitted to the Engineer for approval as specified herein:

a. A diagram of the proposed testing arrangement.

b. A description of the proposed manufacturer's inspection and testing facilities and procedures.

c. A list of all instruments the manufacturer proposes to use for the tests with initial and last calibration reports certified by an approved independent testing laboratory. (All instruments shall be of ranges suitable for the quantities to be measured.)

d. Sample test data sheets.

e. Sample calculations.

f. Descriptive matter on the testing equipment which shall contain illustrative photographs, drawings, and such other matter as may be requested by the Engineer.

g. The approved Shop Drawing(s) for installation of the equipment to be tested shall be listed in the Contractor's notice and made available to Agency representatives during witness shop testing.

D. Should the equipment or instrumentation not be ready, as per prior submitted approved data, the witnesses shall return to the home office at Contractor's expense. The cost of the additional trip will be borne by the Contractor.

E. Witness Shop Testing Attendee Requirements:

1. Contractor: A duly authorized representative of the Contractor shall be present during each witness shop test.

2. Engineer: When Schedule 01 43 15-1 and/or the Engineer require witness shop tests for equipment, the only tests which will be accepted are those made in the presence of the Engineer or the Engineer's representative.

F. Witness Shop Test Facility: Each piece of equipment for which pressure, duty, capacity, rating, efficiency, performance, function, or special requirements are specified, shall be tested in an approved facility in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents.

G. Tests shall be conducted in accordance with the test codes of the ASME and the IEEE.

H. Witness Shop Test Results:

1. The results of the shop tests shall be considered official and conclusive for the purpose of determining whether or not the equipment is in accordance with the performance requirements as specified.

2. No such equipment shall be shipped to the work site until the Engineer notifies the Contractor in writing that the results of the Witness Shop Test(s) are acceptable.

I. Certificate of Authenticity:

1. Inspection and shop test data and interpreted results thereof accompanied by a certificate of authenticity sworn to, before a notary, by an officer of the manufacturing company, shall be forwarded to the Engineer for review and approval as required.

2. When witness shop tests are waived by the Engineer, the manufacturer's actual test data and the interpreted results thereof, accompanied by a certificate of authenticity sworn to by a responsible official of the manufacturing company, shall be submitted to the Engineer for approval.

J. Serial Numbers: All equipment and material to be Witness Shop Tested shall be identified with serial numbers and/or approved permanent type identification marks.

K. Expenses:

1. Witness Shop Testing:

a. For the equipment to be witness shop tested, whether of foreign or domestic manufacture, the Contractor shall be responsible for the costs for a minimum of two (2) representatives of the Engineer or the Agency, including all transportation, food, lodging, and miscellaneous expenses for each witness shop test.

1) Refer to the corresponding specification section(s) listed in Schedule 01 43 15-1 for additional requirements.

b. The Contractor shall make all required travel and lodging arrangements that shall be in accordance with the New York City Comptroller's Office Directive No. 6 or a later or equivalent City document. All arrangements shall be submitted for approval of the Engineer.

2. The duration of each witness shop test shall be as required for conducting all specified performance tests, as determined by the Agency.

3. Retesting:

a. If a retest is required, the entire retest cost of the retest shall be borne by the Contractor.

1.06 QUALITY ASSURANCE

A. Unless otherwise approved by the Engineer, all Witness Shop Tests for equipment shall take place at the point of manufacture and/or origin.

B. Witness shop testing of equipment shall be performed in accordance with:

1. The procedures described herein, and

2. The Witness Shop Test requirements of the Specification Section(s) referenced in Schedule 01 43 15-1, Witness Shop Test Schedule, located after the End of Section designation.

C. Where applicable, prior to the witness shop testing, the Contractor shall ensure that the equipment to be witness shop tested have met the requirements and approved by the Engineer as specified in Section 01 43 10 – Quality Assurance Inspection.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents.

B. In addition, for each item of equipment listed in Section 01 43 15-1, Witness Shop Test Schedule, located after the End of Section designation, the Contractor shall submit the following:

1. Action Submittals:

a. Advance notice for each item, as specified herein.

b. Test Report Documents: Submit two (2) copies of a detailed Witness Shop Test performance test report, including but not limited to the followings documents:

1) Copy of the Witness Shop Test procedure.

2) Final diagram of the testing arrangement.

3) Copies of the raw test data sheets.

4) Copies of the tabulated test data work sheets.

5) Copies of the instrumentation calibration certificates.

6) Calculations.

7) Characteristic curves, for graphical representation of the performance test data.

8) Copies of the photos taken during the test.

9) Certification of authenticity by the Manufacturer, as specified herein.

10) Non-editable electronic (e.g., PDF) copy of the complete report including all supporting documents.

11) Additional information necessary for evaluating performance of the equipment against the requirements of the Contract Documents.

C. Refer to the individual Specification Section(s) referenced in Schedule 01 43 15-1 for additional submittal requirements regarding Witness Shop Testing.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 APPLICATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SCHEDULE 01 43 15–1
WITNESS SHOP TEST SCHEDULE

Specification Reference:		**Equipment Scheduled for Witness Shop Testing:**
Section No.	**Section Title:**	
40 80 81	PMCS Factory Testing	PLC Control Panels
43 41 45	Fiber-Reinforced Plastic Tanks	Fiber-Reinforced Plastic Tanks

SECTION 01 43 20 – APPROVAL OF PRODUCT MANUFACTURERS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the requirements for the use of Product Manufacturers of materials and equipment and the substitution requirements for the use of equivalent materials and equipment.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. A “Named Manufacturer” is defined as a company cited by name in a Specification Section that manufactures, fabricates, assembles, and/or integrates materials,

fixtures, equipment, appliances, or other fittings. Named Manufacturer does not mean a distributor, sales representative, and/or supplier.

1.05 DESCRIPTION

A. Approval of Manufacturers (General)

1. All transactions with manufacturers shall be through the Contractor.

2. Similar materials and equipment of one and the same kind, type or classification that are used for identical purposes shall be made by the same manufacturer, except that multiple manufacturers may be approved for commodity items including, but not limited to, such items as concrete, conduit and cable, at the discretion of the Engineer.

3. Approval of a proposed manufacturer is conditional upon compliance with the Contract Documents as determined by the Engineer during the subsequent review of the Contractor's submitted Shop Drawings.

4. Unless otherwise approved by the Engineer, the Contractor shall be granted approval for one manufacturer per item.

5. For items of significant import or requiring specialized manufacturing, the Engineer may deny approval based on a determination that the proposed manufacturer:

a. Does not have a plant of sufficient capacity with a production force and plant facilities of the type and size suitable to produce the specified equipment or material required;

b. Does not have an operating quality control department with an experienced and qualified staff;

c. Has not successfully produced similar equipment or materials for at least three (3) years; or

d. Has previously failed to adhere to product specifications, scheduling, delivery requirements, or warranty obligations in connection with City contracts and projects.

B. List of Named Manufacturers in the Bid Booklet

1. The bidder shall indicate on the form in the Bid Booklet (when included) entitled "LIST OF EQUIPMENT/MATERIAL MANUFACTURERS," which manufacturer the bidder intends to use for each item of equipment or material listed on that form, by either:

a. Writing in one of the Named Manufacturers specified in the Specifications for that equipment or material, in which case the indicated Named Manufacturer is not subject to approval by DEP and shall be utilized for that item as part of the Work of the Contract; or

b. As an alternative to selecting a Named Manufacturer, a proposed "or equal" may be submitted for any of the items.

The proposed "or equal(s)" must be indicated in the designated column on the form. The submittal of more than one manufacturer for each item of equipment/material will not be permitted. No other requests for substitutions for these items may be submitted during the Work of the Contract, unless otherwise approved by the Engineer.

c. The bidder shall certify its selection of manufacturers by signing the List of Equipment/Material Manufacturers form.

2. The procedure for review by the Engineer for the "or equal" items proposed with a bid on the List of Equipment/Material Manufacturers form shall be as follows:

a. Within 14 days following bid opening, the apparent low bidder shall submit sufficient information to substantiate that the item proposed is the equivalent of that of the Named Manufacturer.

b. Wherever:

1) Information substantiating the request for approval of a substitution is not submitted within said 14-day period, or

2) The submission in support of proposed "or equal" material or equipment has been judged to be unacceptable by the Engineer, then the bidder (if awarded the Contract) shall provide the material or equipment of a Named Manufacturer as specified in the Contract Documents and must submit, within seven calendar days after notice, a revised List of Equipment/Material Manufacturers form identifying the manufacturer of the material or equipment to be provided. If the Contractor fails to timely make this submission, the award may be rescinded and the bid rejected as non-responsive

c. No Shop Drawing submittals shall be made for a proposed "or equal" item prior to approval of List of Equipment/Material Manufacturers form.

C. Named Product Manufacturers Not on the List in the Bid Booklet

1. Whenever materials or equipment not included on the Bid Booklet List of Equipment/Material Manufacturers are indicated in the Contract Documents by referring to a particular Named Manufacturer, the naming is intended to establish the type, function, and quality required. Unless the Contract specifies an item as "Brand Name Only" with no substitution of any "approved equal" allowed, then materials or equipment of other manufacturers may be approved, if sufficient information is submitted to allow the Engineer to determine that the material or equipment proposed is equivalent or equal to that of the Named Manufacturer.

2. For such materials or equipment, proposed "or equals" may be submitted and reviewed as part of the Contractor's Shop Drawing approval process. The following shall apply to such determinations:

a. The Engineer will be the sole judge as to the type, function, and quality of any proposed “or equal” and the Engineer's decision shall be final.

b. The Engineer may require the Contractor to furnish additional data about the proposed "or equal."

c. Approval by the Engineer of an “or equal” item shall not relieve the Contractor of the responsibility for full compliance with the Contract Documents.

d. The Contractor shall pay all costs of implementing approved "or equal(s)”, including any redesign and changes to the Work necessary to accommodate the substitution. These shall include resulting costs incurred by other Contractors (if any) on the project.

D. The following provisions shall apply to all requests to substitute equipment or material manufacturers:

1. The Contractor may be granted approval for one manufacturer per item. However, during the performance of Work, multiple manufacturers may be approved for certain commodity items at the sole discretion of the Engineer, upon written request by the Contractor. The Contractor must include a justification in the written request.

2. The Engineer will evaluate each proposed “or equal” within a reasonable period of time.

3. No substituted item shall be ordered, installed, or utilized without the Engineer's prior written approval of the proposed “or equal.”

4. The bidder’s or Contractor’s substantiating information, which will be considered by the Engineer in evaluating a proposed “or equal”, shall address the following factors:

a. Whether it is equal in construction, function and efficiency to that of the Named Manufacturer.

b. Whether acceptance of the proposed “or equal” will cause delay in the Contractor's achievement of Substantial Completion.

c. Whether acceptance of the “or equal” for use in the Work will require a change in any of the Contract Documents to adapt the design to the proposed substitution.

d. Whether incorporation or use of the “or equal” in connection with the Work is subject to payment of any ongoing license fee or royalty.

e. The availability of maintenance, repair, and replacement service. The proposed Manufacturer shall have a service agency that is staffed by properly trained personnel and maintains adequate spare parts, and is able to respond and complete repairs within 24 hours.

f. An itemized estimate of all costs that will result directly or indirectly from approval of such "or equal," including cost of any required redesign and potential claims of other Contractors affected by the resulting change.

g. Whether the proposed "or equal" item meets or exceeds the requirements listed in the appropriate Specifications.

E. Changes Resulting From Approval of Proposed "Or Equal"

1. The Specifications and Contract Drawings were prepared to accommodate the equipment furnished by the Named Manufacturers. All motor horsepower, connecting pipe sizes, equipment dimensions, etc., shown are based on the best information available at the time of design.

2. If proposed "or equal" equipment is different in dimensions, horsepower requirements, pipe connection sizes or other material characteristics from that provided for in the Contract Documents, and such difference is not the result of changes in design conditions or concept ordered by the Engineer, then the Contractor shall be responsible for the furnishing of all properly sized pipe connections, motor starters, motor control centers, and electrical wiring and connections, and all other Work required to properly install the equipment in complete operating condition.

3. Any necessary redesign resulting from any proposed "or equal" shall be submitted to the Engineer for approval, along with the submission of substantiating information in support of the proposal.

4. The cost of all such revisions shall be considered to be included in the bid price(s) on the Contractor's Bid Schedule of Prices.

5. The Contractor shall, at no additional cost to the City, be responsible for and pay all costs in connection with any proposed "or equal," including, without limitation, inspections and testing of equipment or materials submitted for review prior to the Contractor's purchase thereof, whether or not the Engineer approves the proposed "or equal." The Contractor shall have and make no claim for an extension of time or for damages by reason of the time taken by the Engineer in considering an "or equal" proposed by the Contractor or by reason of the failure of the Engineer to approve a substitution proposed by the Contractor.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 01 45 33 – CODE REQUIRED SPECIAL INSPECTIONS AND PROCEDURES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, tools, equipment, appurtenances, and incidentals as shown, specified, and required to cooperate with the Coordinating Special Inspector and individual special inspectors employed by DEP, and to perform required testing and inspections. The Contractor shall engage the services of testing agencies as needed to facilitate Special Inspections.

B. The Contractor may elect to utilize "eFiling" through DOB NOW for special inspections.

C. The following supplements, attached after the End of this Section designation, is a part of this Section:

1. Supplement A – Statement of Special Inspections.
2. Supplement B – Final Report of Special Inspection.
3. Supplement C – Contractor's Statement of Responsibility.
4. Supplement D – Fabricators Certification of Compliance.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Definitions:

1. Coordinating Special Inspector: Professional engineer or architect, hired by DEP, registered in the same state as the Site, responsible for coordinating and verifying the inspection and testing required by the Statement of Special Inspections included in this Section and reporting to the Building Official.

2. Building Official: Officer or other designated authority having jurisdiction charged with the administration and enforcement of the governing building code, or a duly authorized representative.

3. Special Inspections: Testing and inspection required in Supplement A, Statement of Special Inspections, of this Section.

1.05 DESCRIPTION

A. Advanced Notice for Special Testing Inspections:

1. The Contractor shall notify the Engineer in 7 CCDs in advance of all scheduled Special Testing Inspections.

B. Contractor's Responsibilities:

1. Prepare Supplement C, Contractor's Statement of Responsibility, of this Section which shall include:

a. Acknowledgment of the requirements of the Quality Assurance Plan portion of Supplement A, Statement of Special Inspections, of this Section.

b. Acknowledgment that necessary quality control shall be exercised in fabricating, handling, and installing to conform to the Contract Documents.

c. List the Contractor's procedures for ensuring the quality of the Work required for compliance with the Contract Documents relative to each system or component listed in the Quality Assurance Plan portion of Supplement A of this Section.

d. List personnel who control the quality of the Work relative to the Contract Documents and indicate their position in the Contractor's organization.

2. Employ testing agencies with personnel that comply with qualifications requirements in Supplement A, Statement of Special Inspections, of this Section.

3. Provide safe access to the Work to be tested and inspected.

4. Obtain and handle test samples at the Site.

5. Facilitate inspections and tests.

6. Provide access to Suppliers' and Subcontractors' operations as required.

7. Notify testing agencies, Coordinating Special Inspector, and Engineer sufficiently in advance of the Work for the testing agencies, Coordinating Special Inspector, and Engineer to coordinate their personnel at the Site. Do not cover the Work to be inspected until Special Inspections have been completed and the results thererof are acceptable.

8. Special Inspections required in this Section do not supersede or make unnecessary inspections and tests required under other Specification Sections or standard inspections required by Laws and Regulations.

C. Coordinating Special Inspector's Responsibilities:

1. Hire special inspectors to provide inspections listed on the Contract Drawings, and as required by Laws and Regulations, and laws.

2. Review testing agencies and testing personnel submitted by the Contractor, relative to compliance with Supplement A, Statement of Special Inspections, of this Section, and in accordance with Laws and Regulations.

3. Complete Supplement A, Statement of Special Inspections, of this Section to provide names of each inspector and testing agency for each Special Inspection required. Provide Supplement A, Statement of Special Inspections, of this Section to the Building Official, DEP, Engineer, and Contractor.

4. Provide interim reports of inspections and material testing to Building Official, DEP, Engineer, and Engineer's consultants, including structural engineer and architect.

5. To obtain certificate of use and occupancy from the Building Official, complete and provide to the Building Official, DEP, and Engineer Supplement B, Final Report of Special Inspections, of this Section, documenting completion of Special Inspections and correction of discrepancies noted in the Special Inspections.

D. Inspector's Responsibilities:

1. Perform specified inspections, sampling, and testing of materials and methods of construction; review and ascertain compliance with Laws and Regulations.

2. Promptly notify Coordinating Special Inspector, DEP, Engineer and Contractor of irregularities or deficiencies in the Work observed during Special Inspections. Corrective action, if required, will be determined by Engineer.

3. Promptly submit two copies of each report of inspections and tests to Coordinating Special Inspector, Engineer, and Contractor including:

   a. Date issued.

   b. Project title and number.

   c. Name and signature of inspector.

   d. Date of inspection or sampling and test.

   e. Record of temperature and weather.

   f. Identification of product and Specification Section.

   g. Location in Project.

   h. Type of inspection or test.

   i. Results of inspections and tests, and observations regarding compliance with Laws and Regulations, and standards.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. DEP will employ and pay for services of the Coordinating Special Inspector, who will have not less than five years of experience in managing, monitoring, and inspecting building construction.

2. Inspectors will be qualified in their assigned Special Inspection in accordance with Supplement A, Statement of Special Inspections, of this Section.

3. Inspectors will be qualified in the responsibilities of the Special Inspection for which each is responsible.

B. Regulatory Requirements:

1. Special Inspections shall be in accordance with applicable building code and other Laws and Regulations, and Supplement A, Statement of Special Inspections, of this Section.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

   a. Qualification Statements:

1) Names and qualifications of each testing agency to be employed, and qualifications of testing agency's personnel that will perform testing as required in Supplement A, Statement of Special Inspections, of this Section.

b. Procedure Submittals: List of control procedures within the Contractor's organization for testing, including methods, frequency of reporting, and distribution of testing reports.

c. Samples: Representative Samples of materials when required by the Engineer.

2. Information Submittals:

a. Completed Supplement C, Contractor's Statement of Responsibility, as attached to this Section, addressing each system and component listed in the Quality Assurance Plan portion of Supplement A, Statement of Special Inspections, of this Section.

b. Completed Supplement D, Fabricator's Certificate of Compliance, as attached to this Section, for fabrication of structural steel.

c. Site Quality Control Submittals: Material test reports.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

Supplement A - Statement of Special Inspections

Project:

Location:

Owner:

Design Professional in Responsible Charge:

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to the Project as well as the name of the Coordinating Special Inspector and the identity of other approved agencies to be retained for conducting these inspections and tests. Special inspection jobs may be filed using the DOB NOW eFiling feature. This *Statement of Special Inspections* encompass the following disciplines:

☐ Structural ☐ Mechanical/Electrical
☐ Architectural ☐ Other: _____

The Coordinating Special Inspector shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Inspections listed are periodic unless indicated to be continuous or required by code to be continuous.

Interim reports shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency: Weekly or ☐ per attached schedule.

Prepared by:

_____
(type or print name)

_____
Signature Date

Design Professional Seal

Owner's Authorization:

_____
Signature Date

Building Official's Acceptance:

_____
Signature Date

Schedule of Inspection and Testing Agencies

This Statement of Special Inspections / Quality Assurance Plan includes the following building systems:

- ☒ Soils and Foundations
- ☒ Cast-in-Place Concrete
- ☒ Precast Concrete
- ☒ Masonry
- ☒ Structural Steel
- ☒ Cold-Formed Steel Framing
- ☐ Spray Fire Resistant Material
- ☐ Wood Construction
- ☒ Exterior Insulation and Finish System
- ☒ Mechanical & Electrical Systems
- ☐ Architectural Systems
- ☐ Special Cases

Special Inspection Agencies	Firm	Address, Telephone, e-mail
1. **Coordinating Special Inspector**		
2. Inspector		
3. Inspector		
4. Testing Agency		
5. Testing Agency		
6. Other		

Note: The inspectors will be engaged by Owner or Owner's Agent, and not by Contractor or Subcontractor whose Work is to be inspected or tested. Testing agencies shall be engaged and paid for by Contractor. Conflicts of interest must be disclosed to the Building Official prior to commencing the Work. Refer to the Contract Drawings for the list of required Special Inspections and Progress Inspections.

Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspections are subject to the approval of the Building Official. The credentials of all inspectors and testing technicians shall be provided if requested.

Key for Minimum Qualifications of Inspection Agents:

When Engineer deems it appropriate that the individual performing a stipulated test or inspection have a specific certification or license as indicated below, such designation shall appear below the *Agency Number* on the Schedule.

PE/SE	Structural Engineer – a licensed SE or PE specializing in the design of building structures
PE/GE	Geotechnical Engineer – a licensed PE specializing in soil mechanics and foundations
EIT	Engineer-In-Training – a graduate engineer who has passed the Fundamentals of Engineering examination

American Concrete Institute (ACI) Certification

ACI-CFTT	Concrete Field Testing Technician – Grade 1
ACI-CCI	Concrete Construction Inspector
ACI-LTT	Laboratory Testing Technician – Grade 1&2
ACI-STT	Strength Testing Technician

American Welding Society (AWS) Certification

AWS-CWI	Certified Welding Inspector
AWS/AISC-SSI	Certified Structural Steel Inspector

American Society of Non-Destructive Testing (ASNT) Certification

ASNT	Non-Destructive Testing Technician – Level II or III.

International Code Council (ICC) Certification

ICC-SMSI	Structural Masonry Special Inspector
ICC-SWSI	Structural Steel and Welding Special Inspector
ICC-SFSI	Spray-Applied Fireproofing Special Inspector
ICC-PCSI	Prestressed Concrete Special Inspector
ICC-RCSI	Reinforced Concrete Special Inspector

National Institute for Certification in Engineering Technologies (NICET)

NICET-CT	Concrete Technician – Levels I, II, III & IV
NICET-ST	Soils Technician - Levels I, II, III & IV
NICET-GET	Geotechnical Engineering Technician - Levels I, II, III & IV

Exterior Design Institute (EDI) Certification

EDI-EIFS	EIFS Third Party Inspector

Other

Supplement B - Final Report of Special Inspections

Project:

Location:

Owner:

Owner's Address:

Architect of Record:

Structural Engineer of Record:

To the best of my information, knowledge and belief, the Special Inspections required for this project, and itemized in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

(Attach continuation sheets if required to complete the description of corrections.)

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Special Inspector

(Type or print name)

Signature Date

Licensed Professional Seal

Agent's Final Report

Project:

Agent:

Special Inspector:

To the best of my information, knowledge and belief, the Special Inspections or testing required for this project, and designated for this Agent in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

(Attach continuation sheets if required to complete the description of corrections.)

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Agent of the Special Inspector

(Type or print name)

Signature Date

Licensed Professional Seal or Certification

Supplement C - Contractor's Statement of Responsibility

Each contractor responsible for the construction or fabrication of a system or component designated in the Quality Assurance Plan of Supplement A shall submit a Contractor's Statement of Responsibility.

Project:

Contractor's Name:

Address:

License No.:

Description of designated building systems and components included in the Contractor's Statement of Responsibility:

Contractor's Acknowledgment of Special Requirements

I hereby acknowledge that I have received, read, and understand the Project's seismic requirements, Quality Assurance Plan in Supplement A, and Special Inspection program.

I hereby acknowledge that control will be exercised to obtain conformance with the Contract Documents approved by the Building Official having jurisdiction.

_____ _____
Signature Date

Contractor's Provisions for Quality Control

Procedures for exercising control within the Contractor's organization, the method and frequency of reporting and the distribution of reports are attached to this Statement.

Identification and qualifications of the person(s) exercising such control and their position(s) in the organization are attached to this Statement.

Supplement D - Fabricator's Certificate of Compliance

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2 of the International Building Code must submit a *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project:

Fabricator's Name:

Address:

Certification or Approval Agency:

Certification Number:

Date of Last Audit or Approval:

Description of structural members and assemblies that have been fabricated:

I hereby certify that items described above were fabricated in strict accordance with the Contract Documents.

_____ _____
Signature Date

_____
Title

Attach copies of fabricator's certification or building code evaluation service report and fabricator's quality control manual.

NO TEXT ON THIS PAGE

SECTION 01 51 11 – TEMPORARY WATER AND SANITARY SERVICES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances to furnish, install, and test all temporary water services and temporary sanitary services, complete and operational.

B. The following index of this Section is presented for convenience:

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2.02	Materials / Equipment	3
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2.04	Source Quality Control / Shop Tests	3
PART 3	EXECUTION	3
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3.04	Startup / Demonstration	3
3.05	Adjusting / Protection / Cleanup	3

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. The Contractor shall provide and maintain temporary city water and sanitary services for the use of Contractor's personnel on the Site. In addition, the Contractor shall provide all water required to perform the Work of this Contract.

1. Temporary Sanitary Services:

a. Toilet facilities, both exterior and interior, shall be furnished and installed for use by the Contractor's personnel. Toilet fixtures shall be furnished, installed and maintained in satisfactory operating condition. The Contractor shall keep the temporary toilet fixtures in a clean and sanitary manner.

b. Enclosures for the toilet fixtures shall be erected and maintained in a clean and sanitary manner.

c. Heating and lighting for the enclosures shall be furnished, installed and maintained by the Contractor.

2. Temporary Water Services:

a. The Contractor shall extend branch piping with outlets located so City water is available by hoses with threaded connections. The Contractor shall be responsible for preventing all temporary pipes and hoses from freezing.

b. The Contractor shall be responsible for providing water meters and appropriate backflow preventers where necessary to protect against contamination of the City water supply.

c. The Contractor shall provide sufficient potable quality drinking water for all personnel employed by the Contractor at the Site.

B. The Contractor shall provide and maintain all temporary city water and sanitary services at the site during construction in compliance with all applicable State, City and local regulations.

1. It shall be the Contractor's responsibility to obtain all necessary permits from the Bureaus within DEP and other City agencies or from local authorities having jurisdiction.

C. Potable water shall be used for testing of potable water lines and domestic needs.

D. The Contractor shall remove all temporary water and sanitary services at the completion of the Work.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 51 12 – TEMPORARY HEAT AND VENTILATION
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as specified and required, to furnish, install, and test all Temporary Heat and Ventilation, complete and operational.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. General:

1. In order to permit construction to continue as scheduled during all seasons of the year, the Work of the Contract shall be protected at all times from the harmful effects of low temperature and from accumulation of harmful gases such as chlorine, methane and hydrogen sulfide.

2. Labor may be required seven days a week and during other than Normal Project Working Hours for the period of time required by seasonal weather conditions.

3. The Contractor shall begin to supply temporary heat only when so directed in writing by the Engineer and shall continue to supply temporary heat until directed in writing by the Engineer to discontinue.

4. In prosecuting the Work of this Contract, the Contractor shall provide all temporary ventilation necessary for the protection of the Contractor's employees, all other persons at or about the Contractor's Work area, Work, and equipment of the Contractor. Temporary ventilation shall be in accordance with all applicable regulations of the Federal Occupational Safety and Health Act of 1970.

B. Temperature Requirements:

1. When directed by the Engineer, the Contractor shall provide sufficient heat to maintain the temperature requirements prescribed herein. Temperatures shall be maintained at a level sufficient to meet construction requirements, but in no event shall the temperature fall below 50 degrees Fahrenheit.

C. Method of Temporary Heat:

1. Temporary heat shall be in conformance with all applicable Federal, State, and Local regulations and shall be subject to the approval of the Engineer.

2. The method of temporary heat shall:

a. Not cause the deposition of dirt or smudge upon any finished Work or any defacement or discoloration.

b. Not be injurious or harmful to personnel or materials.

c. Not interfere with the operation of the facility or with DEP Operations.

3. The following methods of heat shall not be permitted:

a. Open fires.

b. Electric heating.

c. Salamanders or other direct-fired equipment will not be allowed in construction areas.

d. Torpedo blowers and/or propane heaters will not be allowed in construction areas.

4. The method of temporary heat shall not require any unnecessary demolition or penetration through existing or new structures.

D. Temporary Heating System:

1. Systems shall include boilers, pumps, radiators, unit heaters, water and heating piping, insulation, controls, fuel storage and/or any other equipment as necessary, all furnished and installed by the Contractor.

E. Method of Temporary Ventilation:

1. Temporary ventilation shall be in conformance with all applicable Federal, State, and Local regulations and shall be subject to the approval of the Engineer.

F. Temporary Ventilation System:

1. The temporary ventilation system shall be forced or gravity type and shall include, but not limited to fans, motors, inlets, outlets, ductwork, heaters, controls and all appurtenances.

G. Operation and Maintenance:

1. Temporary Heating:

a. The Contractor shall coordinate operations in the Work of providing temporary heat to ensure sufficient and timely performance of the Work under this Contract.

1) The Contractor shall maintain all permanent or temporary enclosures at no additional cost to the City.

b. The Contractor shall maintain the temporary heating system in operating condition at all times during the temporary heating period.

1) Temporary heating system equipment shall be placed so as to comply with the requirements specified hereinbefore, and shall be connected, disconnected and suitably supported and located so as to permit construction Work, including finish Work such as wall plastering and painting, to proceed.

2) The installation of the temporary heating system and the placing of ancillary system equipment and components shall be coordinated with the operations of all Subcontractors so as to ensure sufficient and timely performance of the Work.

2. The Contractor shall remove all portions of the temporary heating system when so directed by the Engineer.

3. Temporary Ventilation:

a. The Contractor shall maintain the temporary ventilation system in operating condition at all times during the performance of Work.

1) Temporary ventilation system equipment shall be placed so as to comply with the requirements specified hereinbefore,

and shall be connected, disconnected and suitably supported and located so as to permit construction Work, including finish Work such as wall plastering and painting, to proceed.

2) The installation of the temporary ventilation system and the placing of ancillary system equipment and components shall be coordinated with the operations of the Subcontractors so as to ensure sufficient and timely performance of the Work.

H. Electrical Power for Temporary Heating and Ventilation System:

1. Temporary Heating System:

a. The Contractor shall provide all labor, materials, and equipment necessary to provide and maintain the temporary electrical system and power necessary for the operation of the temporary heating systems.

2. Temporary Ventilation System:

a. The Contractor shall provide all labor, materials, and equipment necessary to provide and maintain the temporary electrical system and power necessary for the operation of the temporary ventilation systems.

3. Temporary electrical system shall comply with the latest applicable regulations and codes referenced elsewhere in the Specifications.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 51 30 – TEMPORARY ELECTRICAL SYSTEM
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The temporary electrical system shall be furnished, installed, operated and maintained in accordance with the requirements of this Section and the Contract Drawings.

B. The temporary electrical system shall supply power and light as required for the construction related activities. The temporary electrical system shall be complete and shall include all auxiliary equipment necessary to support the construction.

C. Attachments

1. Schematic Diagram for Temporary Electrical System Arrangement

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 05 27 – Grounding

1.04 REFERENCES

A. Temporary electrical system shall comply with the latest applicable provisions and recommendations of the following:

1. Electrical Code of the City of New York.
2. NFPA 70, National Electrical Code.
3. National Electrical Safety Code.
4. Local Codes
5. NYC Local Law 18 of 2014
6. Local Utility Requirements
7. OSHA Regulations

1.05 DESCRIPTION

A. System Description

1. The Contractor shall make all necessary arrangements with the Utility and shall provide a temporary electrical service point connection. Connecting lines and service supply shall be of sufficient capacity to supply all temporary light and power required on the site.
2. Arrangements shall be made with the Utility immediately after notice to commence work in accordance with these Specifications.
3. The Contractor shall be responsible for making arrangements with the Utility to have a sealed meter installed and for payment of same.
4. The energy charges for the Contractor's field office and shop usage shall be the responsibility of the Contractor.
5. Energy charges associated with the work areas general power and lighting and the security site lighting shall be the responsibility of the Contractor. Energy charges associated with the Engineer's field office shall be the responsibility of the Contractor.

B. Design Requirements

1. The Contractor shall provide all systems and circuits in accordance with the Electrical Code of the City of New York, NFPA 70, the National Electrical Safety Code, local codes, utility codes, and OSHA requirements.
2. The temporary electrical system shall be provided in accordance with the following design requirements:

a. The Contractor and the Engineer's trailer shall have a separate branch.

b. A separate branch shall supply the work area general lighting, power, and security. Receptacles (GFI type) shall be located throughout the work area. Receptacle connected equipment shall be suitable for 120-volt operation. Operating input shall not exceed 1500 volt-amperes. Illumination levels shall be as required by OSHA.

c. Security site lighting circuits shall supply a system of security lighting for the work area, field office complex(s), Contractors' staging areas, and all parking areas. Unless specifically shown otherwise on the Contract Drawings or stated in the Specifications, the system shall be arranged to provide a minimum lighting intensity of 5 foot-candles in these areas.

d. A total of three (3) 200 amperes and three (3) 100 ampere meter pans and fused disconnect switches rated for 120/208 volt, 3 phase, 4 wire shall be furnished, installed and wired for the above.

e. See attached schematic diagram for Temporary Electrical System Arrangement.

1.06 QUALITY ASSURANCE

A. The temporary general lighting system shall provide lighting for access to and egress from the Work and for safe and expeditious construction within designated enclosed areas of the structure or structures.

B. All temporary electrical system equipment and components shall be of recent manufacture and of proper working order for the intended purpose.

C. The Contractor shall maintain in proper working order and repair the temporary electrical system.

D. The Contractor shall modify, extend, and relocate the temporary electrical system components, as needed, to support construction activities

E. The Contractor shall remove the temporary electrical system when directed by the Engineer.

1.07 SUBMITTALS

A. Contractor shall submit working drawings, shop drawings and material specifications for the approval of the Engineer and the utility in accordance with the requirements of Section 01330 – Submittal Procedures.

B. Working Drawings:

1. One-line diagram representing the power distribution for the temporary system.

2. Location plan indicating the major distribution equipment.

3. Manufacturer's catalog cuts for the products proposed for use.

4. Panel loading, voltage drop, short circuit and other calculations, as required.

5. Security lighting layout.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The temporary electrical equipment shall be delivered, stored and handled in accordance with these Specifications and the manufacturer's recommendations.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Electrical Service Connection

1. The Contractor shall provide a service entrance and distribution center at the service point. Service entrance and distribution equipment shall be in accordance with the following:

   a. Enclosures shall be rated NEMA 3R.

   b. Meter pans shall be suitable for revenue meters furnished by the utility.

   c. Circuit breakers shall be thermal magnetic type. Circuit breakers shall be equipped with lockable handles.

   d. Disconnect switches shall be fused type with current limiting fuses. Disconnect switches shall be equipped with padlocking features.

   e. All equipment shall be approved by the Utility.

2. The Contractor shall also provide the following other equipment at the service point:

   a. Eight foot high, steel chain link fence with gate shall enclose the service entrance and distribution center. The fence shall be arranged so to permit a minimum clearance distance of 6 feet between the fence and the equipment.

   b. The fence shall include baked enamel, 14 by 10 inch caution signs. The signs shall read, "DANGER - HIGH VOLTAGE - KEEP – OUT". The signs shall be bolted to the fence on each side of the fence and on the main gate.

c. A 4/0 AWG ground grid consisting of four ground rods, one at each corner, shall be provided. Maximum ground resistance shall be 10 ohms. Grounding shall be in accordance with Article 2.04.

B. Raceways and Wiring

1. All conductors shall be 600 volt, enclosed in properly sized raceways or be routed aerially using Type AC, MC or TC cable.

2. Conductors shall be provided for all devices, suitably sized for the intended purpose. Conductors installed in raceways shall be single conductor type THHN/THWN or equal to be approved by the Engineer and the utility. Armored cable, Type AC, metal-clad cable, Type MC or power and control tray cable, Type TC shall also be permitted.

3. Raceways where used shall be suitably sized for the conductors. Raceways shall be rigid metallic type.

4. Aerially routed cables shall be messenger supported from solid wood poles or other recognized means. Messenger shall be high strength galvanized steel.

5. Poles shall have a class suitable for the installation in accordance with the National Electrical Safety Code and the utility and shall be thirty feet length minimum. Poles shall be guyed at angle or corner runs and when eccentrically loaded.

C. Lighting Fixtures and Devices

1. Receptacles (GFI type) shall be grounded type, 120 volt, 20 ampere suitable for hand tools such as drills, hammers and grinders.

2. All temporary lighting shall use high-efficacy lamps in compliance with NYC Local Law 18 of 2014, as specified below:

a. 60 lumens per watt for lamps over 40 watts;

b. 50 lumens per watt for lamps over 15 watts but less than or equal to 40 watts; and

c. 40 lumens per watt for lamps 15 watts or less.

3. General lighting lamps shall be LED equivalent to 100 watt installed in suitable lamp holders. Security lighting lamps shall be LED equivalent to 400 watt high-pressure sodium installed within a floodlight type fixture suitable to illuminate the intended area.

4. Switches, breakers and miscellaneous equipment shall be suitable for the intended purpose, with voltage, current and short circuit interrupting ratings as required for the circuits.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Grounding

1. The temporary systems shall be grounded in accordance with the requirements of Section 26 05 27 – Grounding.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Temporary wiring systems shall be installed without interfering with the work of other contractors.

B. The ground grid cable shall be installed in loop fashion completely around and outside the service point fence. The fence and distribution equipment shall be connected to the grid at a minimum of two locations.

C. The temporary general lighting system shall be installed progressively in structures as the designated areas are enclosed or as lighting becomes necessary because of partial enclosure. Lamps shall be installed to provide an even distribution of illumination over the work areas.

D. Receptacles shall be installed in such a manner so as to reach any point in the work areas with an extension cord not to exceed 40 feet in length.

E. Security lighting shall be installed on poles to illuminate the staging and parking areas.

F. Aerial conductors shall be installed at a minimum height of 14 feet above finished grade. When conductors cannot be routed at the proper height or where it will interfere with plant operations or construction activities, conductors shall be provided in rigid steel conduit and installed underground.

3.03 FIELD TESTING / QUALITY CONTROL

A. Operation

1. The Contractor shall keep the temporary power and lighting system alive each working day from 7:00 A.M. to 6:00 P.M., from Monday to Friday inclusive for the duration of the Contract. This requirement includes provision of one electrician available on-call at all times for incidental modifications of the temporary electrical system as directed by the Engineer or to maintain the electrical equipment and power distribution systems at the site. Areas of the Work designated by the Engineer as requiring the use of the temporary electrical system to function outside of the above hours shall be energized continuously or as directed by the Engineer. These areas include security lighting and the Engineer's trailer complex.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Maintenance

1. The temporary electrical system shall be maintained and repaired until it is no longer required.

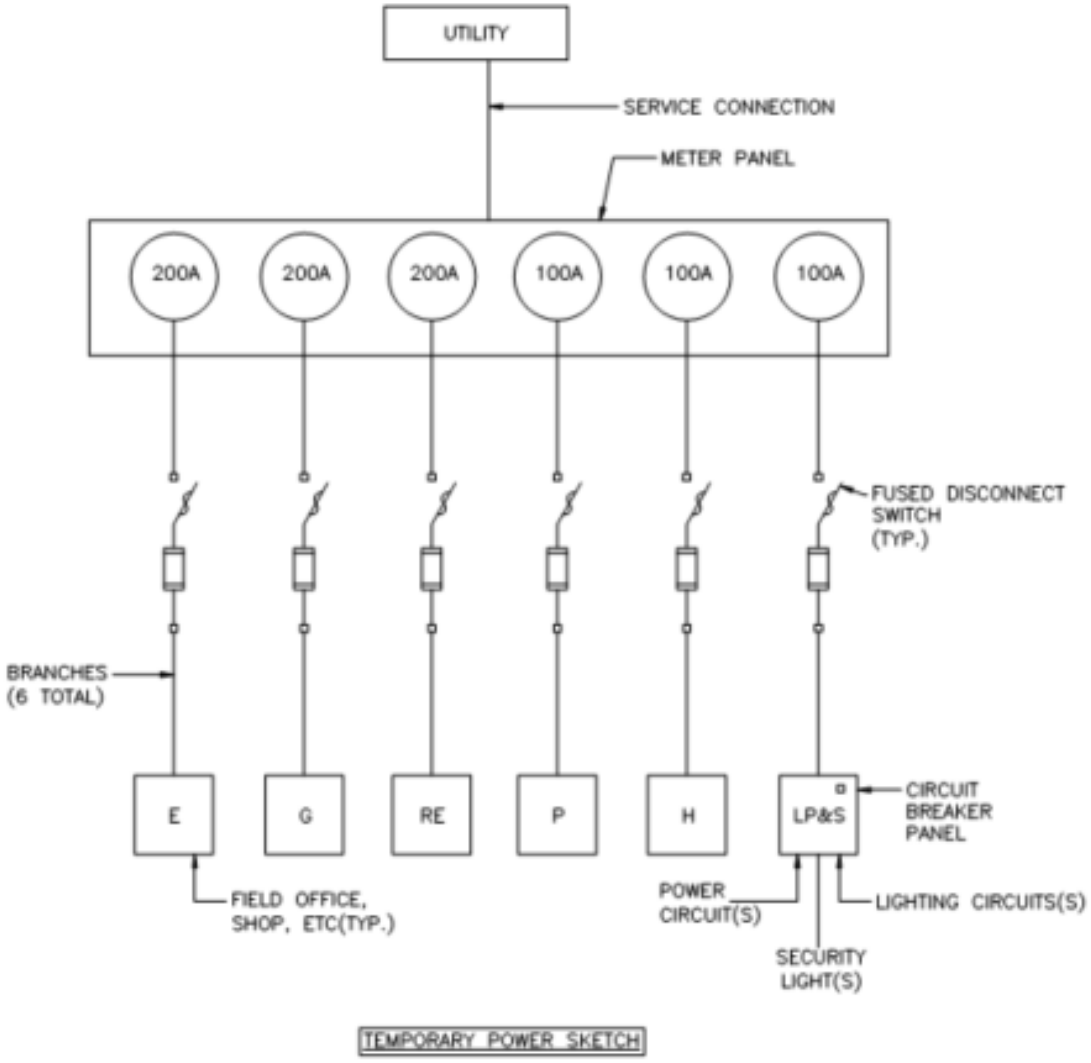
2. Lamps, fuses and other equipment shall be repaired and/or replaced, as required.

B. Removal

1. At the conclusion of the work, when directed by the Engineer, the temporary system shall be removed by the Electrical Contractor in its entirety. The ground surfaces and structures disturbed by the work shall be restored to their original condition.

END OF SECTION

TEMPORARY ELECTRICAL SYSTEM ARRANGEMENT



TEMPORARY POWER SKETCH

—— BY CONTRACTOR

E ELECTRICAL SUB CONTRACTOR

G GENERAL CONTRACTOR

RE RESIDENT ENGINEER

P PLUMBING SUB CONTRACTOR

H HEATING, VENTILATION & AIR CONDITIONING SUB CONTRACTOR

LP&S SUPPLY WITH MAIN BREAKER

SECTION 01 51 51 – TEMPORARY PUMPING
CONTRACT CSO-FC-DF

GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified, and required to furnish, install, test, and place into satisfactory operation a temporary pumping systems, complete and operational.

1. The Contractor shall bear responsibility for operation of the temporary pumping systems.

2. This Section is intended to provide minimum guidelines and requirements for any temporary pumping system that the Contractor may deem necessary as part of the means and methods to complete the Work on a daily basis to maintain a dry work area when performing the Work in the existing sewer conduits. Long term bypass pumping operations are not anticipated.

3. All temporary pumping systems shall be used while the Contractor is present on-site during the daily course of the Work. Temporary pumping systems shall not be left in operation unattended outside of normal working hours, and should be removed from the sewer conduits or Work area at the end of each work day unless otherwise approved by the Engineer.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 73 12 - Maintenance of Operations and Construction Staging

1.04 REFERENCES

A. Reference Standards:

1. Applicable Sections of the latest version of BWT's notification procedures, Bureau Directive 13-06:

a. 911 Calls.

b. Off-hour Power Emergency Contacts.

1.05 DESCRIPTION

A. Service Conditions:

1. The Project Sites include combined sewer collection system infrastructure, which relieves itself during periods of excess wet weather inflow via the CSO regulators and outfalls. Refer to Section 01 73 12 – Maintenance Of Operations And Construction Staging for details of flow conditions within the existing sewer conduits and influent channels, and for staging and sequencing details.

2. The Contractor is advised that collection system peak influent flowrates entering the work area are significant and will not be able to be temporarily pumped. Temporary pumping system requirements in this Section are intended to provide minimum guidelines for provision of any temporary pumping equipment that the Contractor may decide to use to maintain dry working areas within the sewer conduits where flows cannot be completely stopped or diverted.

B. The Work under this Section shall include, but not be limited to, the following components:

1. All material and equipment in this Section shall be new..

2. Temporary Process Interconnections:

a. Provide all piping, valves (air release valves, gate valves, and check valves), and fittings necessary for a functional Temporary Pumping System.

b. Provide pipe supports, including (but not limited to): thrust blocks, saddles, supports, and seismic restraints as necessary and required to accommodate all forces.

c. Provide surge devices, and any other appurtenances necessary and/or required to provide a Temporary Pumping System that is complete and suitable for safe operation.

3. Bulkhead(s):

a. Provide bulkhead(s) to isolate the area(s) of work from receiving sewage flow and to divert flow to the Temporary Pumping System, as necessary to complete the required Work.

4. Pump Controls:

a. Provide controls for temporary pumping system to maintain suction structure liquid level that does not result in flow backups and that does not adversely affect the DEP's system and private property.

C. Any other associated materials, equipment and apparatus including spare parts that are necessary for the successful operation and maintenance of the Temporary Pumping System.

1.06 QUALITY ASSURANCE

A. The Contractor may elect to retain a Subcontractor (hereinafter referred to as the Operator), who is specialized in interim pumping operations of combined sewer (dry weather and wet weather) influent flowrates comparable to those of this application.

1. If the Contractor retains the Operator, the requirements of this Article shall apply to the Operator.

2. The performance of the Operator and staff shall remain the responsibility of the Contractor at all times.

B. Qualifications:

1. The Temporary Pumping System Supplier shall have a minimum of five (5) years of experience in providing substantially similar temporary pumping systems, and shall show evidence of providing at least five (5) temporary pumping systems on other projects similar in size or larger and in similar service the to the temporary pumping systems required for the Project. Submitted references shall include detailed information of the referenced systems and Operator personnel, as well as facility owner contact information.

C. Component Supply and Compatibility:

1. Obtain each temporary pumping system from a single Supplier who shall be responsible for providing a complete system.

D. Field Measurements:

1. All existing conditions, measurements and elevations shall be field verified and submitted in the shop drawings. Any major discrepancies between the field measurements and the contract drawings shall be promptly brought to the attention of the Engineer.

E. Regulatory Requirements and Third-Party Coordination:

1. The Contractor shall meet all requirements of regulatory agencies having jurisdiction over the Work performed under this Contract, including but not limited to: OSHA, NYCDOT, , NYCDEP, USEPA, NYC, and NYSDEC.

2. The Contractor shall coordinate with all third parties for work relating to the temporary pumping system, including but not limited to: Con Edison, Verizon, National Grid, private property owners, property lines and easements, etc.

3. Quality of exhaust emissions from internal-combustion engines associated with temporary pumping systems shall comply with all Laws and Regulations, including applicable air permits. Before furnishing temporary pumping system, verify compliance with air quality standards and provide temporary emissions controls to comply with such standards when required.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Qualifications:

1) Submit the qualifications of the Contractor's Operator, if applicable.

b. Detailed Plan outlining all steps, provisions, and precautions to be taken by the Contractor regarding the diversion of incoming flows during construction:

1) The Contractor shall retain the service of a New York State licensed Professional Engineer to review and approve the Temporary Pumping System Plan. The PE shall sign and seal the Plan.

2) The Plan shall be submitted to DEP’s Engineer for approval 30 consecutive calendar days in advance of commencing the temporary pumping.

3) The Plan shall include a Schedule for Temporary Pumping.

4) This Plan shall be specific and complete.

5) The Plan shall include a copy of all submittals specified in this Section.

c. Drawings and sketches, in plan and in section, showing the piping plan, elevation, and alignment, with all fittings, valves, supports, and appurtenances.

1) The Contractor shall include the following with the submitted drawings and layouts of the temporary piping plan:

a) Size, material, and method of installation, of the temporary piping, and if applicable, methods of protection from traffic, and vandalism.

b) Plan and section drawings showing connection details of the temporary piping in the suction and discharge locations.

c) Size, material, type, method of installation, staging and testing of the temporary bulkheads required.

d) Where it is necessary to bury temporary piping, submit trench details for buried temporary piping, including temporary surfacing proposed for traveled areas. Submit sketches and information on other types of protection proposed for temporary piping. Obtain approvals of owners of surfaces that will be disturbed by burying temporary pumping.

e) Source of power and fuel (as applicable).

2) All design drawings and sketches shall be signed and sealed by a Professional Engineer licensed in the State of New York and shall be submitted to the Engineer for approval.

d. Catalog cut sheets of the following:

1) The temporary pumps.

2) Piping, fittings, couplings, valves, supports, and associated apparatus.

3) Temporary plugs and bulkheads.

4) Flow elements.

5) Level sensors.

e. Noise control methods that the Contractor shall utilize for each pump or temporary electrical generator.

f. A security implementation plan to detail the means and methods that ensure the safe and continuous operation of the interim

pumping system. At a minimum, the plan shall address monitoring, detection, notification and remedial measures against leakage, vandalism, freezing and traffic damage.

B. Comply with all submittal requirements specified under Section 01 73 12 - Maintenance of Operations and Construction Staging.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall provide spare parts and special tools necessary to service, disassemble, repair and adjust the equipment provided under this Section, and as per the requirements of the Contract Documents. In addition:

1. Spare parts and special tools shall be available and ready for immediate operation and use in the event of an emergency or breakdown.

B. Tools: Provide standard and special tools and supplies necessary to service, disassemble, repair and adjust the equipment, products. Adequate hoisting equipment for each pump and accessories shall be maintained on site.

C. Repairs and/or replacements shall be made as expeditiously as possible, but in all cases shall be made to restore full operating and standby capacity within 72 hours.

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Design Criteria:

1. The design, installation, and operation of the Temporary Pumping System shall be the Contractor's responsibility.

a. The Temporary Pumping System shall meet all code requirements from Agencies Having Jurisdiction, including meeting requirements for emission test for any back-up generator provided.

b. The Contractor may subcontract operation to the Operator as specified herein.

2. The Temporary Pumping System design shall be designed and sealed by a Professional Engineer licensed in the State of New York

3. Temporary pumping process interconnections:

   a. Piping shall be steel, ductile iron, high density polyethylene, or other material accepted by the Engineer and suitable for system operating pressures. Durable hoses can be used only for short sections upon acceptance by the Engineer.

   b. Piping system shall have watertight joints of the following types: fused joints, restrained couplings, flanged coupling adapters, quick-connects by Camlok or equal, flanged joints, grooved and shouldered end-type couplings, and other watertight joints accepted by the Engineer.

   c. Size discharge piping for flow velocity of not greater than 10 feet per second.

   d. Provide check valves or pump control valves as required.

   e. Discharge from temporary pumping system shall not adversely affect collection system structures, pipe or conduits, DEP's, operations, private property, and shall not result in flow backups, flooding, or damage. Provide energy-dissipating measures at discharge point as necessary.

4. Temporary plugs and bulkheads:

   a. Acceptable temporary plugs and bulkheads include flow-thru plugs, inflatable dams specifically designed for such service, brick bulkheads, timber bulkheads, sandbags, and other bulkhead methods suitable for the service and conduit conditions.

   b. Each plug and temporary bulkhead shall be suitable for the maximum pressure encountered

   c. Where temporary plugs and bulkheads are under pressure or surcharged, provide either two plugs or a plug and temporary bulkhead.

5. Temporary pumps (including operating and standby units):

   a. The temporary pumps shall be rated for continuous duty.

6. Controls:

   a. Provide controls for temporary pumping system to maintain suction structure liquid level that does not result in flow backups and that does not adversely affect the DEP's system and private property.

B. Operation:

1. The Contractor shall operate the Temporary Pumping System as required to complete the Work and maintain a dry working area.

a. The Contractor shall operate the Temporary Pumping System safely and in such a manner that does not interfere with collection operations.

b. In the event of any backups, spills, leaks, overflows, unauthorized discharges, and/or any other interference with collection system operations that are attributable to interim pumping, the Contractor shall be responsible for the cost of cleanup, repair, and restoration, as well as any and all additional fines, penalties, and fess imposed by regulatory entities that have jurisdiction, all at no additional cost to the City.

2. There shall be no interruption in collection system operations during construction, operation, and removal of the Temporary Pumping System.

a. Contractor shall maintain the Temporary Pumping System equipment, materials, and facilities (such as bulkheads, pumping equipment, conduits, all necessary power and backup emergency power, controls, sensors, and appurtenances) as necessary and required to prevent any interruption.

b. The Contractor shall not be permitted to stop or impede the sewage flows under any circumstances, including during construction and removal, unless otherwise specified in Detailed Specification 01 73 12 - Maintenance of Operations and Construction Staging.

3. The Contractor shall protect public and private property from all damage and flooding resulting from temporary pumping.

4. The Contractor shall protect water resources, wetlands, and other natural resources from temporary pumping.

5. The Contractor shall limit the noise generation from an interim generator (if applicable) to 69 dBA at thirty (30) feet.

a. Contractor shall implement additional sound reduction measures as directed by the City, including those specified to protect the interests of private property owners.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Project Records: The Contractor or the Contractor's Operator shall keep all records relating to the temporary pumping system and make them available for inspection by the Engineer or any agency having jurisdiction upon reasonable notice. The records shall include but not limited to the following:

1. Date and time of any failure of any equipment or component of the temporary pumping system, and action taken by the Contractor.

2. Records of overflows, spills, and/or process interruptions, and any fines paid as required by any agency having jurisdiction over the Work.

3. Dates and times of any sewer spills and/or backups onto private property, any damage to private property, and actions taken by the Contractor.

4. Dates of any public complaints, the nature of the complaint, and the corrective action taken by the Contractor.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Refer to Section 01 73 12 - Maintenance of Operations and Construction Staging, for constraints on preparing and commencing temporary pumping.

B. The Contractor shall prepare the Site for the Temporary Pumping System, and shall provide barriers, fall protection, and fencing, as necessary and/or required, in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

3.02 INSTALLATION

A. Install products, materials, and equipment in complete accordance with the manufacturer's printed instructions and the approved shop drawings.

B. Provide all required lubricants for operation.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used.

3.04 STARTUP / DEMONSTRATION

A. Operation and Maintenance Service:

1. The Contractor shall continuously maintain all pumping system equipment according to the manufacturer's recommendations.

2. The Contractor shall be responsible for handling and disposing of any materials (including screenings) removed from the incoming wastewater flow during operation and Maintenance of the Pump System Facility.

3. The Contractor (or the Operator) shall operate and maintain all temporary pumping equipment according to manufacturer's recommendations to keep them at satisfactory condition at all time.

4. Any interruption of the Temporary Pump System, even due to equipment failure, shall be corrected by the Contractor in a timely manner at no additional cost to the City.

B. Extra Materials:

1. Spare parts for pumps and piping shall be kept on site.

2. Adequate hoisting equipment for each pump and accessories shall be maintained on the site.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. The Contractor shall restore the Site as required by the Contract Documents after removal of the Temporary Pumping System.

END OF SECTION

SECTION 01 52 10 – TEMPORARY FIELD OFFICE TRAILERS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Field Office Trailers

B. Security Systems

C. Office Furniture

D. Kitchen

E. Bathroom Items

F. Attachments

1. Table 1 – Office Furniture

2. Table 2 – Kitchen Items

G. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the

applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 51 11 – Temporary Water and Sanitary Services

B. Section 01 51 30 – Temporary Electrical System

C. Section 01 52 40 – Field Office Equipment and Supplies

D. Section 01 74 20 – Construction Waste Management

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Temporary Engineer's Field Offices as specified herein.

B. Contractor's Field Office

1. The Contractor shall furnish and maintain a field office at each site as listed below in accordance with the requirements of the General Conditions, Article titled "Temporary Structures". Field offices shall be located in the areas designated in the Contract Documents or as directed by the Engineer.

   a. FB CSO Facility at 131-50 Fowler Avenue, Flushing, NY – Main Field Office

   b. TI-010D Dechlorination Facility at 131-35 Avery Avenue, Flushing, NY – Satellite Field Office

   c. TI-011 Disinfection Facility at 32-15 College Point Boulevard, Flushing, NY – Satellite Field Office

C. Land for Contractor's Use During Construction

1. The Contractor shall confine its construction activities to the Site as shown on the Drawings. Limited space will be made available on the site for construction staging and field offices for the Contractor. Space must be used by the Contractor, as required in the Contract Documents or as directed by the Engineer.

2. The Contractor may require additional space for construction staging beyond the limited space available at the site. As such, the Contractor shall provide for space off-site at no additional cost to the City.

3. The Contractor may be required to move its field office during construction in order to sequence the Work. All such moving costs shall be included in the lump sum price bid for the Contract.

4. The City reserves the option to require the Contractor to vacate any part of the land assigned for Contractor's use, including the Contractor's field office area, within sixty (60) days after notice by the City.

5. The Contractor's field office shall present a clean and neat exterior appearance and shall be in a state of good repair. Temporary construction facilities, which, in the opinion of the Engineer, require exterior painting or maintenance, shall be repaired or replaced at the Engineer's direction.

6. Following the completion of the Contract, or as directed by the Engineer, the Contractor shall remove its plant, shanties, trailers, materials, equipment, etc., from the site and restore the site to its original condition, satisfactory to the Engineer.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Submit for approval the following information:

1. Description of Resident Engineer's Field Office, including the street address and a listing of the office space (in square feet) by room.

2. Plan drawing of the Resident Engineer's Field Office, drawn to scale, indicating the Contractor's designed layout of all specified furniture and equipment.

a. Main Field Office – Contractor shall provide interior design of Resident Engineer's Main Field Office suitable for accommodating six full-time individuals while performing construction management and inspection duties.

b. Satellite Field Offices – Contractor shall provide interior design of Resident Engineer's Satellite Field Offices suitable for accommodating three full-time individuals while performing construction management and inspection duties.

3. Site plan indicating proposed location of field office, parking for field office, facilities related to the field office, and material of both field office parking and sidewalk or walkway to field office.

4. Data sheets for all products to be furnished under this Section.

5. Calculations to confirm that the design of the field office trailers was based on consideration of appropriate loads and is in conformance with all applicable codes. Such calculations shall be signed and sealed by a professional engineer licensed in New York State.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Temporary Field Offices shall be as manufactured by:
   1. Williams Scotsman, Inc., Baltimore, MD;
   2. Design Space International, Bala-Cynwyd, PA;
   3. Nadler Modular Structures, Spring Valley, NY;
   4. or approved equal.

B. Office Furniture shall be as manufactured by:
   1. Hon Co., Newark, NJ;
   2. Cole Business Furniture Co., New York, NY;
   3. Or approved equal.

C. Ceiling mounted exhaust fan shall be manufactured by:
   1. Nutone Corp., Cincinnati, OH;
   2. Broan Co., Racine, WI;
   3. Or approved equal.

D. Office Chairs shall be manufactured by:
   1. Nightingale, Mississauga, Ontario, Canada;
   2. Herman Miller, Zeeland, MI;
   3. Steelcase, Grand Rapids, MI;
   4. Exemplis, Chicago, IL.
   5. Or approved equal.

E. Water Filter shall be manufactured by:
   1. Aqua-Pure, Davisburg, MI;
   2. Or Approved Equal.

2.02 MATERIALS / EQUIPMENT

A. Field Office Trailers

1. The Field Office Trailers shall be office type, new, pre-fabricated structure or a new mobile trailer.
    a. Main Field Office:
        1) Provide a minimum of 1,265 square feet (SF)
        2) Minimum Dimensions: 23’-0” wide by 55’-0” long.
        3) Number of Ingresses and Egresses: Four (4) doors, each with a landing, stairs, and railing complying building codes and other Laws and Regulations in effect at the Site. A handicap accessible ramp shall be provided for access at one of the doors as approved by the Engineer.
    b. Satellite Offices:
        1) Provide a minimum of 256 square feet (SF), each.
        2) Minimum Dimensions: 8’-0” wide by 32’-0”long.
        3) Number of Ingresses and Egresses: Two (2) doors, each with a landing, stairs, and railing complying building codes and other Laws and Regulations in effect at the Site. A handicap accessible ramp shall be provided for access at one of the doors as approved by the Engineer.
2. Materials
    a. Exterior metal fully insulated walls and roof with a minimum of R-25 insulation.
    b. Interior walls insulated with R-11 insulation for sound attenuation.
    c. Ceiling height shall be 8 feet.
    d. Completely weatherproofed and insulated.
    e. Floor systems designed for 40 psf in addition to dead load.
    f. Roof system designed for 35 psf in addition to dead load.
    g. Exterior doors fully insulated (whole-unit U-factor less than 0.32, greater than R-3.0) metal type with, aluminum thresholds, heavy-duty closers and vandal-proof locksets with keys meeting building code requirements.
    h. Low VOC Paints and sealants and floor coverings
    i. Exterior walls and roof finished with a high SRI material, minimum reflectivity of 0.65.
    j. Interior doors solid wood with lock sets.

k. High-Performance Windows with a whole-unit U-factor less than 0.32 (greater than R-3.0)

l. Windows provided with adjustable blinds, operable sashes, screens, storm sashes and all hardware such as that required for security.

m. Underside of trailers completely sealed and insulated with minimum of R-19 insulation.

n. Resilient floor coverings with a minimum 20% recycled material content.

o. Passive solar window awnings on South-facing and West-facing windows.

3. HVAC

a. Ducted system with ducts concealed above the finish ceiling.

b. Sized to maintain the temperature in each room at 70 degrees Fahrenheit (F) when the outside temperature is 0 degrees F and 75 degrees F when the outside temperature is 100 degrees F.

c. Wall mounted heat/cool programmable thermostat.

d. Provide 40-gallon hot water heater.

e. Toilet rooms have a switchable ceiling mounted exhaust fan.

1) The fan shall be an 8-inch fan.

4. Electrical

a. The Electrical system shall have capacity for all loads, and be an armored cable system.

b. General interior lighting shall be light-emitting diodes with occupant or sensors.

c. Emergency lights provided as required by code.

d. Receptacles provided as required by code.

e. Trailer and electrical system to be grounded.

f. Work shall be in accordance with Section 01 51 30 – Temporary Electrical System.

5. Plumbing

a. Plumbing work is to include all water supply, drainage and piping required for a complete system. Work shall be in accordance with Section 01 51 11 – Temporary Water and Sanitary Services.

b. All soil, waste, vent and drainage piping shall be provided and connected to the sewer system.

c. Toilets to be low flush (1.28 gpf) or dual flush (1.6 gpf/0.8 gpf.)

d. Urinals to be low flush (0.5 gpf) or waterless

e. Shower Stalls shall be included in each of the male and female bathrooms, as specified herein and indicated on the Contract Drawings.

f. Showers and sinks to be provided with hot and cold water.

g. Water lines to be installed on the interior to prevent freezing and be concealed wherever possible.

h. One (1) exterior water faucet shall be installed at each trailer location.

i. Pipes subject to freezing shall be heat traced.

6. Room Areas for New Field Office Trailers: The room descriptions are solely for the purposes of indicating the intended use for the office/contractor supplier, and are not a binding use for the DEP.

a. Main Field Office

1) No. Offices – Two (2)

2) No. Cubicle Workspaces – Six (6)

3) Conference Area – One (1)

4) Kitchen – One (1)

5) Bathrooms – Two (2)

b. Satellite Offices:

1) No. Offices – One (1)

2) Shared Office Space – One (1)

3) Bathrooms – Two (2)

7. Parking:

a. Main Field Office: A minimum of six parking spaces shall be provided at the new Engineer's Field Office Complex for the exclusive use of the Engineer.

b. Satellite Office: A minimum of two parking spaces shall be provided at the new Engineer's Field Office Complex for the exclusive use of the Engineer.

B. Security Systems

1. The trailer(s) shall be provided with approved Fire, Panic, and Intrusion alarm systems. The alarm system shall be connected via the telephone service in the trailer to an approved central monitoring station so that continuous monitoring will be in effect.

a. Fire Alarm System. In each of the smaller offices, heat detectors rated at 135 degrees F shall be located in the ceiling and as close to the middle of the room as possible. The larger office(s) shall have a single unit that will detect both heat and smoke. The fire system shall be wired directly to a central control panel. Upon activation of the fire system, sirens with a steady tone will sound the fire alert. All sirens will automatically shut down and re-arm after fifteen minutes.

b. Intrusion and Panic Alarm System. Each opening (doors and windows) shall be protected so that if they are opened while the system is activated, an alarm condition will result. Upon activation of the intrusion system, sirens with a modulating tone will sound an alert. All sirens will automatically shut down and re-arm after ten minutes.

    1) Panic alarm units shall be installed in two locations as designated by the Engineer. When this system is activated, there will not be a siren response; this system will be activated in the silent mode.

    2) A remote tamper proof turn off switch shall be installed on the outside of the trailer at a location designated by the Engineer so that the intrusion system can be shut down before entering the field office. The remote turn off switch shall not affect the fire or panic system; turn off switches for these systems shall be located as directed by the Engineer. The intrusion and panic system shall be connected to the central control panel located in the City's field office trailer.

c. Control Equipment

    1) All wiring shall be to be current standards being used in the alarm industry and, where possible, all wires shall be hidden.

    2) All contacts shall be recessed and moisture proof.

    3) The single unit smoke and heat detectors shall be of a photoelectric type that provide quick response to flaming and smoldering fires and designed to permit easy entry of smoke from any direction. The heat detector portion of this unit shall be activated at 135 degrees F. The combined unit will also have a LED pulse located on the face of the unit to indicate that power is on. No radioactive materials will be permitted in this fire alarm sensor.

    4) An 8-ohm siren will be provided. The siren will be installed in a tamper proof steel siren box located on

the exterior of the trailer at least 10 feet above the top of the trailer roof.

a) The external siren shall be of 30-watt capacity with two separate and distinct alarm signals for both warble and continuous tone selections so as to differentiate between fire and burglar alarm. It shall be Ademco Model No. 715 "Blaster" electronic siren in tamper proof cabinet or approved equal. There shall be an amber strobe light attached on or adjacent to the siren box, wired so that it is activated when the siren is activated.

b) The outside wiring shall be installed in protective seal conduit.

5) Control panel shall be provided and installed in the field office trailer. The control panel shall be equipped with at least three channels - one for fire, second for intrusion and third for panic. The control panel shall also have DC batteries that will supply back-up power in the event that AC power is interrupted. Each channel of the control panel will be wired directly to a digital communicator. The control panel shall have one delay entrance exit channel. The control panel and system shall be a 12-volt system.

a) The control panel shall have indicating lights that indicate the mode of the:

(1) Protective circuit

(2) Alarm memory

(3) AC power on

(4) Armed and a switch for bell/battery test and fire reset

6) The digital communicator shall be provided furnished and installed adjacent to the control panel in the field office trailer. It shall be of a type that will notify the approved central station of the specific alarm condition (fire, intrusion, or panic). The digital communicator will also inform the approved central station of low power on the system. The Contractor shall arrange through the New York Telephone Company for the necessary interconnect equipment so that the digital communicator may be connected to the telephone service at the field office trailer. The connection of the New York Telephone Company shall have line seizure

so that the outgoing signal from the digital communicator cannot be interrupted. The current standards used by approved central station regarding "call back to verify" alarm conditions shall be employed.

a) The Contractor shall provide a minimum of four external floodlights to illuminate the Engineer's trailer and surrounding walkways. They shall be activated by a photoelectric unit with a backup timer.

7) The Contractor shall provide and install a complete security system as outlined above. All costs, including connection to the New York Telephone Company, central station monitoring and repair and maintenance charges shall be borne by the Contractor; the costs thereof shall be included in lump sum price bid for the Contract.

C. Office Furniture

1. All furnishings and equipment shall be provided new and unused. All furnished equipment shall be periodically provided with consumable ancillary supplies such as: toner, cartridges, paper and with maintenance / repair and servicing contracts for the entire duration of the Contract. The maintenance response time shall be not more than 24 hours from the time of notification.

2. Office furniture must comply with “Mayoral Directive No.1-91 Procurement and Ergonomic Standards for Video Display Terminals and Ancillary Furniture and Equipment” dated January 25, 1991.

3. Furnish and install office furniture as shown in Table 1, attached, and as directed by the Engineer.

4. Office Chairs: Five-point, high backed, cushioned swivel chairs with seat-height adjustment

5. Conference Chairs: Five-point, high backed, cushioned swivel chairs with seat-height adjustment.

D. Kitchen

1. The kitchen shall be provided with items as shown in Table 2, attached.

2. Under Counter Water Filter with Test/Odor Cartridge

a. The filter shall conform with and be listed under NSF Standard 42 (Class II).

3. Microwave:

a. Minimum capacity: 1.4 cubic feet.

b. Minimum wattage: 1,100 watts with multiple power settings.

c. Touchpad controls.

d. 120 volt, single phase, UL listed.

4. Miniature Refrigerator

a. Minimum capacity: 4.4 cubic feet.

b. Full width freezer compartment with minimum capacity of 0.5 cubic feet.

c. Interior light.

d. 120 volt, single phase, UL listed.

E. Bathrooms

1. The bathrooms shall be properly ventilated and shall be equipped with the following:

Item	Main Field Office Quantity	Satellite Office Quantity
Flush toilet	Two (2)	One (1)
Shower stall with hot and cold running water	--	--
Sink with hot and cold running water	Two (2)	One (1)
Mirror	Two (2)	One (1)
Medicine cabinet	Two (2)	One (1)

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. General

1. The Contractor shall, as specified and approved in accordance with the requirements of all appropriate laws, ordinances, and regulations, furnish, install, equip, maintain, and service the Resident Engineer's Field Offices.

2. The Contractor shall obtain and pay for all permits.

3. The Contractor shall be fully responsible for providing and securing all necessary permits and approvals associated with potable water and sewage

services for the Resident Engineer's Field Offices as well as the Contractor's Field Offices as described in this section.

4. Each office shall be complete with electrical and plumbing hook-ups to be available during the construction period for the exclusive use of the Resident Engineer. The trailers shall be installed at the sites at locations specified by the Engineer. All built-in movable equipment including, but not limited to: fire alarm system, new telephone system, computer system, security system, and portable bi-directional communicator shall be installed and made operable and ready for use by the Contractor.

5. Concrete block foundation walls shall be constructed as directed. The walls and footings shall completely enclose the bottom of each trailer. A wooden platform with stairs and handrails shall be provided adjacent to each entranceway. The site of the trailer shall be graded as directed by the Engineer.

6. All exterior items not factory painted shall be painted by the Contractor as directed by the Engineer.

B. Office Space

1. The floor space as stated herein and shall be a weatherproof and thermally insulated structure, and have separate and adequate means for easy and safe entry and egress. It shall have a sufficient number of windows to permit convenient use for engineering office work, as is appropriate, in normal daylight without the use of artificial light. The office shall be partitioned and furnished as specified herein. Install a fire, intrusion, and panic alarm system.

C. Electrical Installations:

1. The trailer and electrical system therein shall be properly grounded by the Contractor. The Contractor shall provide extended electrical service as required to service all equipment in the trailer and as indicated above. All electrical energy costs for the offices will be borne by the Contractor.

D. Heating and Air Conditioning Installations:

1. The Contractor shall place in operation and maintain the heating and air conditioning units. The system shall be maintained and repaired and kept in good operating condition during the performance of the Work. The HVAC system shall be serviced for maintenance 2 times per year.

E. Contractor's Field Office

1. Trailers utilized by the Contractors shall present a clean and neat exterior appearance and shall be in a state of good repair. Trailers which, in the opinion of the Engineer, require exterior painting or maintenance will not be allowed on the site.

2. The Contractor's Field Trailer shall be equipped with heating ventilation and air conditioning, suitable fluorescent lighting, potable water and

sanitary connections, steel security mesh protection for each window, exterior security lighting, steps with railing to the trailer door and a security alarm to detect intrusion at each exterior window and door. The Contractor shall be responsible for all costs associated with providing these services.

3. The Contractor shall obtain 120/208 volt electrical service for the trailer and necessary outdoor lighting from a panelboard on-site to be identified by the Engineer.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Field Office Trailer Maintenance

1. The finishing of floors and the painting of exterior and interior surfaces of the field offices shall be as approved by the Engineer.

2. Keep the offices in first class condition during the occupancy by the Engineer and until the completion of all work under the Contract. Promptly replace any damaged or defective parts, including appliances, fixtures, computers and equipment.

3. Janitor Service: Provide full, daily janitorial services for all the offices, including, but not limited to, sweeping, mopping, vacuuming, dusting and garbage removal. The office floors shall be swept daily, and washed at least once per week. The bathroom shall be swept and mopped daily and the water closet, sink and shower shall be cleaned and disinfected daily. Furnish, replace and replenish electric light bulbs and fluorescent tubes, toilet paper, cloth and paper towels, soap, and all other items required to maintain the offices in clean and perfect condition. Windows shall be washed at least once every month. Hang, remove, and store window screens, storm windows, and screen and storm doors when ordered. All maintenance work shall be performed during normal working hours.

4. Furnish fuel and provide service for the heating, cooling and hot water systems, as required, to provide the specified heat, cooling and hot water.

5. Provide for the satisfactory disposal of sanitary and other wastes.

6. Keep the access roads, parking areas, and walks about the field office buildings free and clear of snow and ice.

B. Trailer Removal

1. The Contractor shall remove and dispose of the temporary field office trailer at the end of Contract in accordance with Section 01 74 20 – Construction Waste Management.

END OF SECTION

TABLE 1
OFFICE FURNITURE

Description	Main Field Office Quantity	Satellite Office Quantity
Book cases, 41 inches high by 36 inches wide by 13 inches deep	Four (4)	One (1)
55-gallon trash bin	One (1)	Two (2)
55-gallon paper recycling bin	One (1)	One (1)
55-gallon metal/plastic recycling bin	One (1)	One (1)
7-gallon trash bin	Eight (8)	Three (3)
13-gallon trash bin	Four (4)	One (1)
Doormat	At each entrance	At each entrance
Dry chemical fire extinguishers, UL listed 1A-10BC	Four (4)	Two (2)
Office desks Table Top Width: 60-inches Table Top Depth: 30-inches Drawers: One (1) box drawer, One (1) deep file drawer, One (1) center drawer and locks. Under Table Top: Width: 20 – 24 inches Depth at knee Minimum: 15 inches Depth at toe minimum: 23.5 inches Height to top of keyboard support surface: Adjustability includes 23 – 28 inches Display surface height: Allow viewing angle of 5-30 degrees to center screen	Eight (8)	Three (3)
Office Chairs	Eight (8)	Three (3)
Conference Table	One (1)	--
Conference Table Chairs	Ten (10)	--
Metal Folding Chairs	Eight (8)	Two (2)
Folding tables, 60 inches by 30 inches	Two (2)	One (1)
Plan Racks, suitable for 8 sets of plan	One (1)	One (1)
Five-drawer vertical file cabinet, legal size with lock		
Five-drawer vertical fireproof file cabinet, legal size with lock	Two (2)	One (1)
Cork tack-boards, 48 inches by 72 inches	Two (2)	One (1)
White boards, 48 inches by 72 inches with dry markers, eraser, and marker holding tray	Two (2)	One (1)
Electric Clocks	Two (2)	One (1)

TABLE 2
KITCHEN ITEMS

Description	Main Field Office Quantity	Satellite Field Office Quantity
Wood kitchen cabinets with Formica counter tops	15 linear feet	--
Electric bottle-less water filtration system with hot and cold outlets Model: Aqua-Pure AP - 200, with the Aqua-Pure AP 217 taste/odor cartridge	One (1)	One (1)
Microwave oven	One (1)	One (1)
Automatic drip coffee maker	One (1)	One (1)
Miniature Refrigerator	Two (2)	One (1)
Overhead kitchen cabinets	15 linear feet	--
Tables, 60 inches long by 30 inches wide	One (1)	--

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to furnish and install field office equipment and supplies, complete and operational.

1. The Contractor shall also provide servicing of the resident engineer's field offices.

2. Attachments

a. Table 1 – Field Office Equipment

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Data sheets for all office equipment, supplies and services to be provided under this Section including but not limited to the following:

1) Network

2) Printers and Copying Machines

3) Conference Speakerphone.

4) Internet Service.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Combination Copy, Printer, and Scanner Machine: Provide the latest model copy machine from the following brands that meets the requirements specified herein:

1. Work Center 7835 as manufactured by Xerox® Corp.

2. HP Laser Jet Enterprise Flow as manufactured by HP

3. WorkForce ® Enterprise AM Series as manufactured by Epson

4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Provide all furnishings and equipment specified herein new and unused.

B. Provide field office equipment for each trailer(s) in accordance with Table 1 and as directed by the Engineer.

C. All equipment furnished under this Section shall be provided with, at a minimum, the following consumable and ancillary supplies for duration of the Contract:

1. Toner cartridges.

2. Paper.

3. Maintenance / repair service contracts.

a. The Contractor shall provide a service and repair contract via the local representative of the equipment dealer or manufacturer.

b. The service contract shall be for on-call, on-site service during normal business hours.

c. The maintenance response time shall be not more than 24 hours from the time of notification.

D. Provide the following office equipment:

1. The Contractor shall install a LAN System:

a. All cable, conduit, and equipment (installed) necessary to provide a LAN interface from each computer station and the printer.

b. Cable and conduit routing shall be non-invasive and as approved by the Engineer.

c. Provide managed Ethernet switch with sufficient ports for the office equipment specified herein. Power over Ethernet is acceptable for wireless access points and other devices.

d. Provide a sufficient number of 802.3at Wi-Fi access points to provide the following minimum level of service to the entirety of the field office:

1) 1300Mbps at 5 GHz

2) 450Mbps at 2.4GHz

e. The Contractor shall be responsible for providing all appurtenances necessary to connect the managed Ethernet switch to the internet service provider, including underground installation of internet service.

f. Provide cable or fiber optic internet service of 100 MBps speed minimum. Satellite internet service providers are not acceptable.

2. Combination Copy, Scanner, and Printer Machines: The Contractor shall provide two (2) combination copy, scanner, and printer machines.

a. Machines shall be automatic feed type, compatible with the computers.

b. Machines shall operate off the LAN with 10/100 Ethernet Connectivity at a minimum.

c. Machines shall be capable of printing 8½-in. by 11-in., 8½-in. by 14, and 11-in. by 17-in. sheets.

d. Machines shall be capable of printing black and white and color at a resolution up to 1200 x 2400 dpi.

e. Machines shall also have color and black and white scanning capability.

f. Furnish all cable, conduit, and equipment necessary to provide a LAN interface from the managed Ethernet switch to the machines.

g. Cable and conduit routing shall be non-invasive and as approved by the Engineer.

h. The machine shall be designed to produce 110,000 copies per month and shall be dust resistant.

i. Copy function shall be capable of automatically feeding 8½-in. by 11-in., 8½-in. by 14-in., and 11-in. by 17-in. originals.

j. Machine shall be capable of and copying onto plain bond paper sheets at variable magnification from 50% to 200%.

k. The machine shall have an automatic feed tray, a staple function, and an automatic copy sorter.

l. The paper tray for each size paper shall hold at least 144 sheets.

m. Machine shall be capable of scanning to TIFF and text searchable PDF. Machine shall have scan to e-mail function.

n. The Contractor shall obtain and pay for a service and repair contract with a local representative of the copy machine dealer or manufacturer for on-call daily on-Site service.

o. The Contractor shall furnish powders, cartridges, chemicals, or other materials required for proper operation of the copy machine and paper supply.

3. Conference Speakerphone

a. Provide dual USB-A/C and Bluetooth connectivity

b. Compatible with Microsoft Teams, Zoom, and other Unified Communications (UC) platforms.

4. Work Station Equipment

a. Each work station shall be supplied with one monitor, one keyboard, one mouse, one mouse keyboard and all required cables.

b. Monitors shall be 27-inch flat panel LED color monitors with touchscreen capabilities.

c. Mouses shall be laser-type with scroll-wheel.

5. Conference Room Monitor

a. Conference room monitor shall be 60-inch flat panel LED color monitor.

b. Provide required cables or other wireless means of projecting a computer screen to the monitor.

6. Power Strips with Surge Protection

E. Office Supplies:

1. The Contractor shall furnish all office supplies required by the Engineer and his staff during the course of construction.

2. Items shall include but not be limited to note pads, pens, pencils, paper clips, rubber bands, labels, manila folders, envelopes, erasers, hanging folders for filing cabinets, ink pads, etc. and all ancillary supplies necessary to operate the facsimile and copy machine.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. The Resident Engineer's field office shall be completely equipped with office equipment and supplies required under this Section and ready for operations within sixty (60) ccd after the issuance of the Notice to Commence Work and, thereafter, shall be continuously available for the use of the Engineer for the duration of the Work.

3.02 IMPLEMENTATION

A. Maintenance of Equipment and Services:

1. Maintain and repair all office equipment and furnishings in first class condition for continuous operation.

2. Internet service:

   a. Provide internet service (cable or fiber optic – satellite is not acceptable) in order to adequately service the offices.

   b. The Contractor shall pay the costs for installation of the telephone cables and for supplying and maintaining alarm monitoring and internet service.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Removal of Equipment:

1. At the completion of all Work and as directed by the Engineer, the Contractor shall remove and dispose supplied equipment which shall become the property of the Contractor.

2. The Contractor shall have all services disconnected and capped to the satisfaction of the Engineer.

END OF SECTION

TABLE 1 – FIELD OFFICE EQUIPMENT

Description	**Main Field Office Quantity**	**Satellite Office Quantity**
LAN System	As required for each Work Station, Printer, and Conference Area	As required for each Work Station and Printer
Combination Copy, Scanner, and Printer Machines	One (1)	One (1)
Conference Speakerphone	One (1)	--
Work Station Equipment	Eight (8)	Three (3)
Conference Room Monitor	One (1)	--
Power Strips with Surge Equipment	Fourteen (14)	Three (3)

NO TEXT THIS PAGE

SECTION 01 55 00 – VEHICULAR ACCESS AND PARKING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes:

1. Maintenance of Traffic
2. Site access
3. Truck routes
4. Construction staff parking area
5. Contractor employees' parking area

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 55 26 – Traffic Control

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Maintenance of Traffic

1. The Contractor shall be responsible for maintenance and control of traffic in and out of the Site and at all points of vehicular ingress and egress affected by the Work.

2. All maintenance and protection of traffic shall be done in accordance with Section 01 55 26 – Traffic Control, this Contract and the latest traffic stipulations by New York City Department of Transportation (NYCDOT).

3. Construction-related vehicles and activities shall not impede or otherwise adversely affect the flow of regular traffic traveling on the roads leading to and adjacent to the Work location.

4. Construction-related vehicles and activities shall be understood as including vehicles operated and activities undertaken by the Contractor (including its employees, Subcontractors and visitors). Regular traffic shall be understood as referring to all vehicles other than construction- related vehicles.

5. The Contractor shall ensure that construction-related trucks entering the work area do not queue on or along public roads. Queuing areas for all trucks entering or exiting the Site shall be limited to the areas of disturbance. Compliance with the restriction against the queuing of trucks on or along public roads shall be understood to be a material provision of this Contract.

6. The Contractor shall perform the Work required in this Contract in accordance with applicable traffic and safety rules, regulations, ordinances, and permit conditions.

7. Modifications to existing streets and traffic patterns shall be approved by and in accordance with the requirements of the Mayor's Office of Construction Mitigation & Coordination Council (OCMC). The Contractor shall be responsible for obtaining and paying for this approval whenever the construction operations require modifications to the existing streets or traffic patterns. Traffic safety devices shall be placed as per the Manual of Uniform Traffic Control Devices (MUTCD).

8. When equipment delivered under this Contract is transported as an "oversized load", the Contractor shall maintain traffic in accordance with the requirements of the various federal, State and City agencies having jurisdiction.

9. During the progress of the Work, the Contractor shall provide all temporary construction roads and walkways as required, and shall make ample provisions to prevent interference with the continued maintenance of vehicular traffic on roadways. Any roadways damaged by the Contractor or his/her Subcontractors or materialmen shall be restored to their original condition upon notification by the Engineer that such repairs are required. Such restoration of the roadway shall be at the Contractor's expense. Temporary walkways shall be removed, at the Contractor's expense, prior to acceptance of the Contract.

B. Site Access

1. Access to the Site shall be at locations designated by the Engineer and is subject to change during the progress of the Project.

2. The Contractor shall provide traffic control signage and flag persons as required to ensure access to the Site for the use of all Subcontractors, suppliers and other traffic required for the expeditious completion of the work in accordance with Section 01 55 26 – Traffic Control.

C. Truck Routes

1. During the progress of construction, trucks entering or leaving the site shall utilize only NYCDOT-designated and DEP-directed or approved truck routes. The Contractor shall ensure that its crew members, and its Subcontractors and materialmen and their crew members are fully advised of the designated and directed or approved routes.

2. NYCDOT truck routes are identified on the New York City Truck Route map. Copies of this map can be obtained at the following website: http://www.nyc.gov/html/dot/html/motorist/trucks.shtml.

3. Notwithstanding the foregoing or any other Contract provision, the Contractor understands and expressly consents that the DEP has the right and authority at all times, in the discretion of the Commissioner and/or the Engineer, to require and/or direct alterations, revisions and/or amendments in or to trucking and transportation plans, procedures and any related protocols. The Contractor further agrees that such right and authority includes the right to designate, alter revise and/or amend any such plans procedures and/or protocols including (without limitation of any kind) the truck and tractor-trailer routes to be utilized by the Contractor and all subcontractors and materialmen to and from Shafts, and including usage of local streets, and interstate, federal, state and/or local highways within the City or between the City and other destinations. No such designation, alteration, revision or amendment shall be deemed a Contract change entitling the Contractor to claim additional compensation unless the designation, alteration, revision or amendment relates to a change in routing outside the City and beyond any bridge or tunnel connecting the City to other jurisdictions.

D. Construction Staff Parking Area

1. The parking area identified on the Contract Drawings is limited. The area shall be utilized solely by the Construction Management staff and visitors to the Construction Management Office.

2. The Contractor shall take appropriate actions to ensure that no personal vehicles of its employees, or employees of its Subcontractors or materialmen will be permitted on the Site.

E. Contractor Employees' Parking Area

1. The Contractor Employees Parking Area(s) shall be adequately sized, and shall be provided for and maintained by the Contractor at its sole expense. Contractor agrees that the City shall have no obligation to assist in obtaining nor to make available publicly-owned property for such purposes. It is a contractual requirement that the Contractor implement and enforce this policy, and that the Contractor take any necessary or appropriate actions to ensure compliance with such parking policy by its and its Subcontractors' employees. The Contractor agrees to make appropriate efforts to encourage the use of public transportation and the practice of car-pooling by all such employees.

2. The Contractor shall issue parking badges or stickers to such employees for their personal vehicles, in such form and with such associated documentation as the Engineer may approve, require or modify.

3. The parking badges or stickers shall be displayed in a prominent location upon each employee's vehicle, as may be approved, required or modified by the Engineer.

4. The Contractor Employees Parking Area(s) shall be of a size and situated in location(s) acceptable to the Engineer, and unless otherwise authorized by the Engineer, within 0.5 miles of the Site.

5. The Contractor shall be responsible for the safe and efficient movement of employees between the Contractor Employees Parking Area and the Contractor's Work area.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. Under this Section, the Contractor shall maintain and/or redirect both vehicular and pedestrian traffic and protect the public from all damage to person and property, within the limits of and for the duration of the Contract. Traffic shall be maintained over a smooth traveled way, as approved by the Engineer, which shall be so marked by signs, delineation and/or other methods that a person who has no knowledge of conditions can ride, drive or walk over all or any portion of the highway under construction where traffic is to be maintained.

B. The Contractor is placed on notice that the maintenance and protection of traffic during construction is considered as important and necessary as an item of Work as is the actual construction itself. The Contractor shall at all times conduct the operation in a manner to ensure the safety of motorists, pedestrians and employees.

C. All Work performed and materials furnished under this provision shall be in strict conformity with the Contract Drawings, the Specifications, the final approved Maintenance and Protection of Traffic (MPT) Plan and Schedule of Operations, and subsequent modifications or amendments thereto approved by the Engineer and agencies and departments having jurisdiction. If, in the opinion of the Engineer, maintenance and protection of traffic is not adequate, the City may order the Work to be done by others and deduct the actual cost thereof from payments to the Contractor.

D. The Contractor shall, prior to bidding, thoroughly familiarize himself or herself with the ordinances, rules, regulations and practices of the City of New York. The Contractor is referred to the U.S. Federal Highway Administration Manual of Uniform Traffic Control Devices (MUTCD) and the New York State Department of Transportation (NYSDOT) Supplement to the MUTCD, which shall govern wherever applicable. BEDC EHS Standard for Work Zone Traffic Control shall apply to all work of this Section. The Contractor shall, prior to commencement of work, obtain copies of all said requirements, a copy of which shall be given to the Engineer.

E. As required, the Contractor shall provide all traffic control devices necessary to protect traffic at designated work zones. Traffic control devices specified herein include temporary signs, timber curbs, timber barricades, plastic barrels, temporary chain link fence, and temporary pavement markings. Maintenance and protection of traffic shall remain in place until all proposed work is complete and fully operational in accordance with the Contract Documents.

F. Unless otherwise specified in these Contract Documents, the Contractor shall be responsible for the maintenance of the entire pavement, drainage, potable water and sewage facilities, and other street elements, both old and new, after the effective date of starting any field work and ending on the date of Final Acceptance.

G. In addition to the Work shown in the Contract Documents, the Contractor shall comply with the New York City Department of Transportation Bureau of Highway Operations Standard Specifications, Section 1.06.44.

H. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 56 00 – Temporary Barriers and Enclosures

B. Section 31 25 10 – Dust, Soil Erosion and Sedimentation Control

1.04 REFERENCES

A. U.S. Federal Highway Administration Manual on Uniform Traffic Control Devices (MUTCD)

B. New York State Department of Transportation (NYSDOT) Supplement to the MUTCD for Streets and Highways

C. New York State Department of Transportation (NYSDOT) US Customary Standard Sheets

D. New York City Department of Transportation (NYCDOT) Standard Highway Specifications

E. New York City Department of Transportation (NYCDOT) Standard Details of Construction

F. ASTM B589 - Standard Specification for Refined Palladium

1.05 DESCRIPTION

A. Maintenance of Traffic

1. During working hours, the Contractor shall be responsible for maintenance and control of traffic in and out of the Site at all points of vehicular ingress and egress and shall provide flagmen to warn vehicles on City streets of vehicles approaching from the Site. Flagmen shall be properly attired, equipped and trained according to the regulations of the City of New York and BEDC EHS Work Zone Traffic Control Standard. All roadway closures and minimum lanes of traffic shall be in conformance with the final NYCDOT-Office of Construction Mitigation and Coordination (OCMC) Traffic Stipulations.

2. Modifications to existing City streets and traffic patterns shall be approved by and in accordance with the requirements of the NYCDOT OCMC. The Contractor shall be responsible for obtaining and paying for this approval whenever the Contractor’s construction operations require modifications to the existing streets or traffic patterns. Traffic safety devices shall be placed as per the MUTCD and the NYSDOT Supplement to the MUTCD.

3. When equipment delivered under this Contract is transported as an "oversized load", the Contractor shall maintain traffic in accordance with the requirements of the various City agencies having jurisdiction.

4. During the progress of the Work, the Contractor shall provide all temporary construction roads and walkways as required, and shall make ample provisions to prevent interference with the continued maintenance of vehicular traffic on roadways and shall indemnify and save harmless the City and the Engineer from any expense whatsoever due to the Contractor’s operations over said roadways. Any roadways damaged by the Contractor or Subcontractors or materialmen shall be restored to their original condition upon notification by the Engineer that such repairs are required. Such restoration of the roadway shall be at the Contractor's expense. Temporary walkways shall be removed, at the Contractor's expense, prior to Final Acceptance of this Contract.

5. The Contractor shall provide the minimum lane width at the various work zones as specified in the final NYCDOT OCMC Traffic Stipulations or as directed by the Engineer. Vehicular traffic at driveways to adjacent properties shall be maintained at all times, other than at the time of

construction, and shall provide temporary steel road plates at all times. Temporary traffic detours shall be implemented according to the approved MPT Plan or as directed by the Engineer.

A. ATTACHMENTS:

1. Exhibit A –NYCDOT OCMC Traffic Stipulations.

1.06 QUALITY ASSURANCE

A. Standards

1. The Contractor shall comply with the MUTCD, the NYSDOT Supplement to the MUTCD, the NYCDOT Standard Highway Specifications, BEDC EHS Standard for Work Zone Traffic Control, and all applicable Federal, State and Municipal codes including revisions to date of Contract.

B. Requirements of Regulatory Agencies

1. Prior to proceeding with construction Work, the Contractor shall submit an MPT Plan and a Schedule of Operations to the NYCDOT-OCMC, 7th Floor, 55 Water Street, New York, NY 10041, for review and approval, and for obtaining final written Traffic Stipulations. The Contractor shall adhere to any and all requirements identified in the NYCDOT-OCMC final Traffic Stipulations, and in addition the Contractor must also adhere to the following:

a. The Contractor shall be required to organize and attend a pre-construction meeting with the NYCDOT-OCMC and shall comply with all requirements issued by that agency. The Contractor shall notify both the City and the Engineer of the scheduled meeting.

b. The Contractor shall notify NYCDOT-OCMC 30 calendar days prior to the start of Work.

c. To permit finalization of traffic control measures, the Contractor, ten (10) days prior to the start of Work, shall arrange for an on-site field meeting with NYCDOT-OCMC. The Contractor shall notify both the City and the Engineer of the scheduled meeting.

d. Access must be provided for local and emergency vehicles at all times. A copy of the final NYCDOT-OCMC Traffic Stipulations shall be made available on the construction site at all times.

C. Permits

1. The Contractor shall obtain all necessary permits required by the NYCDOT. Such permits shall be maintained in effect for the entire duration of the Contract. Should the Contract time be extended, the Contractor shall obtain all necessary additional permits.

2. The Contractor shall obtain and pay for all required permits, fees and inspections by authorities having jurisdiction, including but not limited to the NYCDOT Sidewalk Roadway and Closure Application.

3. The Contractor shall also comply with the requirements specified in Section 01 41 00 – Regulatory Requirements.

D. Qualifications of Manufacturers

1. Products used in the Work of this Section shall be produced by manufacturers regularly engaged in the manufacturing, installing and servicing of similar items with a history of successful production acceptable to the Engineer as specified herein and in accordance with the applicable parts of the Contract Documents.

E. After Hour Work

1. If at any time, the Contractor is required by NYCDOT or deems it necessary to work outside the Normal Project Working Hours, he or she shall obtain all necessary permits and shall notify DEP in advance.

1.07 SUBMITTALS

A. General

1. The Contractor shall submit Shop Drawings as specified herein, including the MPT Plan and Schedule of Operations for the Maintenance and Protection of Traffic.

2. If not included within the MPT the Contractor shall submit a list of certified flaggers identifying the training for each as required by the BEDC EHS Standard.

B. MPT Plan and Schedule of Operations

1. The Contractor, as the Work progresses, shall prepare and submit to the Engineer and any agencies and departments under which responsibility of roadways fall, an MPT Plan and Schedule of Operations for the Maintenance and Protection of Traffic, showing in complete detail the methods, sequences, procedures and facilities proposed for installation. Before the Contractor shall in any way or manner restrict or interfere with the normal flow of traffic, he or she shall first secure written approval from the agencies and departments having jurisdiction of its proposed plan. The MPT Plan and Schedule of Operations shall be prepared, signed and sealed by a Professional Engineer licensed in the State of New York.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. General

1. All temporary signs, temporary concrete barriers, fencing, delineators, barricades, lighting and other warnings and guiding devices shall be as approved by the Engineer, agencies and departments having jurisdiction, and except as otherwise specified, will remain the property of the Contractor.

B. Temporary Signs

1. All materials and the details of fabrication, erection, location, relocation, and assembly shall be per the approved MPT Plan and in accordance with the applicable rules and regulations of the New York City Bureau of Traffic Operations and the NYSDOT Supplement to the MUTCD where applicable and approved by the Engineer.

2. All signs and barricades shall conform to the NYSDOT Supplement to the MUTCD.

3. All materials for the Temporary Traffic Signals shall conform to the latest specifications and drawings on file with the New York City Department of Transportation, Division of Traffic Operations, Signal Engineering and Street Lighting office. The Contractor or an approved Subcontractor must perform this Work.

C. Type III Breakaway Barricade

1. The Contractor shall furnish and install Type III Breakaway Barricade units as necessary or required by the Engineer.

2. Type III Breakaway Barricades shall comply with Section 6.28B of the NYCDOT Standard Highway Specifications and NYCDOT Standard Details of Construction Drawing No. H-1038.

3. If the Contractor elects to substitute any material not listed in this Specification, he or she shall submit evidence acceptable to the NYCDOT that the proposed material is not frangible.

4. If the Contractor elects to use an alternate design, he or she shall submit Shop Drawings in accordance with Section 01 43 20 – Approval of Product Manufacturers.

D. Timber Curb

1. Timber and lumber shall be dense, structural grade Douglas Fir or Southern Yellow Pine.

2. Lag screws shall be 3/4" diameter by ten (10) inches long. Anchor spikes shall be one (1) inch diameter by not less than twenty-four (24) inches long. Splice spikes shall be 40d.

3. Striping shall be done with white and orange enamel as required by NYCDOT Standard Details of Construction Drawing No. H-1012.

4. Reflective material shall conform to the requirements of ASTM Designation B589 "Standard Specification for Refined Palladium."

E. Timber Barricades

1. Timber and lumber shall be dense, structural grade Douglas Fir or Southern Yellow Pine.

2. Reflectorizing materials shall conform to the requirements of ASTM designation B589 "Standard Specification for Refined Palladium."

3. Flashing units for each barricade shall be solar powered with battery backup, or as approved by the Engineer.

F. Plastic Barrels:

1. The Work shall include the furnishing and installing of plastic barrels, sand ballast, and flashers (for every fourth barrel). The barrels are to be placed as indicated on the plans or as directed by the Engineer. The barrels shall be maintained and replaced as required during the various stages of construction. Barrels and flashers shall be in accordance with NYCDOT Standard Details of Construction Drawing No. H-1049.

G. Temporary Construction Fencing:

1. All materials shall be in accordance with Section 01 56 00 – Temporary Barriers and Enclosures.

H. Temporary Pavement Marking Tape

1. As required, the Contractor shall provide, install and remove temporary paste-on pavement markings.

2. Pavement markings tape shall be 4-inch wide white "Flex-O-Line" as manufactured by FOL Tape, Fenton, MO., "Scotch Lane" as manufactured by 3M Company, St. Paul, MN, or approved equal.

I. Precast Concrete Median Barrier (Jersey Barrier):

1. The Contractor shall furnish and install precast concrete barriers as necessary or required by the Engineer. All materials shall be in accordance with NYCDOT Standard Highway Specifications, Volume II, Section 6.59.3.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Verification of Conditions

1. The Contractor shall examine the areas and conditions under which work of this Section will be installed and correct conditions detrimental to proper and timely completion of the Work. He or she shall not proceed until all unsatisfactory conditions have been corrected.

3.02 ERECTION

A. General Construction Details

1. Construction work shall be conducted in such a manner as to provide minimum interference of normal pedestrian or vehicular traffic. In some cases, it will be necessary to block walks and driveways. Prior to blocking or obstructing walks and/or driveways, the Contractor shall provide sufficient notice (48 hours) to a responsible person in each residence or commercial establishment.

2. The Contractor shall not close or obstruct any portion of a street, road or private way without first obtaining permits from the proper authorities. If any street, road or private way shall be rendered unsafe by the Contractor's operations, he or she shall make such repairs or provide such temporary ways or guards as shall be acceptable to the Engineer and to the proper authorities.

3. The Contractor, who shall assume and have full responsibility for the adequacy and safety of provisions made therefore, shall maintain streets, roads, private ways, and walks not closed passable and safe.

4. Where streets or portions of streets, now in use, are included for paving or repaving work under this Contract, the Contractor shall be responsible for the maintenance of such streets or portions of streets, prior to the performance of said paving or repaving work. The maintenance of such streets shall include any repairs, as directed, including the filling of potholes, that may be necessary due to usage of the streets by traffic, and shall start from the date of written notice to commence work or actual start of work, whichever is earlier.

5. The Contractor shall notify the Police and Fire Departments in writing, with a copy to the Engineer, at least 24 hours in advance of a proposed closure of a street or roadway. He shall cooperate with the Police Department in the establishment of alternate routes and shall provide adequate detour signs, plainly marked and well lighted, in order to minimize confusion.

6. The Contractor is required to submit to the Engineer, and appropriate agencies and departments responsible for the roadway involved, a plan and schedule of his method of operations on any detour. If the Contractor proposes any modifications, amendments or changes in location for detours as called for, or proposes new detours, such changes and additions to the maintenance of traffic must be brought to the immediate attention of the Engineer and responsible agencies and departments involved.

7. The Contractor shall furnish, erect and maintain at closures, intersections and at all other locations, where required, all necessary standard or approved barricades, suitable and sufficient lights, torches, approved reflectors, danger signals, warning and closure signs, directional detour signs and whatever additional measures the Engineer may deem necessary for proper control of traffic and for the safety of all concerned, all in accordance with the rules and regulations of the NYCDOT Bureau of Traffic Operations. He or she shall indicate by day and by night the impassable and dangerous conditions existing on or adjacent to the site of the work. He or she shall provide a sufficient number of watchmen and take all necessary and legal precautions for the protection of the work and for the safety of the public, as required by the Contract. All barricades, danger signals, warning signs and obstructions shall be illuminated at night and all lights shall be kept burning from sunset until sunrise.

8. Barricades shall be placed parallel to, adjacent to and on both sides of excavations for curbs and sidewalks. Each line shall have a clear space of not more than twenty-five (25) feet between barricades. Barricades shall be Type III Breakaway Barricades complying with the REGULATION MANUAL ON TEMPORARY TRAFFIC CONTROL BY STREET BARRICADES AND CHANNELIZATION issued by the NYCDOT Bureau of Traffic Operations. Each barricade shall have at least one (1) solar powered flash-type warning device with battery backup affixed thereon, as approved by the Engineer.

9. The Contractor shall furnish material, labor and equipment at any time, day or night, to immediately repair, remedy and prevent washouts, formation of holes, ruts and depressions, sunken trenches and the destruction or sinking of temporary pavements, both when the work is under way, and when the work is temporarily suspended for any period of time. Special attention shall be given to maintenance of a satisfactory travel way over weekends, holidays and nights.

10. In the case of traffic being diverted from the accustomed traveled way, onto the road shoulder or onto an area not immediately affected by the actual construction work, occasioned by the location of the trench, excavation, materials or equipment, the shoulder or areas outside of the project so affected, shall be restored to a condition equal or better than the original condition. This shall apply equally as well to those pavements or any detours or a designated area, over which traffic was routed.

11. The Contractor shall keep the travel way free of foreign objects such as rocks, timber and other items that may fall from transporting vehicles. Spillage of material carried by or dropped from the under-carriage of any carrying vehicle resulting from the Contractor's hauling operations along or across any public travel way, shall be removed immediately and such travel way, both within and outside of the Contract limits, shall be kept free of such spillage by the Contractor. Existing pavement and shoulder surfaces along or across any public travel way shall be cleaned at a minimum of once per week with a mechanical street sweeper. This shall include all truck routes to and from the project site. The Engineer shall approve all cleaning equipment prior to use. Cleaning shall continue until adequate cleaning results as determined by the Engineer.

12. Whenever dusty conditions resulting from the Contractor's operations occur, they shall be corrected by sweeping the area to remove excess materials and by spraying the area with water to control any dust in accordance with Section 31 25 10 – Dust, Soil Erosion and Sedimentation Control.

13. Whenever it becomes necessary to maintain and limit traffic to one lane, the Contractor shall provide adequate traffic controls on the section of highway or roadway on which vehicle operation is maintained. He or she shall employ a sufficient number of competent flagmen and/or temporary traffic lights operating continuously during the time traffic is so maintained. In the event the length of the one-lane operation is extremely short and conditions are favorable to safe operation, the Engineer may, in writing, authorize the Contractor to dispense flagmen or traffic control signals.

14. The Contractor shall also provide a sufficient number of competent flagmen in areas where traffic is congested, particularly where construction equipment is operating.

15. The Contractor shall provide an adequate travel way as specified and devote particular attention to all drainage facilities, keeping them fully operative at all times.

16. The Contractor shall furnish and erect temporary fencing around all unattended excavations. Lighted barricades and warning signs shall also be used around the perimeter and at a significant distance away from the excavation in each traffic flow direction (whether vehicular or pedestrian) so as to warn vehicles or pedestrians of the existence of the excavation.

    a. Temporary wire fences shall be furnished and installed at the site by the Contractor and shall completely enclose all excavations, steep embankments and other potentially hazardous locations as soon as such a condition is apparent and as ordered by the Engineer. This fence is in addition to any provision that the Contractor would normally follow to safeguard such Work operations as specified in Section 01 56 00 – Temporary Barriers and Enclosures, and in no

way reduces the Contractor's obligations as required by the Contract Documents.

b. Excavation for basins, inlets, manholes, seepage basins, pipe connections, sewers and other miscellaneous structures shall be protected by installing a five (5) foot high, 2" x 4" mesh, #14 gauge, welded-wire fabric fence around the periphery. Stay wires shall be 2" apart; line wires 4" apart. Wire fabric shall be securely attached to approved posts which are driven into the ground. Maximum post spacing shall be eight (8) feet. The said excavation shall be further protected by the use of barricades.

c. The Contractor shall furnish, erect, relocate, maintain and remove all temporary fencing required under this Section.

d. The Contractor will be permitted to remove such portions of the fencing as may be required for his operations during working hours, providing that the public is continuously safeguarded by other satisfactory means during these operations. In all such cases the fence must be restored at the end of each workday.

e. The fence and warning devices shall be maintained in good repair throughout the duration of the work and shall be removed upon completion of the work.

17. Decking, in general, shall consist of heavy, adequately sized, steel plates completely covering excavations where pedestrians and vehicular traffic make this decking operation necessary.

18. The Contractor shall construct and maintain at all times, where called for or as directed, temporary bridges or bridging across pipe trenches, excavations, obstructions and newly-laid pavements, to provide adequate ingress and egress for pedestrian and vehicular traffic to and from private driveways, business and commercial establishments or for main street intersections and heavily traveled crossings. The Contractor will be required, after the installation of all pipes and necessary appurtenances thereto, to immediately backfill and compact all trenches to existing grade, to permit the resumption of traffic without delay.

19. Steel plates shall be provided over all excavations in front of driveways and excavations over which pedestrian or vehicular traffic is to be maintained. Plates shall be of a thickness sufficient for the loads to be carried and shall have not less than two (2) feet of bearing on either side of an excavation. Width of plates for vehicular traffic shall not be less than ten (10) feet, and for pedestrian traffic not less than four (4) feet. Plates for pedestrian traffic shall be equipped and approved, dismountable handrails on both sides, for the full lengths of plates. The Contractor shall be responsible for the adequacy of all plates.

20. During all phases of construction, provisions shall be made for access for all emergency vehicles, such as firefighting equipment, police vehicles, ambulances, etc.

21. The Contractor shall furnish and maintain, as required and as directed by the Engineer, reflectorized signs for the information of the motorist, and to adequately and legally post the highway under construction as to its status.

22. The City shall have the right to open to vehicular traffic those areas adjacent to the structures upon which Work has been completed before the final acceptance of all Work. The Contractor shall carry on the remaining Work so as not to interfere with or endanger such vehicular traffic and shall make no claim for damages on account thereof.

23. At the conclusion of the Work, all temporary facilities shall be removed and the area restored to pre-work conditions or better, unless otherwise specified. The Contractor shall, when ordered, remove existing street signs; store, protect and keep them clean. Where necessary to remove such signs, the Contractor shall prepare a location plan prior to removal. He shall replace signs so removed in their original location or as directed, as promptly as possible. Signs not to be replaced shall be cleaned and delivered to the Engineer as directed by him.

24. Signs or markers lost or damaged because the Contractor failed to properly install or maintain shall be replaced at the Contractor's expense.

25. The Contractor shall maintain route marker signs during construction. Should relocation be necessary at various stages of construction, they shall be placed in locations visible to traffic, as directed.

B. Temporary Signs

1. The Work shall consist of the fabrication, furnishing, installation, erection, assembly and maintenance of warning, detour, regulatory, guide and directional signs required to properly stage the Work and maintain traffic and shall include the furnishing and incorporation of sign supports and posts; the furnishing and installation of all fastening devices and miscellaneous appurtenances; and the relocation, removal and disposal of signs or sign assemblies.

C. Type III Breakaway Barricades

1. All methods shall comply with NYCDOT Standard Details of Construction Drawing No. H-1038.

D. Timber Curb

1. Construction of timber curb shall comply with the NYC Bureau of Highways' Standard Drawing H-1012. Spike holes in 12" x 12" timber and in the 2" x 8" splice plates shall be predrilled. Reflective material shall be wrapped around posts, lapped and tacked on a side opposite the traffic face or side of post. After assembly, the front and rear faces and the top of 12" x 12" timbers shall be painted with alternate white and orange stripes. Two

(2) coats of each color shall be used. White stripes shall be thirteen (13) inches wide and orange stripes shall be eleven (11) inches wide.

2. Timber curb units shall be placed where shown or directed with traffic faces flush. Abutting ends of units shall be spliced. Unless otherwise directed by the Engineer, both ends of all units shall be spiked into the ground or surface material. Timber curb shall be maintained in first class condition at all times to the satisfaction of the Engineer. Maintenance shall include the replacement of damaged components; refastening; repainting; anchoring or re-anchoring; replacing and re-affixing reflective material; and re-splicing; all, when necessary or ordered and directed by the Engineer. At the completion of the work or when directed by the Engineer, timber curb shall be removed and disposed of away from the work site.

E. Timber Barricades

1. The Work shall consist of the construction, installation, erection, placement, maintenance, removal and disposal of lighted and unlighted timber barricades. It shall include the furnishing and incorporation, as required, of all timber, lumber, fastenings, anchors, reflectorizing materials, solar powered flashers with battery backup and other warning devices; paints and painting; and furnishing all labor, materials, plant, equipment, insurance and necessary incidentals required and completing the work. Construction of timber barricades shall comply with the NYCDOT Standard Details of Construction Drawing No. H-1013.

2. Lighted timber barricades shall be placed at the locations shown on the plans or designated by the Engineer. Unless otherwise shown on the plans or directed by the Engineer, barricades shall be constructed, installed, erected, placed, reflectorized and lighted in conformity with the applicable rules and regulations of the New York City Bureau of Traffic Operations, for Class I Barricade.

3. Barricades, at all times shall be maintained in a condition satisfactory to the Engineer. Maintenance shall consist of the replacement of all damaged or worn out components; repainting, as required or directed; replacement of reflectorizing materials; and general rehabilitation to keep barricades in good condition during the life of the Contract.

4. Lighting of barricades shall be by solar-powered flashing units with battery backup.

5. At the completion of the Work or when directed by the Engineer, barricades shall be removed and disposed of away from the work site.

F. Plastic Barrels

1. Furnishing and installing plastic barrels will be for the purpose of traffic lane delineation during construction. The barrels shall be placed in a straight line 25 feet apart, within the work area. A flashing light shall be affixed to every fourth barrel. After placement, the barrels shall be filled with sand for one third of their height.

2. At the completion of the Work or when directed by the Engineer, the plastic barrels shall be removed and disposed of away from the work site.

G. Temporary Construction Fencing

1. All methods shall be in accordance with Section 01 56 00 – Temporary Barriers and Enclosures.

H. Temporary Pavement Marking Type

1. Application shall be as recommended by the manufacture or as directed by the Engineer.

I. Precast Concrete Median Barrier (Jersey Barrier)

1. All methods shall be in accordance with the NYCDOT Standard Highway Specifications, Volume II, Section 6.59.4(F) and NYSDOT Standard Sheet 606-36 Precast Concrete Barrier.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NEW YORK CITY DOT

Department of Transportation

Ydanis Rodriguez, Commissioner

OCMC TRAFFIC STIPULATIONS

November 25, 2024

OCMC FILE NO: QEC-24-326
CONTRACT NO: WP-169 CSO-FC-DF
PROJECT: CONSTRUCTION OF FLUSHING CREEK CSO DISINFECTION FACILITIES

PERMISSION IS HEREBY GRANTED TO **THE NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION (NYC DEP)** AND ITS DULY AUTHORIZED AGENT, TO ENTER UPON AND RESTRICT THE FLOW OF TRAFFIC AT THE LOCATION(S) BELOW FOR THE PURPOSE OF CARRYING OUT THE ABOVE NOTED PROJECT, SUBJECT TO THE STIPULATIONS, AS NOTED BELOW:

I. SPECIAL STIPULATIONS

A. **EMBARGOES** – A CONSTRUCTION EMBARGO WILL APPLY TO THOSE LOCATIONS BELOW WHICH FALL WITHIN THE **HOLIDAY EMBARGO** OR ANY OTHER SPECIAL EVENT/CONSTRUCTION EMBARGOES PUBLISHED BY THE BUREAU OF PERMIT MANAGEMENT AND CONSTRUCTION CONTROL.

B. **BIKE LANES** – FOR ANY WORK IN OR AFFECTING A BIKE LANE, THE PERMITTEE MUST COMPLY WITH THE **NEW GUIDELINES FOR THE MAINTENANCE & PROTECTION OF TRAFFIC PLAN FOR CYCLING**, WHICH ARE AVAILABLE AT:

https://www1.nyc.gov/html/dot/downloads/pdf/bike-mpt-guidelines.pdf

C. **BUS STOPS/BUS ROUTES** – THE PERMITTEE SHALL PROVIDE WRITTEN NOTICE TO NYC DOT OCMC AND NEW YORK CITY TRANSIT (NYCT) A MINIMUM OF FIVE (5) WEEKS IN ADVANCE FOR LANE/STREET CLOSURES THAT AFFECT BUS STOPS/BUS ROUTES. NYCT MUST APPROVE ANY PROPOSED IMPACT PRIOR TO THE PERMITTEE MOBILIZING.

BRONX	MICHAEL WALLIN (MICHAEL.WALLIN@NYCT.COM)
BROOKLYN	BRENNAN ORTIZ (BRENNAN.ORTIZ@NYCT.COM)
MANHATTAN	PHILIP SPEIDEL (PHILIP.SPEIDEL@NYCT.COM)
QUEENS	JIE LI (JIE.LI@NYCT.COM)
STATEN ISLAND	COLIN HARRINGTON (COLIN.HARRINGTON@NYCT.COM)

D. **ACCESS TO ABUTTING PROPERTIES** – THE PERMITTEE SHALL COORDINATE ALL ACTIVITIES WITH ABUTTING PROPERTY OWNERS TO ENSURE ACCESS IS PROVIDED TO/FROM ENTRANCES/DRIVEWAYS AT ALL TIMES.

E. **BIKE SHARE STATIONS:** THE PERMITTEE SHALL NOT REMOVE, RELOCATE, DAMAGE OR DISRUPT THE OPERATION OF EXISTING BIKE SHARE STATIONS WITHOUT FIRST CONTACTING NYC BIKE SHARE AT 855-245-3311 FOR THEIR REQUIREMENTS PRIOR TO COMMENCING WORK.

F. **CITYBENCH:** THE PERMITTEE SHALL NOT REMOVE, RELOCATE, DAMAGE OR DISRUPT AN EXISTING CITYBENCH WITHOUT FIRST CONTACTING NYC DOT AT 212-839-6569, OR VIA EMAIL AT CITYBENCH@DOT.NYC.GOV PRIOR TO COMMENCING WORK.

G. **NYC DOT STREET FURNITURE:** THE PERMITTEE SHALL NOT MOVE, DAMAGE OR DISRUPT ANY EXISTING WALKNYC WAYFINDING SIGNS, BIKE RACKS, BENCHES, LEANING BARS, GRANITE BLOCKS, OR PLANTERS ON THE SIDEWALK OR ROADWAY. THE PERMITTEE MUST CONTACT NYC DOT VIA EMAIL AT STREETFURNITUREUNIT@DOT.NYC.GOV A MINIMUM OF TWO (2) WEEKS PRIOR TO COMMENCING ANY WORK WHICH IMPACTS ON THE STREET FURNITURE.

H. **PROTECTION OF NYC DEP GREEN INFRASTRUCTURE:** THE PERMITTEE SHALL TAKE PRECAUTION OF NYC DEP GREEN INFRASTRUCTURE IN THE RIGHT-OF-WAY. PERMITTEE MUST CONTACT NYC DEP 48 BUSINESS HOURS BEFORE CONSTRUCTION STARTS AT GIUTILITY@DEP.NYC.GOV FOR FURTHER INSTRUCTION ON HOW TO PROCEED. ALSO, THE PERMITTEE MUST FOLLOW NYC DEP'S GREEN INFRASTRUCTURE PROTECTION REQUIREMENTS AT **HTTPS://WWW1.NYC.GOV/SITE/DEP/WATER/GREEN-INFRASTRUCTURE.PAGE**. PERMITTEE IS RESPONSIBLE FOR RESTORATION, REPLACEMENT, OR RECONSTRUCTION OF DAMAGED DEP GREEN INFRASTRUCTURE ASSETS IMPACTED BY THE PERMITTEE AS DIRECTED BY DEP.

I. **PROTECTION OF NYC DEP PERMEABLE PAVEMENT:** THE PERMITTEE SHALL TAKE PRECAUTION OF NYC DEP PERMEABLE PAVEMENT IN THE RIGHT-OF-WAY. PERMITTEE MUST CONTACT NYC DEP 48 BUSINESS HOURS BEFORE CONSTRUCTION STARTS AT GIUTILITY@DEP.NYC.GOV FOR FURTHER INSTRUCTION ON HOW TO PROCEED. ALSO, THE PERMITTEE MUST FOLLOW NYC DEP GREEN INFRASTRUCTURE PROTECTION REQUIREMENTS AVAILABLE AT **HTTPS://WWW1.NYC.GOV/SITE/DEP/WATER/GREEN-INFRASTRUCTURE.PAGE**. PERMITTEE IS RESPONSIBLE FOR RESTORATION, REPLACEMENT OR RECONSTRUCTION OF DAMAGED DEP GREEN INFRASTRUCTURE ASSETS IMPACTED BY THE PERMITTEE AS DIRECTED BY DEP.

NYC Department of Transportation
Bureau of Permit Management and Construction Control
55 Water Street - 7th Floor, New York, NY 10041
T: 212.839.9637 F: 212.839.8970
www.nyc.gov/dot

OCMC FILE NO: QEC-24-326
CONTRACT NO: WP-169 CSO-FC-DF
PROJECT: CONSTRUCTION OF FLUSHING CREEK CSO DISINFECTION FACILITIES

J. **STREETLIGHTS / TRAFFIC SIGNALS:** THE PERMITTEE SHALL NOT REMOVE OR RELOCATE EXISTING STREET LIGHTS OR TRAFFIC SIGNALS WITHOUT FIRST OBTAINING APPROVAL FROM NYC DOT STREET LIGHTING / TRAFFIC SIGNALS UNIT.

K. **TRAFFIC CAMERAS, DETECTION/COMMUNICATION EQUIPMENT:** IF AT ANY TIME DURING THE APPROVED WORK, THE PERMITTEE ENCOUNTERS TRAFFIC SURVEILLANCE CAMERAS, DETECTION EQUIPMENT OR ANY TYPE OF COMMUNICATION EQUIPMENT (WIRELESS OR HARD-WIRED) ON ANY NYC DOT FACILITY, THAT IS NOT INCLUDED ON THE DESIGN/BUILD DRAWINGS, THE PERMITTEE SHALL IMMEDIATELY NOTIFY NYC DOT TRAFFIC MANAGEMENT BY PHONE AT 718-433-3390 OR 718-433-3340 AND VIA EMAIL AT TMC@DOT.NYC.GOV AND AWAIT DIRECTION PRIOR TO CONTINUING WORK.

L. **METERS** – THE PERMITTEE SHALL NOT REMOVE OR RELOCATE PARKING METERS WITHOUT FIRST OBTAINING APPROVAL FROM NYC DOT PARKING METER DIVISION AT 718 – 894 – 8651.

M. **TEST PITS –** THE BELOW TRAFFIC STIPULATIONS DO NOT APPLY TO TEST PIT WORK RELATED TO THIS CONTRACT. WORK HOURS AND OTHER REQUIREMENTS FOR TEST PIT OPERATIONS MAY DIFFER FROM THE STIPULATIONS IDENTIFIED BELOW. THE PERMITTEE SHALL BE REQUIRED TO OBTAIN SEPARATE PERMITS RELATED TO TEST PITS.

N. **NOTIFICATION** – THE PERMITTEE MUST AT LEAST TWO (2) WORKING DAYS BEFORE THE START OF CONSTRUCTION NOTIFY THE NYC FIRE DEPARTMENT, NYC POLICE DEPARTMENT, NYC EMS, LOCAL COMMUNITY BOARD, BOROUGH PRESIDENT'S OFFICE-CHIEF ENGINEER, NYC DOT OCMC OFFICE, AND ALL ABUTTING PROPERTY OWNERS.

O. **TEMPORARY PARKING REGULATIONS/PAVEMENT MARKINGS –** THE PERMITTEE IS REQUIRED TO INSTALL, MAINTAIN AND REMOVE ALL NECESSARY TEMPORARY PARKING AND REGULATORY SIGNS AND PAVEMENT MARKINGS, AND RESTORE THEIR ORIGINAL CONDITION PER NYC DOT STANDARDS, PRIOR TO EXPIRATION OF THEIR PERMIT(S). THE PERMITTEE OR AGENCY PERFORMING PUBLIC OUTREACH SHALL POST AND MAINTAIN ADVISORY SIGNS A MINIMUM OF 48 HOURS PRIOR TO CHANGING EXISTING PARKING REGULATION SIGNS TO APPROVED TEMPORARY CONSTRUCTION PARKING REGULATION SIGNS. THE ADVISORY SIGNS SHOULD BE POSTED ON ALL POLES AND DRIVE RAILS ON THE SEGMENT AFFECTED, INDICATING THE DATE OF THE CHANGE, THE NEW REGULATIONS AND A TELEPHONE NUMBER TO OBTAIN MORE INFORMATION.
   - PER SECTION 2-02 (C)(4) OF THE HIGHWAY RULES, PERMITTEES MUST AFFIX THEIR DEPARTMENT ISSUED FIVE-DIGIT IDENTIFICATION NUMBER USING A WATERPROOF LABEL OR STICKER ON ALL TEMPORARY SIGNS, INCLUDING BUT NOT LIMITED TO TEMPORARY CONSTRUCTION, RAISE PLOW, PARKING OR REGULATORY SIGNS. THE LETTERING MUST BE IN ARIAL FONT, BLACK INK, ¾ INCH IN HEIGHT AND WIDTH, PLACED AT THE LOWER RIGHT-HAND CORNER OF THE FRONT AND THE LOWER LEFT AND RIGHT-HAND CORNERS OF THE BACK OF THE SIGN. THE LABELS/STICKERS MUST BE VISIBLE/LEGIBLE AT ALL TIMES. PERMITTEE MUST REPLACE ANY WORN OR FADED LABELS/STICKERS.

P. **CONSTRUCTION INFORMATIONAL SIGNS** – THIS PROJECT REQUIRES A CONSTRUCTION PROJECT INFORMATIONAL SIGN (CPIS) IN ACCORDANCE WITH NYC DOT HIGHWAY RULE SECTION 2-02 (4) AND (5). CRITERIA AND A PROTOTYPE FOR THIS SIGN MAY BE FOUND ON THE NYC DOT WEBSITE AT: HTTP://WWW.NYC.GOV/HTML/DOT/DOWNLOADS/PDF/DOT_CPIS_DIRECTIONS.PDF

II. ENHANCED MITIGATIONS

A. **"NO STANDING ANYTIME-TEMPORARY CONSTRUCTION" SIGNS** AND TEMPORARY PAVEMENT MARKINGS SHALL BE INSTALLED AND MAINTAINED AS WARRANTED BY THE MAINTENANCE AND PROTECTION OF TRAFFIC (MPT) REQUIRED TO FACILITATE TRAFFIC MOVEMENTS THROUGH THE WORK ZONE. ALL TEMPORARY SIGNS AND PAVEMENT MARKINGS SHALL BE REMOVED UPON COMPLETION OF THE PROJECT.

B. **COMMUNITY OUTREACH** SHALL BE PROVIDED FOR THE DURATION OF THE PROJECT.

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PROJECT: CONSTRUCTION OF FLUSHING CREEK CSO DISINFECTION FACILITIES

III. MAINTENANCE AND PROTECTION OF TRAFFIC

LOCATION(S)	MAINTENANCE AND PROTECTION OF TRAFFIC
1. **COLLEGE POINT BOULEVARD BETWEEN BOOTH MEMORIAL AVENUE AND BLOSSOM AVENUE**	1. Work 10am-4pm Monday to Friday, 5am-1pm Saturday and Sunday, and 10:30pm-5am nightly. 2. During work hours, maintain a minimum of two 11 foot lanes for traffic on each side of the center median with flaggers at each end of the work zone to help direct traffic. 3. Restore all travel lanes to traffic after work hours or when the site is unattended. Locations for on-street storage on construction related material and equipment are to be determined on an as needed basis. 4. Maintain either a minimum 5 foot clear sidewalk or a 5 foot clear protected pedestrian walkway in the roadway adjacent to the work zone for pedestrians. The pedestrian walkway shall be ramped at the entry for handicapped access. Full width of the sidewalk shall be opened to pedestrians after work hours or when the site is unattended.
2. **BLOSSOM AVENUE BETWEEN COLLEGE POINT BOULEVARD AND CROMMELIN STREET**	1. Work 9am-4pm Monday to Friday and 8am-6pm Saturday. 2. During work hours, maintain a minimum of two 11 foot lanes for traffic with one lane in each direction. 3. Restore all travel lanes to traffic after work hours or when the site is unattended. Locations for on-street storage on construction related material and equipment are to be determined on an as needed basis. 4. Maintain either a minimum 5 foot clear sidewalk or a 5 foot clear protected pedestrian walkway in the roadway adjacent to the work zone for pedestrians. The pedestrian walkway shall be ramped at the entry for handicapped access. Full width of the sidewalk shall be opened to pedestrians after work hours or when the site is unattended.
3. **EAST ROAD BETWEEN MERIDIAN ROAD AND EAST ROAD**	1. Must coordinate with the adjacent businesses on the block. 2. Work 9am-4pm Monday to Friday, 5am-6pm Saturday and Sunday, and 8pm-5am nightly. 3. During work hours, maintain a minimum one 11 foot lane for two-way through traffic with flaggers at each end of the work zone. 4. Restore all travel lanes to traffic after work hours or when the site is unattended.

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4. **COLLEGE POINT BOULEVARD BETWEEN 32 AVENUE AND WHITESTONE EXPRESSWAY**	1. Work 10am-4pm Monday to Friday, 5am-1pm Saturday and Sunday, and 10:30pm-5am nightly. 2. During work hours, maintain a minimum of three 11 foot lanes for traffic west of the double yellow center line and a minimum of two 11 foot lanes for traffic east of the double yellow center line with flaggers at each end of the work zone to help direct traffic. 3. Restore all travel lanes to traffic after work hours or when the site is unattended. 4. Maintain either a minimum 5 foot clear sidewalk or a 5 foot clear protected pedestrian walkway in the roadway adjacent to the work zone for pedestrians. The pedestrian walkway shall be ramped at the entry for handicapped access. Full width of the sidewalk shall be opened to pedestrians after work hours or when the site is unattended.
5. **32 AVENUE BETWEEN COLLEGE POINT BOULEVARD AND WITESTONE EXPRESSWAY**	1. Work 10am-4pm Monday to Friday, 5am-1pm Saturday and Sunday, and 10:30pm-5am nightly. 5. During work hours, maintain a minimum of two 11 foot lanes for traffic with one lane in each direction with flaggers at each end of the work zone to help direct traffic. 1. Restore all travel lanes to traffic after work hours or when the site is unattended. 2. Maintain a minimum 5 foot clear sidewalk for pedestrians.
6. **32 AVENUE BETWEEN WHITESTONE EXPRESSWAY AND LINDEN PLACE**	1. Must coordinate with the adjacent businesses on the block. 2. Work 9am-4pm Monday to Friday, 7am-6pm Saturday and Sunday, and 9pm-5am nightly. 3. During work hours, maintain a minimum of two 11 foot lanes for traffic with one lane in each direction. 4. Restore all travel lanes to traffic after work hours or when the site is unattended. Locations for on-street storage on construction related material and equipment are to be determined on an as needed basis. 5. Maintain either a minimum 5 foot clear sidewalk or a 5 foot clear protected pedestrian walkway in the roadway adjacent to the work zone for pedestrians. The pedestrian walkway shall be ramped at the entry for handicapped access. Full width of the sidewalk shall be opened to pedestrians after work hours or when the site is unattended. 6. On the cross streets, maintain a minimum of one 11 foot lane for traffic on one-way streets and a minimum of two lanes for traffic on two-way streets and work 9am-4pm Monday to Friday, 7am-6pm Saturday and Sunday, and 9pm-5am nightly within all intersection except with Whitestone Expressway, where the work hours shall be work 10am-4pm Monday to Friday, 5am-1pm Saturday and Sunday, and 9pm-5am nightly.

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IV. GENERAL NOTES

A. **THIS IS NOT A PERMIT**. This stipulation sheet must be submitted with all requests for permits pertaining to the above contract and present at the work site along with all active construction permits when the approved work is being performed.

B. The Permittee must comply with all Construction Embargos issued by the NYC DOT including the Holiday Embargo.

C. The Permittee shall comply with all requirements of the NYC DOT Special Events Unit as identified below:

1. Street Fairs / Festivals
   - All excavations must be plated with skid resistant plates.
   - Plates must be recessed and flush with pavement.
   - All pavement defects must be corrected within or adjacent to the work zone.
   - The contractor is responsible for any defects within the immediate vicinity if NYC DOT Street & Arterial Maintenance cannot make repairs due to project interference (as determined by NYC DOT).
   - All equipment, trailers and material storage must be removed.

2. Running / Walking / Biking Events
   - All excavations must be backfilled and paved or plates must be recessed and paved over flush with pavement.
   - All pavement defects must be corrected within or adjacent to the work zone.
   - The contractor is responsible for any defects within the immediate vicinity if NYC DOT Street & Arterial Maintenance cannot make repairs due to project interference (as determined by NYC DOT).
   - All equipment, trailers and material storage must be removed.

3. Parades
   - All excavations must be backfilled and paved or plates must be recessed and paved over flush with pavement.
   - Formation and dispersal area plates must be recessed and flush with pavement (Plates must be skid resistant).
   - All pavement defects must be corrected within or adjacent to the work zone.
   - The contractor is responsible for any defects within the immediate vicinity if NYC DOT Street & Arterial Maintenance cannot make repairs due to project interference (as determined by NYC DOT).
   - All equipment, trailers and material storage must be removed.

4. Mayoral Events
   - All excavations must be backfilled and paved or plates must be recessed and paved over flush with pavement.
   - All pavement defects must be corrected within or adjacent to the work zone.
   - The contractor is responsible for any defects within the immediate vicinity if NYC DOT Street & Arterial Maintenance cannot make repairs due to project interference (as determined by NYC DOT).
   - All equipment, trailers and material storage must be removed.

D. All relocation work by the utilities such as; Con Edison, telephone, gas and cable companies shall precede the contractors' start of work on all affected roadways in the impacted contract area.

E. The contractor is advised that other contractors may be working in the general area during the term of this stipulation. In which event, the contractor may require modifications by the OCMC-Streets.

F. The Permittee is not authorized to enter, occupy or use any PUBLICLY OWNED or privately owned, non-paved, landscape or non-landscaped location without specific written permission. When the location is within the right-of-way of a limited-access arterial highway, written approval from the NYC DOT OCMC-Highways is required. When the location is within the right-of-way of a public street or public park, written approval from the New York City Department of Transportation or New York City Department of Parks and Recreation is required. When the location is within the right-of-way of any other jurisdiction such as private property, State, Federal etc., it is the Permittee's responsibility to determine the property owner and obtain the written approval.

G. The Permittee shall adhere to the NYC DOT Bureau of Bridges' Special Provisions for Landscape Protection, Maintenance and Restoration, items 1.18.15 through 1.18.19, whenever and wherever any of the Permittee's activities occur within a limited access arterial highway right - of - way.

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H. NO DEVIATION OR DEPARTURE FROM THESE STIPULATIONS WILL BE PERMITTED WITHOUT THE PRIOR WRITTEN APPROVAL FROM THE OCMC-STREETS. REQUEST FOR SUCH MODIFICATIONS SHALL BE SUBMITTED TO THE OFFICE OF THE OCMC-STREETS, NEW YORK CITY DEPARTMENT OF TRANSPORTATION, A MINIMUM OF TWENTY (20) DAYS IN ADVANCE FOR CONSIDERATION.

I. FOR ANY CONSTRUCTION ACTIVITY RESULTING IN THE FULL CLOSURE OF A ROADWAY FOR MORE THAN 180 CONSECUTIVE CALENDAR DAYS, THE CONTRACTOR MUST PRODUCE AND SUBMIT A COMMUNITY REASSESSMENT, IMPACT AND AMELIORATION (CRIA) STATEMENT TO NYC DOT PLANNING AND OBTAIN THEIR APPROVAL BEFORE APPLYING FOR PERMITS, IN COMPLIANCE WITH THE PROVISIONS OF LOCAL LAW 24 STREET CLOSURE LAW.

J. FOR THIS PROJECT THE CONTRACTOR SHALL FURNISH, INSTALL AND MAINTAIN ALL NECESSARY ADVANCE WARNING AND DETOUR SIGNS, TEMPORARY CONTROL DEVICES, BARRICADES, LIGHTS AND FLASHING ARROW BOARDS IN ACCORDANCE WITH THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES," THE TYPICAL SCHEMES INCLUDED IN THIS SPECIFICATION; AND AS ORDERED BY THE ENGINEER-IN-CHARGE AND THE OCMC-STREETS.

K. THE CONTRACTOR SHALL BE RESPONSIBLE FOR IDENTIFYING HIS CONSTRUCTION SIGNAGE. THE IDENTIFICATION SHALL INCLUDE THE CONTRACTOR'S NAME, SPONSORING AGENCY NAME AND THE CONTRACT NUMBER. THE IDENTIFICATION SHALL BE PLACED ON THE BACK OF THE SIGN. THE LETTERING SHALL BE THREE (3) INCHES HIGH.

L. THE OCMC-STREETS RESERVES THE RIGHT TO VOID OR MODIFY THESE STIPULATIONS SHOULD CONSTRUCTION FAIL TO COMMENCE WITHIN TWO (2) YEARS OF THE SIGNED DATE OF THESE STIPULATIONS.

DUANE BARRA
DUANE BARRA
DIRECTOR
OCMC-STREETS

STEPHEN PINKUS
STEPHEN PINKUS
PROJECT MANAGER – QUEENS
OCMC-STREETS

PART 1 GENERAL

1.01 SUMMARY

A. Maintenance and Protection of Traffic (MPT) devices

B. Fencing

C. Protection of Work, personnel and materials

D. Tree and plant protection

E. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 55 26 – Traffic Control

B. Section 31 10 10 – Site Clearing

1.04 REFERENCES

A. NYC Department of Transportation (NYCDOT) Standard Highway Specifications

B. NYC Department of Transportation (NYCDOT) Standard Details of Construction

C. OSHA Standards 29 CFR 1926

1.05 DESCRIPTION

A. MPT Devices

1. Roads, Parking Areas and Sidewalks

a. The Contractor shall provide, erect and maintain as necessary for the Work, all MPT devices as necessary and in accordance with Section 01 55 26 –Traffic Control. These devices shall include, but not be limited to temporary concrete barriers, timber curb, Type III barricades, barrels, construction signs, warning signs, wide angle reflectors, temporary striping and warning lights along all roads, parking areas and sidewalks that are accessible to the public or City personnel and in such other areas of the Site as needed for the safety of all persons at the Site.

b. Sufficient barricades shall be erected to keep vehicles from being driven on or into Work under construction in accordance with NYCDOT requirements.

2. Excavations

a. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property.

b. The Contractor shall, at its own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workers. Bridges provided for access during construction shall be removed when no longer required.

c. The length or size of excavation will be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by the City and Engineer. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the City and Engineer may require special construction procedures such as limiting the length of the open trench, prohibiting stacking excavated material in the street, and requiring that the trench shall not remain open overnight.

d. The Contractor shall take precautions to prevent injury to the public or City personnel due to open trenches. All trenches, excavated material, equipment, or other obstacles which could be dangerous to the public or City personnel shall be well lit from sunset to sunrise.

3. The Contractor's responsibility for the maintenance of barricades, signs and lights shall continue throughout the duration of the Work. The Contractor shall provide and maintain other warning signs and barricades in other Work areas as may be required for the safety of all those employed in the Work, plant operating personnel, or those visiting the Site.

B. Fencing

1. Temporary Construction Gates and Fencing

a. As required or directed by the Engineer, the Contractor shall furnish and erect a new temporary 10-foot high chain link fence, gates and all necessary incidentals in accordance with NYCDOT Standard Highway Specifications, Volume II, Section 6.34 and NYCDOT Standard Details of Construction Drawing No. H-1021, with the following exception:

1) Fabric for fencing shall be aluminum-coated steel wire with a mesh size of 1-inch, complying with the requirements of AASHTO Designation M 181.

2. Safety Fencing

a. The Contractor shall provide and erect, when required or directed by the Engineer, temporary project safety fencing at the Work Site.

b. The safety fencing shall be a high visibility, orange colored, high-density polyethylene grid or approved equal, a minimum of 42 inches high, supported and tightly secured to steel posts located on maximum 10-foot centers.

3. Fencing shall be maintained by the Contractor for the duration of the Contract. Upon Final acceptance of the Work, fencing shall become the property of the Contractor and shall be removed from the Site, unless otherwise directed by the Engineer.

4. Maintenance shall include, but not be limited to, graffiti removal, repair of cracks and breaks in the fencing, and re-painting of the fencing as directed by the Engineer.

C. Protection of Work, Personnel and Materials

1. Until permanent walls, railings, stairs, hatches, etc., are in place, the Contractor shall be responsible for the installation and maintenance of temporary barricades and temporary railings around openings, stairwells, on temporary or permanent stairs, around the perimeter of elevated floors, landings, permanent ramps, etc. The installation shall be in accordance with the requirements of OSHA Standards 29 CFR 1926 and the codes and regulations of authorities having jurisdiction.

2. During the progress of the Work and up to the date of Substantial Completion, the Contractor shall be solely responsible for the care and protection of all Work, personnel, and materials covered by the Contract.

3. In order to prevent damage, injury or loss, actions taken by the Contractor shall include, but not be limited to, the following:

   a. Store apparatus, materials, supplies, and equipment in an orderly, safe manner that will not interfere with the progress of the Work or the work of any Other Contractor or utility service company.

   b. Provide suitable storage facilities for all materials which are subject to injury by exposure to weather, theft or breakage.

   c. Place upon the Work or any part thereof only such loads as are consistent with the safety of that portion of the Work.

   d. Clean up frequently all refuse, rubbish, scrap materials, and debris caused by the Contractor's operations, to the end that at all times the Site shall present a safe, orderly and workmanlike appearance.

4. The Contractor shall protect the existing work and material from damage by its workers and shall be responsible for repairing any such damage at no additional cost to the City.

D. Tree and Plant Protection

1. Protect existing trees, shrubs, and plants on or adjacent to the Site, shown or designated to remain in place, against unnecessary cutting, breaking, damage, or skinning of trunk, branches, bark, and roots.

2. Do not store materials or equipment or park construction equipment and vehicles within foliage drip lines.

3. In areas subject to traffic, provide temporary fencing or temporary barricades to protect trees and plants.

4. Open fires are not allowed onsite.

5. Within the limits of the Work, water trees and plants that are to remain to maintain their health during construction operations.

6. Cover exposed roots with burlap, and keep such burlap continuously wet. Cover exposed roots with earth as soon as possible. Protect root systems from mechanical damage and damage by erosion, flooding, runoff, and noxious materials in solution.

7. If branches or trunks are damaged, prune branches immediately and protect cut or damaged areas with emulsified asphalt compounded specifically for horticultural use, in a manner acceptable to the Engineer.

8. When directed by the Engineer, remove and dispose of at location away from the Site damaged trees and plants that die or suffer permanent injury, and replace each damaged tree or plant with specimen of equal or better species and quality.

9. Other applicable methods of tree protection shall be as required by Section 31 10 10 – Site Clearing.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Temporary Construction Fencing

1. All materials shall comply with NYCDOT Standard Highway Specifications, Volume II, Section 6.34.2.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 ERECTION

A. Temporary Construction Fencing

1. All methods shall comply with NYCDOT Standard Highway Specifications, Volume II, Section 6.34.3.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 01 57 00 – TEMPORARY CONTROLS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes:

1. General Requirements
2. Prohibited construction procedures
3. Noise Control
4. Dust Control
5. Pest and Rodent Control
6. Pollution Control
7. Care during Welding
8. Notification of Non-Compliance
9. Storm Water Runoff Control
10. Site Security

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 33 00 – Submittal Procedures

B. Section 01 35 55 – Site Security

C. Section 01 57 16 – Temporary Pest Control

D. Section 31 25 10 – Dust, Soil Erosion and Sediment Control

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. General Requirements

1. The Contractor shall furnish all labor, materials, equipment and incidentals required to ensure adequate environmental protection including implementation of all erosion and sediment control measures as directed by the Engineer and specified herein.

2. In the performance of the Contract, the Contractor shall comply with all applicable federal, State and local laws and regulations concerning environmental protection, restoration and erosion and sediment control.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Submit Shop Drawings as specified in Section 01 33 00 – Submittal Procedures.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Prohibited Construction Procedures

1. The following construction procedures are prohibited:

a. Dumping or wasting of spoil material into any stream corridor, any surface waters or at unspecified locations adjacent to the Work area or at locations not approved by the Engineer.

b. Indiscriminate, arbitrary or capricious operation of equipment in any stream corridor or surface waters.

c. Dumping of silt-laden water directly into any stream corridor or surface waters without provision for treatment as noted herein.

d. Damaging vegetation adjacent to or outside of access roads or limited right-of-way for the Work. All construction operations must

be confined within the Contractor's Work limits as shown and/or specified.

e. Disposal of trees, bush and other debris into any stream corridor, any wetlands or at unspecified locations.

f. Open burning of materials.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Cover and Liner Fabric for Stockpiles

1. Cover and liner fabric for stockpiles shall be as specified under Section 31 25 10 – Dust, Soil Erosion and Sediment Control.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Noise Control

1. All sound attenuation measures shall comply with the following City noise code regulations.

a. Exterior Mechanical Equipment: Section 27-770 of the New York City Administrative Code concerns windows of dwelling units facing mechanical equipment and the noise output limitation for

exterior mechanical equipment as measured within the interior of the dwelling unit.

b. Ambient Noise Quality: Title 24, Chapter 2, Subchapter 5 (Prohibited Noise, Specific Noise Sources – Sound Level Standard) of the New York City Administrative Code concerns ambient noise quality criteria and standards which indicates the maximum outdoor sound levels in specific ambient noise quality zones for daytime and nighttime standards.

2. The Contractor's vehicles and equipment shall be operated and maintained so as to minimize noise to the greatest degree practicable. Noise levels shall conform to the latest regulatory standards and in no case will noise levels be permitted which interfere with the work of the on-site personnel.

3. All construction equipment powered by an internal combustion engine shall be equipped with a properly maintained muffler.

4. Air powered equipment shall be fitted with pneumatic exhaust silencers.

B. Dust Control

1. The Contractor shall be responsible for controlling objectionable dust caused by his operation of vehicles and equipment, clearing or for any reason whatsoever. Contractor shall conduct all operations and maintain the area of activity to minimize creation and dispersion of dust.

2. The Contractor shall apply water to keep dust in the air to a minimum. The use of calcium chloride for dust control shall not be permitted.

3. Dust control for construction activities at all work areas shall be as follows:

4. Non-paved roadways and parking areas, which are used for construction traffic, shall be sprayed at least every other hour with water during the hours of construction unless otherwise approved by the City.

5. Contractor shall regrade unpaved roadways and parking areas once a week to the satisfaction of the Resident Engineer.

6. All other construction areas shall be hosed down twice a day with water during the hours of construction, or as deemed necessary by the Engineer

7. The Contractor shall erect runoff barriers or other means to ensure that runoff generated from dust control activities does not enter Flushing Creek or surrounding water bodies and tributaries.

8. The Contractor shall comply with the requirements of Section 31 25 10 – Dust, Soil Erosion and Sediment Control.

C. Pest and Rodent Control

1. Provide rodent and pest control as necessary to prevent infestation of construction or storage area.

2. Employ methods and use materials which will not adversely affect conditions at the Site or on adjoining properties.

3. All chemicals shall be approved by the Engineer prior to their use and shall be safe for use in drinking water environment.

4. The Contractor shall comply with the requirements of Section 01 57 16 – Temporary Pest Control.

D. Pollution Control

1. Provide methods, means and facilities required to prevent contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations.

2. Provide equipment and personnel to perform emergency measures required to contain any spillages, and to remove contaminated soils or liquids.

3. All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, or reactant of other classification, must show approval of the EPA and other recognized certifying agencies. Use of all such chemicals and disposal of residues shall be in strict conformance with regulatory requirements.

4. The Contractor's equipment used during construction shall conform to all current Federal, State, and local laws and regulations.

E. Care during Welding

1. Provide protection of City's workers from welding arcs during the construction by providing adequate welding shields.

F. Notification of Non-Compliance

1. The Engineer will notify the Contractor in writing of any non-compliance with the provisions of this Section and the action to be taken. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or its authorized representative at the Site of the Work, shall be deemed sufficient for the purpose.

2. If the Contractor fails or refuses to comply promptly, an order stopping all or part of the Work may be issued by the City until satisfactory corrective action has been taken.

3. No part of the time lost due to any such stop work orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor, unless it is later determined that the Contractor was in compliance with the provisions of this Section.

4. The Contractor shall be responsible for its Subcontractors' compliance with the provisions of this Section.

G. Stormwater Runoff Control

1. Prevent discharge of sediment to and erosion from the Site to surface waters, drainage routes, public streets and rights-of-way, and private property, including dewatering operations.

2. Prevent trash, demolition waste and construction debris from contaminating storm water runoff.

3. Provide berms, dikes, and other acceptable methods of directing storm water around work areas to drainage routes.

4. Storm water runoff controls shall be inspected daily. Problems and deficiencies shall be brought to the attention of the Engineer and corrected promptly.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Site Security

1. The Contractor shall comply with the requirements of Section 01 35 55 – Site Security.

B. Stockpiling of Materials

1. Stockpiling of excavated materials shall be handled in accordance with Section 31 25 10 – Dust, Soil Erosion and Sediment Control.

END OF SECTION

SECTION 01 57 16 – TEMPORARY PEST CONTROL
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Pest Control Service
2. Regulatory Requirements
3. Material Requirements
4. Packaging
5. Safe Operation

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 35 27 – Environmental, Health and Safety Requirements

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Pest Control Service:

1. The Contractor shall provide the services of a certified, licensed and insured pest control service for the purpose of exterminating and controlling pests at the Project Site whenever construction work is ongoing at the Site until the date demobilization is complete at the Site.

a. The "Site" referred herein refers to the various locations of work as described in Section 01 11 00 – Summary of Work and shown on the Contract Drawings.

2. The Contractor shall provide rodent control as follows.

a. The rodent (i.e., rat) traps shall be effective and adequate in number placed within the site perimeter and at locations directed by the Resident Engineer. Each trap shall be checked monthly to ensure that they are properly baited and in proper working condition. All traps shall be rebaited monthly as required.

3. The Contractor shall provide mosquito control during the summer months as follows.

a. The Contractor shall provide an extermination schedule prior to commencing spraying based on the recommendation of the pest control service and/or the chemical manufacturer.

b. The Contractor shall identify and eliminate standing water as soon as possible. Where the standing water is not a part of the Contract Work or is not under the control of the Contractor, the standing water shall be reported to the Resident Engineer. To the extent possible pools of standing water shall be removed rather than applying insecticide to any pools of standing water to control the breeding of mosquitoes.

4. The Contractor shall furnish all labor, equipment, and materials necessary to implement a Rodent and Insect Control Program.

a. On and around the Resident Engineer's field office, parking lot, guard booth, and portosans.

5. All Work shall be performed by an exterminator licensed in the State of New York and shall comply with all requirements of the New York City Department of Health and Mental Hygiene and New York State Department of Health for rodent and insect control. The exterminator shall only use

products approved by the U.S. Environmental Protection Agency (EPA) for rodent and insect control.

6. The Contractor shall perform one full round of rodent and insect control on and around the areas specified in this Section once every two months from October through May and once every month from June through September.

B. Regulatory Requirements

1. The Contractor and the pest control service shall comply with all Federal, State, City and local ordinances, codes and regulations regarding the following:

a. Performing the pest control service.

b. Utilizing only the pesticides recommended by the manufacturer for the purpose intended and which will not create a hazard to health or property.

c. Cleaning up and disposing of all pesticides and pests.

2. The Contractor shall comply with all requirements of New York City Local Law 37 (LL 37) of 2005 for all City-owned or leased properties, upstate and in-city, including, but not limited to:

a. The prohibition of certain pesticide products for use on New York City property;

b. The requirement for notices at least 24 hours prior to pesticide applications; and

c. Reporting and recordkeeping requirements for upstate and in-city facilities

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. The Contractor shall provide a Rodent and Insect Control Plan

B. The Contractor shall provide, as required by LL 37, detailed information regarding each pesticide application.

1. The Contractor shall ensure that all records are provided to New York City using the NYC Department of Health and Mental Hygiene (DOHMH) Pesticide Use Reporting System (NYCPURS).

a. The Contractor shall confirm that the information regarding any prior month applications has been properly submitted through NYCPURS. A copy of such information shall be included in the monthly Contractor Environmental, Health and Safety (EHS) report in accordance with Section 01 35 27 – Environmental, Health and Safety Requirements.

2. The LL 37 required information, including any necessary prior notifications, shall be provided to DEP on the reporting forms established by the NYC DOHMH or approved equivalent.

   a. This information shall be provided to DEP as part of the monthly Contractor EHS report in accordance with Section 01 35 27 – Environmental, Health and Safety Requirements.

   b. By February 1 of each year, the Contractor shall provide a complete summary of all LL 37 required information for all pesticide applications at the project site (including upstate projects) for the entire prior year.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Pesticides shall be stored, handled, and used in accordance with the manufacturer's label and directions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Pesticides shall be approved commercially available products that are currently registered by the United States Environmental Protection Agency and the New York State Department of Environmental Conservation. Pesticides shall also have all required labels indicated that they are approved for the intended use.

   1. Pesticides prohibited by LL 37 may not be utilized.

B. Pesticides shall be mixed and used in strict conformance with the instructions on the label or supplemental labels.

C. Packaging:

   1. Pesticides shall be delivered and securely stored, until used, in the manufacturer's standard containers that have legible labels affixed in accordance with the provisions of the Federal, State, City and local pesticides laws, rules and regulations in effect at the time of delivery.

   2. Pesticides that do not meet these packaging requirements, at any time, will be rejected by the Resident Engineer and shall be removed from the site immediately.

3. The Resident Engineer shall reject any pesticides that have become wet, caked or otherwise unfit for use.

4. The basis of acceptance shall be original, sealed, and properly labeled pesticide containers.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Before performing any pest control work, the technician shall report to the Resident Engineer 24 hours prior to announce his presence and to ascertain if there are any special areas which need to be addressed.

3.02 IMPLEMENTATION

A. Safe Operation

1. The pest control service shall exercise caution in the application of pesticides and other operations in order not to endanger or injure on-site personnel or the public. Rates and methods of application shall be in accordance with the manufacturer's instructions on the pesticide label.

2. All pesticides shall be delivered in original containers or packaging or in service containers properly labeled as required by law. All pesticides shall be secured at all times against unauthorized access.

3. Residual pesticides and containers shall be disposed off-site in accordance with the label instructions and applicable Federal, State, City and local regulations.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 58 13 – TEMPORARY PROJECT SIGNAGE
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the requirements of the New York City Department of Buildings (DOB) for uniform display of project and safety contact information in the signage posted along construction fences and sidewalk sheds at government-owned or government-funded project sites. Under Local Law 47/13, all miscellaneous construction signs – including City, Contractor and 311 contact information are consolidated in one simplified project information panel. No other signage or permits, unless otherwise required by law, may be posted.

B. Attachments: The following figures are attached to this Section:

1. Figure 1 – Project Information Panel Layout (For Projects with Street Frontage of 60 Feet or Greater)

2. Figure 2 – Project Information Panel Layout (For Projects with Street Frontage of Less than 60 Feet)

3. Figure 3 – Environmental Facilities Corporation (EFC) Construction Sign Schematic: Clean Water State Revolving Fund (CWSRF)

C. The following index of this Section is presented for convenience:

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3.05	Adjusting / Protection / Cleanup	5

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. New York City Local Law 47/13

B. Rules of the City of New York 3301-01 (RCNY 3301-01)

1.05 DESCRIPTION

A. The Contractor shall procure and erect a project information panel at the Project Site identifying the project. The panel shall be erected within 21 days from the date the Contractor is ordered to Commence Work and shall be in accordance with the specifications and details included in this Section.

B. Names of individuals on the Project information panel(s) shall be updated by the Contractor when these names change, at the direction of the Engineer.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Submit the following for approval prior to fabrication of the project information panel:

1. Detailed sketch showing all lettering, dimensions and colors
2. Detailed bill of materials indicating materials of construction for all project sign components.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The project information panel shall be manufactured by one of the following:

1. Mineola Signs, Mineola, New York; http://mineolasigns.com/
2. Or approved equal

2.02 MATERIALS / EQUIPMENT

A. Project Information Panel

1. The Project information panel shall be constructed in accordance with RCNY 3301-1, including the following requirements shown on Figure 1 or Figure 2 attached to this Section. The Engineer will provide project specific information.
   a. For construction sites with a street frontage of 60 feet or greater, the sign dimensions shall be in accordance with Figure 1. For construction sites with a street frontage less than 60 feet, the sign dimensions shall be in accordance with Figure 2.
   b. For projects that are not funded through the New York State Revolving Fund, the information and lettering shown below the sample rendering in Figures 1 and 2 should be removed and the rendering extended to fill that space.
2. Project information panels shall include the following information:
   a. A rendering, elevation drawing, site plan, or zoning diagram of the building exterior that does not contain logos or commercially recognizable symbols;
   b. A title line stating "Work in Progress:" and specifying the nature of the project;
   c. Anticipated project completion date;
   d. Website address to contact for project information;
   e. The corporate name and telephone number of the Contractor;
   f. The following statement, in both English and Spanish, "TO ANONYMOUSLY REPORT UNSAFE CONDITIONS AT THIS WORK SITE, CALL 311";
   g. When applicable, a copy of the primary project permits, with accompanying text "To see other permits issued on this property, visit: www.nyc.gov/buildings." The permit shall be laminated or encased in a plastic covering to protect it from the elements or shall be printed directly onto the project information panel.
   h. The name(s) of government official(s) shall be incorporated into the panel in accordance with Figures 1 and 2.
3. The project information panel shall be constructed of ¾-inch thick plywood panel of the following quality or equal as approved by the Engineer:
   a. High density overlaid exterior type fir plywood panels, 5 ply, B-B grade or better.

b. Each plywood panel shall be resin impregnated on both sides.

4. The content shall be written in the Calibri font or similar Sans Serif font style, with letters a minimum of 1 inch (25 mm) high, as measured by the upper-case character. Such letters shall be white, on a blue background, with such blue color of a shade matching Pantone 296, or RGB 15, 43, 84, or CMYK 100, 88, 38, 35.

B. EFC Clean Water State Revolving Fund (CWSRF) Sign

1. The EFC construction sign shall be constructed of ¾" minimum thickness plywood identical to that specified in 2.02.A.3.

a. For a sample sign layout, refer to Figure 3 - EFC Construction Sign Schematic: DWSRF.

2. Project information panels shall include the following fasteners, sign supports, coating, lettering, and emblem:

a. Fasteners: All fasteners used in the fabrication of the sign shall be rust-proof

b. Sign Supports: The sign shall be adequately supported and braced to remain in the proper positioning and alignment, including resistance to wind loads and toppling of the sign.

c. Coating: All paint or exterior coverings used shall be exterior grade coating suitable for use on wood or the material of construction. The sign face background and sign back shall be white and consist of a minimum two coats of paint.

d. Lettering and Emblem: The sign shall include the following logos in an aspect ratio consistent with other lettering on the sign but not less than a height of 2".

1) The EFC logo available at https://efc.ny.gov/efc-logo-pdf

2) The EPA logo consistent with the EPA Logo and Seal Specifications for Signage Produced by EPA Assistance Agreement Recipients as outlined in https://www.epa.gov/sites/default/files/2015-01/documents/epa_logo_seal_specifications_for_infrastructure_grants.pdf

e. For CWSRF projects, incorporate the following language: "This project is jointly funded by the New York State Clean Water State Revolving Fund and the U.S. Environmental Protection Agency. The CWSRF is administered by the New York State Environmental Facilities Corporation." Other language as shown on Figure 3.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Location: The Project information panel shall be located in a prominent position as determined by the Engineer.

B. Panel Supports: Adequate supports for the Project information panel, including the positioning and alignment of the sign, as determined by the Engineer, shall be provided by the Contractor.

C. Maintenance: The Project information panel shall be maintained by the Contractor in good condition at all times for the duration of the Contract.

D. Removal of Project information panel from Project Site: The Contractor shall remove the Project information panel and supports from the Site when ordered by the Engineer.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

FIGURE 1
PROJECT INFORMATION PANEL LAYOUT
(For Project Sites with Street Frontage of 60 Feet or Greater)



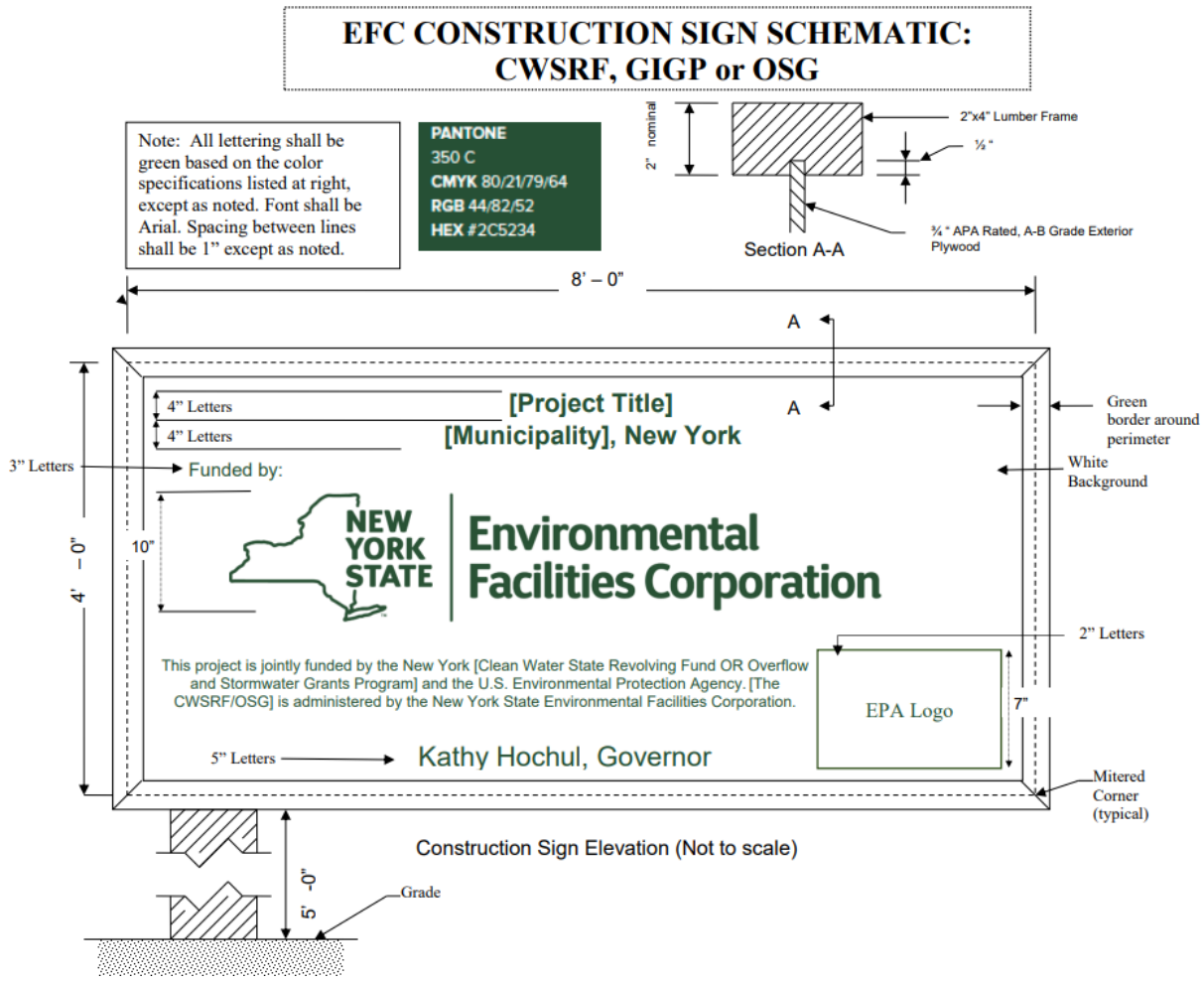
Note: As directed by the Engineer, the wording below the rendering shall be deleted if the project is not funded under the NYS Revolving Loan Fund and the rendering shall be extended to fill in that space.

FIGURE 2
PROJECT INFORMATION PANEL LAYOUT
(For Project Sites with Street Frontage of Less Than 60 Feet)



Note: As directed by the Engineer, the wording below the rendering shall be deleted if the project is not funded under the NYS Revolving Loan Fund and the rendering shall be extended to fill in that space.

FIGURE 3


EFC CONSTRUCTION SIGN SCHEMATIC:
CWSRF, GIGP or OSG
Note: All lettering shall be green based on the color specifications listed at right, except as noted. Font shall be Arial. Spacing between lines shall be 1" except as noted.
PANTONE 350 C
CMYK 80/21/79/64
RGB 44/82/52
HEX #2C5234
2" nominal
2"x4" Lumber Frame
½"
¾" APA Rated, A-B Grade Exterior Plywood
Section A-A
8' – 0"
A
A
4" Letters
4" Letters
[Project Title]
[Municipality], New York
3" Letters
Funded by:
Green border around perimeter
White Background
10"
4' – 0"
NEW YORK STATE
Environmental Facilities Corporation
2" Letters
This project is jointly funded by the New York [Clean Water State Revolving Fund OR Overflow and Stormwater Grants Program] and the U.S. Environmental Protection Agency. [The CWSRF/OSG] is administered by the New York State Environmental Facilities Corporation.
EPA Logo
7"
5" Letters
Kathy Hochul, Governor
Mitered Corner (typical)
Construction Sign Elevation (Not to scale)
5' -0"
Grade

PART 1 GENERAL

1.01 SUMMARY

A. Equipment and appurtenances

B. Delayed approvals

C. Accessories included

D. Contractor's working equipment

E. Excessive loadings

F. Welding

G. Sole plates

H. Grouting

I. Operating instructions

J. Damage during tests and instruction periods

K. Work may be rejected at any time

L. Requirements for electrical work and electrical equipment

M. Service of manufacturer's engineer

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Equipment and appurtenances. Equipment and appurtenances shall be designed in conformity with ASME, ASTM, and IEEE standards, as applicable, and shall be of rugged construction and of sufficient strength to withstand all stresses that may occur during fabrication, testing, transportation, installation and all conditions of operation. Adequate stays, braces and anchors shall be provided. All bearings and moving parts shall be adequately protected against wear by bushings or other approved means and shall be fully lubricated by readily accessible devices. Details shall be designed for appearance as well as utility. Protruding members, joints, corners, gear covers and the like shall be finished in appearance. All exposed welds shall be ground smooth and the corners of structural shapes shall be mitered.

1. Machinery parts shall conform exactly to the dimensions shown on the Shop Drawings. There shall be no more fitting or adjusting in setting up a machine than is necessary in assembling high-grade apparatus of standard design. The equivalent parts of identical machines shall be made interchangeable.

2. All equipment components shall comply with American standards, except where written permission is granted by the Engineer to deviate from such standards. Such standards shall include in part or in whole, but shall not be limited by, the standards, codes, specifications, or tentative specifications adapted and published by technical societies, organizations and bodies specified in the Contract. Thread components made to metric, Whitworth or other foreign standards are unacceptable.

3. All grease lubricating fittings on equipment shall be button head type and samples thereof shall be submitted for approval.

4. All machinery and equipment shall be safeguarded in conformity with the safety codes of the ANSI, OSHA and related New York State and New York City Codes.

5. All petroleum bulk storage tank installations shall be installed in accordance with the requirements of the Environmental Protection Agency, New York State Department of Environmental Conservation, the New York City Fire Department and Departments of Buildings and of Small Business Services and all other Agencies Having Jurisdiction (AHJ). The Contractor, at its own expense, shall obtain a facility registration certificate and all permits required. In addition, the Contractor shall submit a certified statement that the installation is in compliance with all regulations.

6. All electric motors shall be designed to conform to IEEE standards and to Section 26 05 91 – Low Voltage Electric Motors and Section 26 05 92 – Medium Voltage Electric Motors. Characteristics of electrical energy and source of supply are given in these Sections. Electric energy supplies at the site of the work is subject to commercial loads and operating variations. The voltage given in the Contract Documents is subject to correction for plant bus conditions and feeder drop. Adequate and proper provisions must be made so that all apparatus furnished hereunder will operate normally under such conditions.

7. Galvanized cast iron junction boxes or equivalent provisions for threaded conduit connections shall be furnished, unless otherwise specified or approved.

8. Equipment comprising several electrically operated devices shall be furnished completely wired and shall have all electrical appliances, conduit and connections that are integral parts thereof. Such connections shall terminate in a junction box of ample size.

9. Limit switches and other mechanically actuated switches shall be enclosed in cast metal boxes and be installed in the proper locations ready for rigid conduit connections. Switches shall be complete with all supports, stops, cams, arms, tripping and operating members which shall be adjustable where required for proper functioning. A complete statement of the scheme of control sequence and timing of operations required shall be submitted for approval. The electrical parts of mechanically actuated switches shall be encased as specified and be fully protected from shock and strain under all operating conditions. The manufacturer shall guarantee, for the service required, the electrical units and parts used in the assembly.

10. Electrical equipment shall be supplied only by manufacturers who maintain service facilities and spare parts stocks so that service and spare parts are capable of being furnished to a DEP specified location within a maximum time period of 48 hours. Service and stock shall be adequate for the equipment supplied, and evidence of such capability shall be presented when the equipment is submitted for approval.

11. Equipment manufactured outside continental U.S.A. shall be supplied only by manufacturers who maintain acceptable service facilities and spare parts stocks within the continental U.S.A. Service and stock shall be adequate for the equipment supplied and evidence of such facilities shall be presented when the name of the manufacturer is submitted for approval.

B. Delayed approvals. The time spent in approving working drawings, samples, equipment or other data which does not conform in every respect with the Contract Documents will not be considered as the basis for a claim for an extension of the Contract time.

C. Accessories included. The Contractor shall furnish, install and protect all necessary guides, track rails, bearing plates, anchor and attachment bolts and all other appurtenances needed for the installation of the devices included in the equipment specified. Anchor bolts shall be made of ample size and strength for the purpose intended.

1. Suitable templates and working drawings for installation shall be furnished.

2. The Contractor shall furnish with each piece of equipment one complete set of suitably marked special tools and appliances which may be needed to adjust, operate, maintain or repair the equipment. It shall submit, for approval by the Engineer, a complete list of the special tools and appliances to be furnished. Such tools and appliances shall be furnished in approved painted steel cases properly labeled and equipped with commercial grade cylinder locks and duplicate keys.

3. All spare parts shall be furnished as specified in the Contract. The Contractor shall furnish and install all specific equipment complete with all appurtenances, enclosures, means for connecting to power supply, and supporting structures necessary for standard operation of the equipment.

D. Contractor's working equipment. The Contractor shall have on hand sufficient proper equipment and machinery of ample capacity to facilitate the work and to handle all emergencies normally encountered in work of this character.

E. Excessive loadings. Floor slabs shall not be subjected to excessive concentrated loads and in no case shall maximum safe loads be exceeded.

F. Welding. All structural welding and gas cutting shall conform to the requirements of the American Welding Society (AWS), American Society of Mechanical Engineers (ASME), NYC Department of Buildings (DOB) and the New York City Construction Code. All welding of pipe, fittings and pipeline equipment shall be performed by qualified welders as specified by the latest requirements of the ASME and AWS codes and their supplements, as applicable.

1. Welders shall be certified in compliance with Section IX Welding Qualifications of the ASME Boiler and Pressure Vessel Code or AWS D1.1 through D1.6, as applicable and as approved by the Engineer, and

shall be qualified by an independent testing laboratory approved by the City.

G. Sole plates. All equipment mounted to concrete without cast iron or fabricated steel equipment bases shall be provided with a sole plate approved by the Engineer.

H. Grouting. The Contractor shall, at its own expense, furnish all materials and labor for, and shall properly bed in epoxy grout each piece of equipment or its supporting base resting on masonry foundations.

1. The epoxy grout shall be pre-measured, fast curing, high strength, non-shrink, have good adhesion to concrete and steel, and resist degradation by oil, solvents and acids. All epoxy grouting material and installation procedures shall be approved by the manufacturer of the equipment being grouted and the Engineer.

2. The storage, surface preparation, forming, mixing, and placing of the grout shall be as recommended by the grout manufacturer.

3. Flowability of the material shall provide self-leveling for ease of placement.

4. Epoxy grout shall completely fill the space between the equipment or base and the foundation and it shall generally average one inch in thickness. Leveling wedges shall not be removed and jacking bolts shall not be backed off before final set of grout. Voids left by wedges shall be pointed. Exposed surfaces of epoxy grout shall be finished to the satisfaction of the Engineer. Final alignment of the equipment shall be checked in the presence of the Engineer.

I. Operating instructions. The Contractor, through qualified individuals, shall adequately instruct designated employees of the City in the operation, maintenance and care of all equipment installed hereunder.

J. Damage during tests and instruction periods. The Contractor shall be fully responsible for the proper operation of equipment during test and instruction periods and it shall neither have nor make any claim for damage which may occur to equipment prior to the time when the City formally takes over the operation thereof.

K. Work may be rejected at any time. If at any time an inspection, test or analysis of work reveals faulty design, inferior or defective materials, poor workmanship, improper installation, excessive wear or non-conformity with the requirements of the Contract Documents, such work will be rejected and shall be replaced with satisfactory work at the Contractor's expense.

1. Electrical appliances which have been subjected to damage by water shall be thoroughly dried out and put through a special dielectric test as directed by the Engineer, or shall be replaced by the Contractor, all at its own expense.

L. Requirements for electrical work and electrical equipment. Electrical work and electrical equipment shall be installed under the supervision of the Engineer and shall be subject to approval, inspection and test by the Engineer and by the NYC Department of Buildings (DOB) or the local AHJ.

1. The Contractor shall file with the Department of Buildings or the local AHJ an application for a certificate of electrical inspection and shall pay all filing and inspection fees, as required by the New York City Electrical Code (NYCEC) or local AHJ.

2. For service equipment rated 1000 KVA and larger, drawings shall be submitted by the Contractor for approval to the DOB, as required by the NYCEC; or as otherwise required by the local AHJ. The Contractor shall pay the filing fees required for each submittal.

3. The Contractor shall submit for the approval of the Engineer and as required by the DOB or the AHJ, complete Shop Drawings covering electrical equipment furnished under this Contract.

   a. Where submissions are required to be made by a Professional Engineer the Contractor shall secure these services at no additional cost to the City.

   b. Drawings shall include dimensioned outlines showing provision for and locations of conduit connections, detailed wiring diagrams, schematic wiring diagrams, installation layouts, material schedules, test data and supplementary descriptive data.

   c. Drawings shall be submitted to the Engineer for review before they are submitted to either the DOB or the AHJ.

   d. Upon receipt of approval or comments from DOB or the AHJ, the Contractor will return drawings to the Engineer with the disposition noted.

4. After full completion of its Work, the Contractor shall notify the local borough office of the DOB or the local AHJ, requesting a final inspection to be made.

M. Service of manufacturer's engineer. The prices bid for equipment shall include the cost of furnishing a competent and experienced engineer or superintendent, from the company manufacturing the equipment, who shall assist the Contractor, when required, to install, adjust and test the equipment in conformity with the Contract Documents. After the equipment is placed in permanent operation by the City, such engineer or superintendent shall make all adjustments and tests required by the Engineer to prove that such equipment is in proper and satisfactory operating condition.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 65 00 – PRODUCT DELIVERY REQUIREMENTS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Delivery of products
2. Handling of products
3. Inspection of items
4. Supporting heavy loads

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 66 00 – Protection of Materials & Equipment

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. General Requirements

1. The Contractor shall make all arrangements for transportation, delivery and handling of materials and equipment required for installation and completion of the Work.

2. Storage space at the Site is limited; the Contract Documents indicate the staging and available storage areas. Coordinate with the Engineer as to whether on-site storage will be permitted. Any off-site storage locations or facilities are to be inspected and approved by the Engineer prior to storing items.

a. When storage of materials and equipment is off-site, deliveries to the Site shall be schedule to coincide with installation of the items. Protection, handling and storage of materials shall be performed as per Section 01 66 00 – Protection of Materials & Equipment.

b. If necessary to move stored materials and equipment during construction, the Contractor shall move materials and equipment at no additional cost to the City.

3. Unless otherwise specified, the City's docking facilities or hoisting equipment at or near the Project Site will not be available for the Contractor's use.

4. Transport and handle products in accordance with manufacturers' instructions and in compliance with all federal, State and local laws.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Products

1. The Contractor shall arrange deliveries of products in accordance with construction schedules and with ample time to facilitate inspection prior to installation.

2. The Contractor shall coordinate deliveries to avoid conflict with the Work and conditions at the Site and to accommodate the following:

a. Limitations of storage space

b. Availability of equipment and personnel for handling products

3. Materials and equipment shall not be delivered to the Site until related Shop Drawings, including the manufacturer's recommended storage instructions, have been approved by the Engineer.

4. Materials and equipment shall not be delivered to the Site until required storage facilities have been provided. Storage facilities and protection for products shall be as specified in Section 01 66 00 – Protection of Materials & Equipment.

5. Products shall be delivered to the Site in the manufacturer's original, unopened, labeled containers. The Engineer shall be informed of all deliveries of all materials and equipment.

6. Partial deliveries of component parts of equipment shall be clearly marked to identify the equipment, to permit easy accumulation of parts and to facilitate assembly.

7. Immediately on delivery, the Contractor shall inspect shipments to ensure:

   a. Product complies with requirements of Contract Documents and approved Submittals.

   b. Quantities are correct.

   c. Containers and packages are intact and labels are legible.

   d. Products are properly protected and undamaged.

B. Handling of Products

1. The Contractor shall provide equipment and personnel necessary to handle products in a manner that prevents soiling or damage to products or packaging.

2. The Contractor shall provide additional protection during handling as necessary to prevent scraping, marring or otherwise damaging products or surrounding surfaces.

3. The Contractor shall handle products in a manner that prevents bending or overstressing.

4. Heavy components shall be lifted only at designated lifting points.

5. Materials and equipment shall be handled at all times in a safe manner and as recommended by manufacturer or supplier so that no damage will occur to them. Do not drop, roll or skid products off delivery vehicles. Hand carry or use suitable materials handling equipment.

C. Inspection of Items

1. The Contractor shall inspect all items including all boxes, crates and packages containing materials and equipment for damage that may have occurred during shipment prior to their removal from the truck or other manner of conveyance. Any damage shall be reported immediately to the Engineer.

2. The Contractor shall then carefully remove the materials and equipment from the truck or trucks on which they were shipped. The materials and equipment shall then be transported to the place of installation at the Site. The Contractor shall be liable for loss or damage to the materials and equipment that may occur while being unloaded, transported, stored or installed.

3. All materials and equipment that arrives at the Site during Normal Project Working Hours shall be unloaded as soon as practicable.

D. Supporting Heavy Loads

1. In all cases where heavy loads or demolition may temporarily affect existing slabs, the Contractor shall confirm the slab's load sustaining ability. Whenever heavy loads are to be stored or temporarily imposed on slabs, or whenever the structures may be impacted by demolition, the Contractor shall submit for approval by the Engineer a plan of procedure prepared by a licensed professional engineer, indicating a structural analysis of the slabs and methods of distributing loads, and providing auxiliary support so that slabs and beams are not loaded in excess of their design loadings.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 66 00 – PROTECTION OF MATERIALS & EQUIPMENT
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Handling and storage of products
2. Protection of materials and equipment

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 65 00 – Product Delivery Requirements

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Storage of Products

1. Transport, store and handle products in accordance with manufacturer's methods and instructions and as required in Section 01 65 00 – Product Delivery Requirements.
2. Handle and lift products only at designated lift points and by methods to avoid soiling, disfigurement, bending, overstressing and damage.
3. Store products on shelves, in bins, or in neat groups of like items, with seals and labels intact and legible, and in a manner to provide access for maintenance and inspection.
4. Store loose granular materials on clean, solid, flat surfaces and prevent mixing with foreign matter. Store fabricated products supported above the ground on skids or blocking. Provide erosion control and surface drainage to prevent erosion and ponding of water as per the contract documents or directed by the Engineer.
5. Cover products subject to discoloration or deterioration with impervious sheet covering and protect products from soiling and staining.
6. Store and protect products that are subject to damage by the elements in weather-tight or climate-controlled enclosures, and according to manufacturer's instructions. Maintain temperature, ventilation, and humidity within ranges stated in manufacturer's instructions.
7. Attach applicable manufacturer's storage service instructions labeled "STORAGE SERVICE INSTRUCTIONS ENCLOSED" to exterior of each stored product.
8. Inspect, maintain and service stored products on a regularly scheduled basis, consistent with manufacturer's instructions.
9. Record inspection, maintenance and services performed and keep log available for review by the City and Engineer.

B. Protection of Materials and Equipment

1. The Contractor shall make every effort to minimize extended storage periods of materials and equipment at the Site by judiciously scheduling deliveries to coincide with construction needs.
2. Unless otherwise specified, storage of any mechanical or electrical equipment or other ultraviolet or weather sensitive items out of doors at any time is prohibited regardless of the protection furnished. Storage of mechanical and electrical equipment within structures at the Site will not be permitted unless the structures are enclosed. A structure shall be considered to be enclosed when it is roofed and has protection of doorways, windows and other opening closures.
3. All mechanical and electrical equipment shall be coated, wrapped and otherwise protected from snow, rain, drippings of any sort, dust, mud, condensed water vapor, etc., during shipment, storage, and installation and until placed in service.
4. All storage areas for motors shall be heated. Space heaters shall be supplied, as required, in all enclosures being utilized for storage of motors. Motors equipped with space heaters shall be properly wired and the heaters activated while the motors are in storage.
5. Should storage of mechanical and electrical equipment become necessary before it can be stored at the Site, the Contractor shall provide storage in a weatherproof warehouse.
6. Materials may be stored out of doors if supported above ground surface on wood runners and protected with approved, effective and durable covers.
7. All storage and protection of materials and equipment at the Site shall be subject to the approval of the Engineer.
8. Prior to installation of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by a long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guarantee the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective, and shall be removed and replaced at the Contractor's expense.
9. When stored materials and equipment are moved from the storage location to the Site, the Contractor shall move or cause to be moved the items without additional compensation.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 01 71 30 – PROTECTION AND RESTORATION OF STRUCTURES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified or otherwise required to complete the protection and restoration of all structures installed at or near the site of construction.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. General Contractor Responsibilities

1. The Contractor shall execute the Work to prevent damage or injury to the existing DEP structures and occupants thereof, which might result from Work or other causes, and so as not to interfere with the use, and free and safe passage to and from DEP structures and site Work.

2. The Contractor shall erect and maintain barriers, lights, fences, and other required protective devices in accordance with the Contract Documents and the NYC Building Code and the NYC Department of Transportation (NYCDOT) Bureau of Highway Operations Standards Specifications.

3. The Contractor shall be responsible for taking all precautions, providing all programs, and taking all actions necessary to protect the Work and all public and private property and facilities from damage, injury, loss or vandalism.

4. In order to prevent damage, injury or loss, the Contractor's actions shall include, but not be limited to, the following:

   a. Store apparatus, materials, supplies, and equipment in an orderly, safe manner that will not interfere with the progress of the Work or the plant operations, utility services, or the work of any other contractor.

   b. Provide suitable storage facilities for all materials which are subject to injury by exposure to weather, theft, breakage, or otherwise.

   c. Place upon the work or any part thereof only such loads as are consistent with the safety of that portion of the work.

   d. Clean up frequently all refuse, rubbish, scrap materials, and debris caused by its operations, to the end that at all times the site of the work shall present a safe, orderly and workmanlike appearance.

   e. Provide barricades and guard rails around openings, for scaffolding, for temporary stairs and ramps, around excavations, elevated walkways and other hazardous areas.

5. The Contractor shall assume full responsibility for the preservation of all public and private property or facility on or adjacent to the site. If any direct or indirect damage is done by, or on account of, any act, omission, neglect or misconduct in the execution of the Work by the Contractor, it shall be restored by the Contractor, at his or her expense, to a condition equal to that existing before the damage was done. The Contractor shall, at its expense, provide suitable drainage and erect such temporary structures as are necessary to protect the Work or materials from damage. The suspension of the Work or the granting of an extension of time from any cause whatever shall not relieve the Contractor of the responsibility for the Work and materials.

6. Whenever any notice is required to be given by the City or the Contractor to any adjacent or adjoining landowner or other party before commencement of any Work, such notice shall be given by the Contractor within the time limitations required for such notices.

7. All structures and appurtenances shall be adequately supported and safeguarded against all damage or injury in performance of work under this Contract. The Contractor will be held responsible for any such damage or injury resulting from his operations and shall repair such damage immediately and to the satisfaction of the Engineer.

8. The Contractor shall ascertain the location of underground pipe lines, conduits and other subsurface structures in those locations where the operation of his heavy construction equipment might damage such structures. The Contractor shall either avoid such locations or provide the necessary safeguards and repair any damage quickly at his own expense.

9. The Contractor shall comply promptly with such safety regulations as may be prescribed by the Engineer or the local authorities having jurisdiction and shall, when so directed, properly correct any unsafe conditions created by, or unsafe practices on the part of his employees. In the event of the Contractor's failure to comply, the Engineer may take the necessary measures to correct the conditions or practices complained of, and all costs thereof will be deducted from any monies due the Contractor. Failure of the Engineer to direct the correction of unsafe conditions or practices shall not relieve the Contractor of his responsibility hereunder.

10. Prior to commencement of Work in the vicinity of property adjacent to the work site, the Contractor, at his own expense, shall take such surveys as may be necessary to establish the existing condition of the property.

B. Protection of Existing Structures and Utilities

1. The term existing utilities shall be deemed to refer to both publicly-owned and privately-owned utilities such as, but not limited to electric power and lighting, telephone, water, gas, storm drains, process lines, sewers and all appurtenant structures.

2. Where existing utilities and structures are indicated on the Contract Drawings, it shall be understood that all of the existing utilities and structures affecting the Work may not be shown and that the locations of those shown are approximate only. It shall be the responsibility of the Contractor to ascertain the actual extent and exact location of existing utilities and structures. In every instance, the Contractor shall notify the proper authority having jurisdiction and obtain all necessary directions and approvals before performing any work in the vicinity of existing utilities.

3. The Work shall be carried out in a manner to prevent disruption of existing services and to avoid damage to the existing utilities. Temporary connections shall be provided, as required, to ensure no interruption of existing services. Any damage resulting from the work of this Contract

shall be promptly repaired by the Contractor at his own expense in a manner approved by the Engineer and further subject to the requirements of any authority having jurisdiction. Where it is required by the authority having jurisdiction that they perform their own repairs or have them done by others, the Contractor shall be responsible for all costs thereof.

4. Where excavations by the Contractor require any utility lines or appurtenant structures to be temporarily supported and otherwise protected during the construction Work, such support and protection shall be provided by the Contractor. All such Work shall be performed in a manner satisfactory to the Engineer and the respective authority having jurisdiction over such Work. In the event the Contractor fails to provide proper support or protection to any existing utility, the Engineer may, at this discretion, have the respective authority to provide such support or protection as may be necessary to ensure the safety of such utility, and the costs of such measures shall be paid by the Contractor.

5. During the progress of the Work, the Contractor shall protect from injury any existing utilities or services within the Work area until, if required, they have been re-routed, disconnected or capped off. Protection and re-routing shall conform to standards established by the utilities, agencies and governing codes.

C. Underground Structures

1. Underground structures are defined to include, but not be limited to, all sewer, water, gas, and other piping, and manholes, chambers, electrical and signal conduits, tunnels and other existing subsurface infrastructure located within or adjacent to the Work area.

2. Underground structures known to the Engineer are shown for the assistance of the Contractor in accordance with the best information available, but is not guaranteed to be correct or complete.

3. The Contractor shall explore ahead of the trenching and excavation Work and shall uncover all obstructing underground structures sufficiently to determine their location, to prevent damage to them and to prevent interruption to the services which such structures provide. If the Contractor damages an underground structure, s/he shall quickly restore it to original condition at his or her own expense.

4. Necessary changes in the location of the Work may be made by the Engineer, to avoid unanticipated underground structures.

5. If the Contractor discovers utility facilities not identified in the Contract Documents or in a position different from that shown in the Contract Documents, s/he shall immediately notify the Engineer and the owner of the utility facility, in writing.

D. Surface Structures:

1. Surface structures are defined as all existing buildings, structures and other facilities above the ground surface. Included with such structures are their foundations or any extension below the surface.

2. Surface structures include, but are not limited to, buildings, tanks, walls, bridges, roads, dams, channels, open drainage, piping, poles, wires, posts, signs, markers, curbs, walks and all other facilities that are visible above the ground surface.

E. Protection of Underground and Surface Structures

1. The Contractor shall sustain in their places and protect from direct or indirect injury all underground and surface structures located within or adjacent to the limits of the Work. Such sustaining and supporting shall be done carefully and as required by the party owning or controlling such structure. Before proceeding with the Work of sustaining and supporting such structure, the Contractor shall satisfy the Engineer that the methods and procedures to be used have been approved by the owner of the structure.

2. The Contractor shall be responsible for all damage and expense for direct or indirect injury caused to any structure by the Work. The Contractor shall repair immediately all damage caused by the Work, to the satisfaction of the owner of the damaged structure.

3. The fact that any structure or facility is not shown on the Contract Drawings shall not relieve the Contractor of the responsibility of protecting and preserving the structure or facility.

4. All other existing surface facilities, including but not limited to, guard rails, posts, guard cables signs, poles, markers, and curbs which are temporarily removed to facilitate installation of the Work shall be replaced and restored to their original condition at the Contractor's expense once the protective and relocation work is no longer needed.

F. Restoration of Pavements

1. Restoration of pavements shall be made in conformity with the requirements of the NYC Department of Transportation Standard Highway Specifications, latest edition. These specifications may be examined at the Office of the Department of Transportation, Bureau of Highway Operations, 55 Water Street, New York, New York. The Bidder shall acquaint himself with such requirements before submitting his bid. The Contractor shall give the Department of Highways four weeks written advance notice before proceeding with final restoration of pavements, walks and curbs.

G. Coordination and Relocation of Street Utilities

1. Coordination and relocation of street utilities with utility companies shall be done in conformance with the Contract Documents and all applicable laws and regulations.

1.06 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies

1. The Contractor shall comply with NYS Industrial Code Rule 753
2. The City shall not be liable for any costs incurred by the Contractors as a result of the compliance, non-compliance, or improper compliance of any regulations.
3. The City shall not be liable for any costs incurred by the Contractors for the support, protection and maintenance of underground facilities owned by franchised operators of such facilities.

1.07 SUBMITTALS

A. For any existing structure that is to be relocated or restored, the Contractor shall submit for approval a relocation plan including plan and profile with information related to the existing and final condition of the structure with fittings, appurtenances, thrush blocks, restraints and any applicable supports, signed and sealed by a Professional Engineer licensed and registered in the State of New York.

B. During the progress of Work, the Contractor shall keep an up-to-date set of the Protection and Restoration Drawings showing field and working drawings modifications. Immediately upon completion of Work, the Contractor shall provide As-built Drawings showing the actual Work performed under this Section as specified in the Contract Documents. Restoration Drawings shall include all necessary plans, sections and details, with all reference dimensions and elevations required for complete As-built Drawings of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 71 50 – GENERAL CONSTRUCTION REQUIREMENTS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:

1. Seismic requirements
2. General mechanical requirements
3. Diagrammatic drawings
4. Ratings approximate
5. Schematic wiring diagrams
6. Electrical supply characteristics
7. Special electrical equipment requirements
8. Uniform finishes
9. Temporary support structures

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Seismic Requirements

1. The Contractor is advised that all proposed structures, non-building structures, and architectural, mechanical and non-structural electrical components and systems, including associated equipment and appurtenances furnished and installed on this project shall be subject to the requirements of the most current New York City Construction Code in conjunction with the most current seismic provisions of the International Building Code (IBC) and referenced ASCE /SEI 7-10 for earthquake loadings. In designing and detailing non-building, architectural, mechanical and electrical non-structural components and systems required to be furnished as performance type submissions, seismic forces and subsequent details shall be developed in accordance with the New York City Construction Code, Chapter 16 and the applicable chapters in ASCE 7-10 to the extent that the most stringent provisions are utilized in developing the design earthquake forces. The Contractor shall refer to the structural notes on the Structural Drawings for site, structure and non-building systems specific seismic design criteria. All calculations, seismic certifications and construction details performed and developed as part of the requirements of performance type submissions shall be prepared and sealed by a Professional Engineer (PE) licensed to practice in the State of New York.

2. Shop drawings shall indicate that the equipment, equipment pads, piping, piping hangers and supports and all anchors required for a complete installation are capable of withstanding the seismic loadings.

B. General Mechanical Requirements

1. Where piping and ducts run in areas which have hung ceilings, such piping and ducts shall be installed in the hung ceilings.

2. The Contract Drawings are in part diagrammatic and show the general arrangement of the equipment, ducts and piping included in the Contract and the approximate size and locations of the equipment. The Contractor shall follow these Drawings in laying out the Work and shall familiarize

itself with all conditions affecting the Work and the spaces in which it will be installed.

3. Connections to existing piping shall be made to permit ready disconnection of equipment with minimum disturbance of adjoining piping and equipment. The Contractor shall be responsible for the exact alignment of all piping with the associated equipment and under no circumstances will pipe springing be allowed.

4. The locations of utilities, equipment, piping, gates, outlets and similar underground systems as shown on the Contract Drawings are approximate only, and the exact locations shall be approved by the Engineer during construction. The Contractor shall obtain in the field all information of the actual Work and final locations required for the placing of this Work. In case of interferences with other work or erroneous location with respect to utilities, equipment or structures, the Contractor shall furnish all labor, materials and equipment, at no additional costs to the City, to complete the Work in an approved and acceptable manner.

5. The Contractor shall take necessary field measurements to determine clearances and required sizes of equipment. The Contractor shall verify all pertinent data and dimensions. Dimensions and elevations of existing structures, equipment and piping shown on the Contract Drawings are not necessarily correct and should be considered approximate only as they are based on as-built information from past contracts. Field checking of such dimensions and elevations is necessary before submitting shop drawings for approval.

6. Until the date of Substantial Completion (or use and occupancy in accordance with Article 16 of the Standard Construction Contract), equipment shall be protected from water drippings or splashings at all times during shipment, storage and construction, by covering with waterproof material, effectively arranged. The Engineer will be the sole judge of whether equipment which has been subjected to damage by water shall be replaced or dried out. Equipment that is to be dried out shall be subject to confirmation of insulation integrity by dielectric testing. Equipment replacement or drying-out shall be at the Contractor's expense.

C. Diagrammatic Drawings

1. Various pipelines are shown on the Contract Drawings in diagram form. Where such pipelines are shown in diagram form, they shall be arranged clear of other pipelines, equipment and walking areas, and shall be accessible for maintenance. Such pipelines shall be fitted and installed in a neat and workmanlike manner in accordance with approved shop drawings. An adequate number of unions shall be provided in main pipe and branch pipe runs to facilitate dismantling or removal of pipeline sections without disturbing adjacent branch or connecting lines.

2. The final locations of valves, fittings and other such appurtenances included as a part of diagramed pipelines shall be as shown on approved shop drawings or as determined in the field by the Engineer.

3. Diagramed pipelines shall be furnished, fabricated, erected and otherwise installed to lines, elevations, locations and dimensions as shown, specified or required for a complete installation. The Contractor shall verify all dimensions shown on the Contract Drawings and shall take such field dimensions as may be necessary to properly show on shop drawings and install all diagramed pipelines.

4. In the vicinity of overhead roll-up doors and truck ways all pipe, conduit and appurtenances shall be installed a minimum of 14'-0" above the finished grade or floor elevation, and a minimum of 8'-0" above the finished grade or floor elevation in all walking areas.

5. Electrical conduits and wiring shown on the Contract Drawings are in part diagrammatic to show the general arrangement and routing of conduits and wiring and the approximate size and location of devices included in the Contract. The Contractor shall follow the intent of these drawings in laying out the Work and shall verify the spaces allocated in which the Work will be installed.

D. Ratings Approximate

1. The ratings of the motors and devices shown on the Contract Drawings and Specifications are approximate only and indicate the probable power requirements to the extent they can be determined in advance of the purchase of devices. The ratings of the devices furnished may be either increased or decreased accordingly.

2. The Contractor shall verify the exact rating of each device before performing the Work required under his Contract and modify the size of conduit, wiring and control equipment accordingly.

E. Schematic Wiring Diagrams

1. Equipment furnished under the various Specifications will require interconnecting wiring. The Contractor's shop drawings, furnished in accordance with the Specifications, shall include comprehensive schematic diagrams showing wiring of each individual piece of equipment and all interconnecting wiring. Shop drawings shall be submitted for approval of the Engineer prior to commencement of Work.

F. Electrical Supply Characteristics

1. The characteristics of the Electrical Systems available or to be provided for the operation of all electrical equipment are shown in the Contract Documents.

G. Special Electrical Equipment Requirements

1. All electrical equipment and devices manufactured and furnished under this Contract shall be of type that have been in satisfactory operation for not less than three years. Whenever similar devices or appliances are furnished, they shall be of one manufacturer and interchangeable within their ratings. If this is not feasible, the Contractor shall submit a statement for each manufacturer supplying devices, certifying that it:

   a. recommends the use of the device or devices for the specific function to be performed; and

   b. fully guarantees the satisfactory operation of the device or devices in conjunction with the other elements of the equipment.

2. Whenever standard devices or devices of a named manufacturer do not exactly fulfill the specified conditions, they shall be modified or special devices shall be furnished. All electrical devices furnished under the Contract shall be housed in metal enclosures with provisions for threaded conduit connections. The enclosures shall be designed to protect all electrical parts from local conditions.

3. Float switches, limit switches and other mechanically actuated electrical devices shall consist of an approved electrical system housed in rugged metal enclosures. They shall be adjustable without disturbing conduit connections. The switch actuating mechanism shall be mechanically and structurally correct for the required service and shall not subject the electrical parts to unnecessary stress or mechanical shock. Operating shafts shall be bushed and stuffed in dust tight cases.

4. The Contractor shall, unless otherwise directed, furnish and assemble all special lamps, indicating lamps, annunciator lamps and pilot lamps with all accessories.

5. Electrical equipment shall have a power factor of not less than 85% under rated load conditions. Electrical equipment with a power factor less than 85% shall be corrected to at least 85% under rated load conditions. Installed power factor corrective devices shall be switched with utilization equipment.

6. Wire terminals on manufactured assemblies such as switchboards, bench boards, control panels, alarm boards, and motor control equipment shall consist of cup terminals, pronged washers, compression type solderless connectors or pressure type terminals furnished on devices.

7. All control and indication wires within motor control centers and other panels and cabinets shall be terminated on terminal blocks provided with marking strips for wire designation. The manufacturer shall identify all wires on the marking strips. All field wires will be terminated and identified by the Contractor.

8. Provision shall be made for wire and cables installed at the plant site to be terminated by the Contractor with approved solderless copper alloy lugs.

Lugs may be of the compression type, clamp type or screw type with internal pressure bar, or may be pressure tool applied solderless connectors. Pressure tool applied solderless connectors for wires 250 MCM or larger shall have long barrels to allow double indentation.

9. The Contractor shall consult with the manufacturer or its representative to ensure that the electrical items will have a shelf life of at least ten (10) years. Polychlorinated biphenyls (PCBs) shall not be used in any equipment on this project. Manufacturers shall have maintenance facilities in the New York City metropolitan area.

   a. Nameplates and warning signs shall be provided. Nameplates shall be 1/16 inch thick laminated plastic, white with a black core for black engraved lettering, and shall have beveled edges. They shall be provided for all controls on all power control panels and cabinets, lighting cabinets and operating devices, marked and positioned on the front panel as approved by the Engineer. Mounting shall be by stainless steel screws through predrilled nameplate holes, one at each end of the plate. The Contractor shall provide, as required or as directed, all warning signs required for the safe operation of the equipment. Such warning signs shall be of substantial material, porcelain enameled, of suitable thickness and as approved by the Engineer. All components within electrical control panels, switchgear and assemblies shall be identified with engraved stainless steel tags rigidly mounted at or near the respective device.

H. Uniform Finishes

1. A uniform finish shall be used for all hardware, metallic nameplates and similar exposed metal parts used on any equipment or group of equipment and, as far as possible, the same finish shall be used for all such equipment items.

I. Temporary Support Structures

1. The Contract Documents include suggested design and construction requirements for the temporary support structures. The Contractor may submit an alternate design of any temporary support structure for approval by the Engineer. The Engineer may accept or reject the alternate design if the structure is not considered temporary or if it may impose instability to the adjacent existing structure due to lateral and vertical movements. The alternate design of the temporary support shall be performed, signed and sealed by a Professional Engineer registered in the State of New York who is qualified to determine the extent of work necessary to satisfy the temporary support requirements.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 CHOOSE AN ITEM.

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 73 12 – MAINTENANCE OF OPERATIONS AND CONSTRUCTION STAGING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Maintenance of Site operations

B. General criteria and restrictions

C. Specific criteria and restrictions

D. Construction staging

E. The following index of this Section is presented for convenience:

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3.02	Implementation	10
3.03	Field Testing / Quality Control	10
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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 14 00 – Work Restrictions

B. Section 01 32 10 – Progress Scheduling

C. Section 01 35 55 – Site Security

D. Section 01 51 51 – Temporary Pumping

E. Section 01 55 26 – Traffic Control

F. Section 01 56 00 – Temporary Barriers and Enclosures

G. Section 01 57 00 – Temporary Controls

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Maintenance of Site Operations

1. The Contractor shall perform its work in a manner such that the DEP and DPR can keep the existing Site/facility in continuous dependable operation. Any temporary work that may be required to maintain the site/facility in operation shall be furnished by the Contractor at the direction of the Engineer at no extra cost to the DEP.

2. The Contractor shall keep the Engineer and designated representative of the facility/Site informed of any Work that may interfere with normal operations. The Engineer and the facility/site representative must receive a written request at least 15 days in advance of proposed work.

   a. The CPM schedule maintained by the Contractor under Section 01 32 10 – Progress Scheduling shall not serve as prior notice. No work shall proceed prior to the written approval of DEP.

3. Unless otherwise permitted by the facility/Site representative, no existing valves or equipment shall be operated by the Contractor.

4. The employees of the Contractor or its Subcontractors may be prohibited from entering or using some areas of the Site/facility.

B. General Criteria and Restrictions

1. The following general criteria and restrictions shall apply to the Work except where otherwise noted in the Contract:

   a. When the connection of a new pipeline to an existing structure or pipeline requires a shutdown of the existing structure or pipeline, the new pipeline except for the final connection shall be tested prior to proceeding with the shutdown. When the final connection is completed, the new pipeline shall be tested again in its entirety.

   b. The Contractor shall provide all pumps, piping, valves, etc., as necessary to dewater all portions of combined sewer conduits/barrels where Work is proposed, influent channels to the FBCSO Facility storage cells, downstream of the isolation gates,

and existing pipes that are shown to be demolished, directly to a location approved by the Engineer.

c. The Contractor shall provide all pumps, piping, valves, etc., as necessary, to remove unused chemicals from all pipes as described herein.

d. The Contractor shall flush and clean all Contractor Work areas within process channels, conduits, manholes, and tanks after they have been removed from service.

e. Any modification to, relocation of, connection to or shutdown of an existing tank, vessel, conduit, channel, pipe, etc. shall not be scheduled or occur prior to the Engineer's written approval. The Contractor is advised that the conduits, channels and tanks may contain accumulations of putrescible materials which will remain on the walls and inverts. These materials emit noxious, odorous and hazardous gases such as hydrogen sulfide and methane. The Contractor is advised to ventilate and test the air of all confined spaces prior to entry.

f. The Contractor is advised that existing valves, gates and other devices shall be considered as inoperable and subject to leaking. The Contractor shall be responsible for designing, furnishing, installing and removing all temporary devices, stop logs, plugs or bulkheads necessary to isolate or dewater pipes, channels, combined sewer conduits/barrels, or tanks to perform the Work.

g. The Contractor shall coordinate its activities with the other contractors on the site so as to comply with the provisions of these specifications and their intent.

2. The following general restrictions shall be applied to all equipment and appurtenant utility systems:

a. The restrictions provided herein serve to maintain the existing Site facilities in continuous operation and to coordinate with other construction activities at the Site in accordance with the requirements of the authorities having jurisdiction.

b. Existing fire suppression piping at / near Work Sites shall be operational at all times.

c. Plumbing Facilities: All building plumbing systems such as domestic water systems, eyewash showers etc., shall be maintained until turned over by site operations for demolition.

d. Storm Drainage: Storm drainage on the site shall be operational at all times. If necessary, the Contractor shall pump between manholes during the installation of new piping or underground utilities. Roof

drainage shall be maintained at all times and no roof shall be permitted to accumulate standing water.

1) All site drainage flows shall not be interrupted.

e. Power, Light and Communication Systems: Electric power, lighting service, security camera systems and communications systems shall be maintained in uninterrupted operation in all areas that remain in operation. Individual units may be disconnected as required for replacement or relocation.

f. Sump Pumps and Sumps: All existing sumps shall be maintained in an operable condition with either existing pumps or temporary pumps or until turned over for demolition. Interim piping, power and controls shall be provided as required.

g. Combined Sewer Barrels and Conduits:

1) Areas of proposed work in the combined sewer barrels and conduits are primarily affected by stormwater and tidal flow influences.

2) Work shall occur in only one sewer barrel/conduit at a time to allow the remaining barrels/conduits to remain in service as needed. The Contractor shall be prepared to vacate the Work areas within sewer barrels/conduits upon notice of wet weather including all materials, tools, and equipment to allow any sewer barrel/conduit to immediately be placed back into service if needed.

3) Outfall TI-010 sewer conduits are subject to daily inflow/infiltration (I/I) flows upstream of DC-5 and into the FB CSO Retention Facility during dry weather periods. I/I flows vary between 6-8 MGD into the FB CSO Retention Facility and through the influent channels to the facility storage cells.

4) Outfall TI-010 sewer conduits which bypass the FB CSO Retention Facility downstream of the DC-5 bulkhead sluice gates (down Fowler Avenue and Avery Avenue) are protected from Flushing Creek tidal fluctuations downstream by the Outfall TI-010 Tide Gates. The tide gates are normally closed to prevent backflow from Flushing Creek. While the tide gates prevent backflow to a large extent, they are not 100% watertight by design, therefore, managing residual tidewater should be expected, as well as residual CSO liquid that will remain between the tide gates and DC-5. Closest to the tide gates, the liquid level in the sewer conduits can be as high as 40 inches deep during dry weather conditions. Closer to DC-5, the liquid level may be

as deep as 24 inches during dry weather conduits. The three sewer barrels are hydraulically connected to one another.

5) Outfall TI-010 sewer conduits downstream of the TI-010 Outfall Tide Gates are subject to tidal backflow from Flushing Creek during high tide conditions, twice per day. The outfall sewer conduits in the three sewer barrels downstream of this location will flood almost to the ceiling of the conduit during high tide events.

6) Outfall TI-011 sewer conduits along 32nd Avenue and College Point Blvd. are subject to tidal backflow from Flushing Creek during high tide conditions, twice per day. The outfall sewer conduits in the two sewer barrels downstream of this location will flood almost to the ceiling of the conduit during high tide events nearest the outfall; the liquid level will decrease further away from the outfall towards Regulator TI-R09 at Linden Place. During low tide conditions, there is some I/I flow, with the liquid level varying from 2-4 inches in the bottom of each sewer conduit.

7) The Contractor shall provide temporary bulkheads and localized pumping, including pumps, hoses, piping, etc., in accordance with Section 01 51 51 – Temporary Pumping to maintain a dry Work area, and to divert flow around each Work location as needed. Any pumped flow shall be diverted to an adjacent sewer barrel/conduit, or around the Contractor's Work area to a downstream location.

8) Work in each combined sewer barrel/conduit shall be limited to dry-weather conditions to avoid the need for large-scale bypass pumping systems.

h. Temporary Partitions and Enclosures: The contractors shall provide temporary partitions and enclosures as required by the contract documents where necessary to maintain dust-free, heated and ventilated spaces in areas which are adjacent to his work and which must be kept operational by Site operations personnel.

i. Seal Water and Service Water Piping: A supply of seal and service water and the necessary connections to existing equipment shall be maintained during construction. Interim piping shall be provided as required.

3. The following requirements shall be adhered to in development of the circulation plan to be submitted in accordance with the provisions of this Section.

a. Comply with, at a minimum, all requirements of the following:

1) Section 01 14 00 – Work Restrictions,

2) Section 01 32 10 – Progress Scheduling,

3) Section 01 35 55 – Site Security

4) Section 01 51 51 – Temporary Pumping

5) Section 01 55 26 – Traffic Control

6) Section 01 56 00 – Temporary Barriers and Enclosures, and

7) Section 01 57 00 – Temporary Controls.

b. Construction-related vehicles and activities shall not impede or otherwise adversely affect the flow of regular traffic traveling on the roads leading to and adjacent to the Work location.

1) Construction-related vehicles and activities shall be understood as including vehicles operated and activities undertaken by the Contractor (including the Contractor's employees, Subcontractors, and visitors). Regular traffic shall be understood as referring to all vehicles other than construction-related vehicles.

2) Personal vehicles are prohibited on site.

c. Perform the Work required in this Contract in accordance with applicable traffic and safety rules, regulations, ordinances, and permit conditions.

d. Sections of roadway being worked shall only be returned to DEP access after both the permanent (4) foot high fall protection fence, box beam and vehicle guide rails have been installed. The Contractor is responsible for safety in sections of roadway closed for roadwork. For temporary fall protection requirements, refer to Section 01 56 00 – Temporary Barriers and Enclosures. Maximum fence section removal shall be as determined by the Resident Engineer.

e. Protect all open excavations per Section 01 56 00 – Temporary Barriers and Enclosures and, if required, cover open excavations with steel plates after working hours.

4. Any temporary work that may be needed to maintain the Site facilities in operation, and that is made necessary by the requirements of the Contract or by the Contractor's activities, shall be provided by the Contractor as specified under the Contract Documents or at the direction of the Engineer at no extra cost to DEP.

5. The Contractor shall not remove any items from service without written permission from DEP. Upon receiving written approval from the City, the Contractor shall proceed with the Work and shall proceed continuously until the Work is completed, tested, and made ready for operation.

C. Specific Criteria and Restrictions:

1. TI-010 Chlorination Facility (Existing FB CSO Retention Facility):

a. Influent Channels:

1) Only one of the two influent channels (Influent Channel No. 1 and No. 2) and its respective train of storage cells (Storage Cells No. 1 through 7 and Storage Cells No. 15) at the FB CSO Facility may be taken out of service at a time, unless otherwise noted above

2) Areas of proposed work in the influent channels to the FB CSO facility storage cells are primarily affected by stormwater and daily inflow/infiltration flows (in the range of 6-8 MGD).

3) When working in the influent channels, only one channel shall be taken out of service at a time, via closing of the upstream isolation sluice gates for each channel. The downstream storage cells connected to each respective channel are also taken out of service when the sluice gate is closed. Daily inflow/infiltration flow shall be maintained in the remaining open channel from the FB CSO screenings chamber to the downstream storage cells.

4) For the short durations when access to both influent channels may be required (for making pipe penetrations or completing concrete demolition), the Contractor shall coordinate the work during dry weather periods and coordinate with BWT CFN staff to close all influent sluice gates to the channels and utilize the in-line sewer system for temporary storage. Such shutdowns of both channels shall be limited to eight-hour continuous durations. If planned work requires more than eight hours to complete, then the work shall be scheduled in multiple phases to work within the eight-hour limit.

5) The Contractor shall provide temporary bulkheads and localized pumping, including pumps, hoses, piping, etc., in accordance with Section 01 51 51 – Temporary Pumping to dewater each work area, or divert flow around each work location as needed. Any pumped flow shall be diverted to an adjacent influent channel or storage cell.

6) Work in each influent channel or storage cell shall be limited to dry-weather conditions to avoid the need for large-scale bypass pumping systems.

b. Sewer Barrels/Conduits:

1) Work is required in each of the three sewer barrels/conduits at DC-5 which will need to be taken out of service intermittently.

2) The TI-010 work areas within and downstream of DC-5 can be isolated from stormwater and any daily inflow/infiltration in the sewer system by the existing DC-5 sluice gates and use of the existing stop log grooves located in each channel where such use will not interfere with the proposed work. The upstream side of the DC-5 sluice gates will typically have stormwater and combined sewer water flow present at all times. The downstream side can be isolated between the DC-5 sluice gates and the downstream Outfall TI-010 Tide Gates, however, residual water and solids may be present in the proposed work areas during dry-weather periods. The sewer conduits on the downstream side of the DC-5 sluice gates are hydraulically connected to one another.

c. General Site:

1) NYCDEP and NYCDPR vehicle access to the existing facilities must be maintained at all times.

2) Coordination with NYC DPR maintenance staff to complete work on the chemical fill station and chemical fill piping will be required to minimize impact to NYC DPR operations.

3) Coordination with NYC DEP BWT Operations staff will be required to complete Work in the driveway area of the FB CSO Retention Facility to maintain DEP access to the screenings roll-off containers and other DEP stored materials (i.e., portable generators and portable pumping equipment), and to the facility itself. Coordination will also be required for any site work adjacent to DC-5 as the Work area is also utilized by the DEP for access to the Lawrence and Peck Pumping Station. The DEP can access the pumping station directly from College Point Boulevard when necessary.

2. TI-010D Dechlorination Facility:

a. Combined Sewer Barrels/Conduits:

1) Work is required in each of the three sewer barrels/conduits on the TI-010 outfall that will need to be taken out of service intermittently.

2) The TI-010 work areas can be isolated from stormwater and any daily inflow/infiltration in the sewer system by the existing DC-5 sluice gates and use of the existing stop log grooves located in each channel where such use will not interfere with the proposed work. The Contractor can utilize the existing stop log grooves but will need to provide temporary stop logs or plates to isolate the flow. The upstream side of the TI-010 Outfall tide gates can be isolated between the DC-5 sluice gates and the downstream Outfall TI-010 Tide Gates, however, residual water and solids may be present in the proposed work areas during dry-weather periods.

3) Work downstream of the existing stop log grooves will require temporary bulkheads due to the daily tidal inflow from Flushing Creek.

3. TI-011 Disinfection Facility:

a. Combined Sewer Barrels/Conduits:

1) Only of the two sewer barrels/conduits on the TI-011 outfall may be taken out of service at a time.

2) The TI-011 work areas do not have outfall tide gates, and are therefore, subject to tidal backflow from Flushing Creek that may flow into the TI-011 sewer barrels/conduits. Work in the sewers will require temporary bulkheads due to the daily tidal inflow from Flushing Creek.

3) Flow from Regulator TI-R09 and upstream Regulators to the east typically is only present during wet weather flow events, however, residual water and solids may be present in the sewer barrels/conduits during dry-weather periods.

b. Regulator TI-R09:

1) Work in Regulator TI-R09 or downstream of the regulator shall be coordinated with DEP's Bureau of Wastewater Treatment Collections Facilities North (CFN) staff and Tallman Island WRRF operations to allow for lockout and tag-out of the pumpback system located at the FB CSO facility, which can cause overflow to Regulator TI-R09 if not properly monitored.

D. Construction Staging

1. The Work included under this Contract, shall be performed in accordance with the Contract Documents. Further, the Contractor shall submit a comprehensive work schedule to the Engineer to demonstrate that it shall rigidly adhere to these requirements.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 73 17 – INSTALLATION OF EQUIPMENT
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to install equipment.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. General:

1. This Section includes the following:
   a. Concrete foundations, bases, dowels and anchor bolts.
   b. Sleeves, recesses, openings, chases and related concrete installation items.
   c. Supervision by manufacturers' representatives.
   d. Workmanship.
   e. Clearance and safeguards.
   f. Alignment and leveling.
   g. Cutting and patching.
   h. Lubrication.
   i. Maintenance of installed equipment.
   j. Protection of installed equipment.
2. The Contractor shall have adequate resources on site, including labor, materials, construction tools and equipment, to successfully perform the Work.
3. The Contractor shall be responsible for locating, aligning and leveling all equipment and shall employ a surveyor licensed in the State of New York to set all lines and levels of equipment to the accuracies specified in the Contract Documents.
4. Manufacturer's complete and official installation instructions, including permissible tolerances, shall be furnished in duplicate with each unit of equipment or set of identical units.
5. All equipment shall be installed in accordance with the approved shop drawings (including manufacturer's specifications, drawings, and tolerances) and under the direct supervision of the required manufacturer's representative. In no instance shall the directions of the manufacturer's representative contravene the Engineer's direction.
6. Equipment shall be erected in a neat and workmanlike manner on the foundations at the locations and elevations shown on the approved shop drawings unless directed otherwise by the Engineer during installation.
7. As a condition precedent to the acceptance of equipment installed and operating, the Contractor shall provide the Engineer with written certification, obtained from each company manufacturing equipment for the Work that the equipment is installed and does operate in accordance with the Contract Documents and manufacturer's recommendations.

B. Concrete Foundations, Bases, Dowels and Anchor Bolts:

1. The Contractor shall provide all reinforced concrete foundations, bases, dowels, and anchor bolts for all equipment and piping furnished under this Contract.

    a. All reinforced concrete bases and supports shall be steel reinforced and dowelled to floor slabs. Where possible, dowels shall be in place before new floor slab concrete is placed.

2. Where not explicitly stated in the Contract Documents, the Contractor shall utilize foundation bolt drawings or templates for the installation of equipment requiring concrete bases.

3. Dowelling into existing work shall be provided under this Contract.

    a. Anchor bolts penetrating into existing reinforced concrete work shall be drilled in place, shall be of the expansion type, and shall have sufficient length and configuration to resist the imposed loadings when installed in accordance with the Contract Documents, the manufacturer's recommendations, and as approved by the Engineer. Dowels and anchor bolts in existing concrete shall be installed using a bonding agent approved by the Engineer.

    b. All concrete bases for equipment shall be treated with an approved sealer to prevent oil and grease from seeping into the concrete.

4. Installation of reinforced concrete bases and the installation of dowels and anchor bolts into existing and new reinforced concrete work shall be in accordance with the Contract Documents and the manufacturer's recommendations, and shall be subject to the approval of the Engineer.

C. Sleeves, Recesses, Openings, Chases and Related Concrete Installation Items:

1. The Contractor shall make provisions as shown on the Contract Drawings, specified, and/or otherwise required for sleeves, recesses, openings, chases, and related items, for installation of the equipment and materials

2. When the Contract requires the placing of conduits, saddles, boxes, cabinets, sleeves, inserts, foundation bolts, anchors and other similar work in floors or walls of buildings and structures, they shall be promptly installed in conformity with the Contract Documents. The Contractor shall arrange the work in strict conformity with the approved construction schedule and avoid interferences with the work of other contractors.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Concrete foundations for equipment shall be of approved design and shall be adequate in size, suitable for the equipment erected thereon, properly reinforced, and tied into floor slabs by means of reinforcing bars or dowels. Foundation bolts of ample size and strength shall be provided and properly positioned by means of suitable templates and secured during placement of concrete. Foundations shall be built and bolts installed in accordance with the manufacturers approved drawings.

B. Before mounting equipment on a foundation, the Contractor shall clean the top surface; if necessary, rough it with a star chisel and clean again; and clean out all foundation bolt sleeves.

1. The Contractor shall provide a sufficient number of shims about 2-in. wide and 4-in. long, and of a varying thickness from ⅛-in. to ½-in.. A combination of these shims shall be placed next to each foundation bolt to bring the bottom of the bedplate or frame about 1/8 inch above the final setting. The equipment shall be lowered by changing the combination of shims. The Contractor shall use brass shim stock of various thicknesses, and continue to level the equipment a little at a time and in rotation until it is at the correct elevation in both directions.

2. When the equipment is level, the Contractor shall tighten down on the foundation bolts a little at a time, in rotation, to make certain the

equipment remains level and does not shift on the shims. A preliminary alignment check shall be made before grout is placed.

C. Equipment shall be set, aligned and assembled in conformance with manufacturer's instructions. Runout tolerances by dial indicator method of alignment shall be plus or minus 0.002-in. or as directed by the manufacturer, whichever is more stringent.

D. All blocking, wedges, shims, filling pieces, or other materials required for the proper support and leveling of equipment during installation shall be furnished by the Contractor. All temporary supports shall be removed, except the shims, which may be left in place with the approval of the Engineer. Any grinding necessary to bring parts to proper bearing after erection shall be done at the expense of the Contractor.

E. Each piece of equipment or supporting base, bearing on concrete foundations, shall be bedded in grout. The Contractor shall provide a minimum of 1½-in. thick grouting under the entire base plate supporting each pump, motor drive unit, and other equipment. Grouting shall be as specified in the respective equipment specification section(s) and as approved by the Engineer.

F. When motors are shipped separately from driven equipment, the motors shall be received, stored, have insulation resistance tested once a month, and the reports submitted to the Engineer. Space heaters shall be supplied in all enclosures being utilized for storage of motors. After driven equipment is set, the motors shall be set, mounted, shimmed, mill righted, coupled and connected complete.

G. Moving parts shall be rotated a minimum of once weekly before and after installation to ensure proper lubrication and to avoid metal-to-metal welding and to prevent "flat-spotting" of bearings.

H. Anchor and expansion bolts shall be furnished by the Contractor as specified and required by this Contract Documents.

I. At threaded connections, a molybdenum disulfide anti-seize compound shall be applied to all threads in mechanical connections such as bolts, studs, cap screws, tubing, etc., unless otherwise indicated.

3.02 IMPLEMENTATION

A. Workmanship:

1. The following erection details are not intended to be all-inclusive, but only to cover some of the important practices. In all cases, only the best methods known to the trades are to be employed.

2. Only those workers qualified in the handling, setting, alignment, leveling and adjustment of the type of equipment supplied shall be employed in the Work.

3. An oil bath heater shall always be used to expand couplings, gears, etc. They shall not be forced or driven on equipment shafts, nor shall they be subjected to an open flame or torch.

4. Wedging shall not be permitted. Only the least number of flat shims are to be used in leveling equipment (shims are to be clean and free of slag). All shims, filling pieces, keys packing, red or white lead grout, or other materials necessary to properly align, level and secure apparatus in place shall be furnished by the Contractor. All parts intended to be plumb or level must be proven exactly so. Any grinding necessary to bring parts to proper bearing after erection shall be done at the expense of the Contractor.

5. Proper tools shall be used in the assembly of equipment and materials to prevent marring the surface of shafts, nuts, or other parts.

6. Connections requiring gaskets shall be tightened evenly all around to ensure uniform stress over the entire gasket area.

7. No equipment and materials shall be altered or repaired, and no burning or welding will be permitted on any parts having machined surfaces, except by written permission of the Engineer.

8. No rigging shall be done from any structure without the permission of the Engineer, and the Contractor shall be completely responsible for any damage to the structure due to its operations.

9. Only such equipment and materials that shall not damage the structure or equipment and materials shall be used on the Work.

10. The Contractor shall be responsible for the exact alignment of equipment with associated piping and, under no circumstances, will "pipe springing" be allowed.

11. Misaligned holes shall be reamed, as excessive driving of bolts or keys will not be permitted.

12. The Contractor shall furnish and install all necessary plugs in lubrication holes to prevent entry of foreign material.

B. Clearances and safeguards:

1. All devices, equipment, and systems furnished under this Contract shall be fabricated and installed so that the necessary and required clearances are provided for operation, maintenance, repair, and replacement. It is the Contractor's responsibility to review the Contract Drawings and ensure that the necessary and required clearances are available, and it is the Contractor's responsibility to notify the Engineer in the event that such clearances cannot be provided based on the Contract Documents.

2. The construction arrangement, assembly locations, and guarding of all equipment shall conform to the latest ANSI safety practices, the New York State Industrial Code, and all standards specified in the Contract Documents.

C. Alignment and leveling:

1. All couplings shall be aligned while the equipment is free from all external loads.
2. Both angular and parallel alignment shall be checked, and the degree of misalignment shall be recorded and submitted to the Engineer.
3. Dial indicators shall be used for the checking of angular and parallel alignment. During rotation of the held couplings in performance of this test, they shall be maintained in the same relative position, and the dial indicator readings shall be taken at the same place on the circumference of the coupling.
4. Misalignment shall not exceed the manufacturer's tolerances.

D. Cutting and patching:

1. Whenever it becomes necessary to cut existing work, the location and size of cut and method of cutting shall be as approved by the Engineer and adjacent work shall not be damaged. On completion of the cutting, all affected areas shall be restored satisfactorily by qualified workers.

E. Lubrication:

1. All lubrication shall be performed by the Contractor in accordance with the lubricant specifications and directions furnished by the manufacturer.
   a. If required by the manufacturer's specifications and/or instructions, the Contractor shall provide lubrication of equipment while in storage, from delivery to installation.
2. The Contractor shall furnish required lubricants for the equipment until it is accepted.
3. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment at the time of acceptance.

3.03 FIELD TESTING / QUALITY CONTROL

A. Supervision by Manufacturer's Representative: The Contractor shall provide the services of qualified technical representatives of the equipment manufacturers who shall adequately supervise, in person and on site, the installation and testing of all equipment furnished under this Contract and instruct the Contractor's personnel and City operating personnel on maintenance and operation of its equipment.

1. The manufacturers' representatives shall devote, at a minimum, the entire amount of time specified under the relevant Specification sections for the equipment. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor.

2. The manufacturers' representatives shall sign in and out in a log for this purpose kept by the Engineer on every occasion they are on the Site and shall indicate time of arrival, departure, and the purpose of their visit.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. During the period between installation and substantial completion, the Contractor shall maintain all equipment in accordance with the equipment manufacturer's instructions as approved by the Engineer.

1. The Contractor shall also provide protection of installed equipment, as required, to prevent damage and remove protection devices/facilities, when no longer needed, prior to completion of work:

a. Projections such as wall corners, jambs, sills and soffits of openings, shall be covered in areas used for traffic and for passage of products in subsequent work.

b. Equipment for which shop finish paint is required shall be protected in the shop and during transportation and installation to prevent injury and abrasion. Such equipment shall be scheduled for installation when a building is considered enclosed and as late as possible in the construction schedule. However, maintenance of schedules may require the installation of such equipment in unheated areas and in areas where masonry work, concrete finishing, steel erection, painting, and other work will be in progress.

1) Shop finished Work shall be protected during and after installation by waterproof wrappings sealed to prevent condensation on surfaces. Wrappings shall be sufficient to protect surfaces from damage by drippings from masonry and painting work, and additional covering or sheathing shall be provided to protect equipment from contact damage that might result from work in progress in adjacent areas.

2) Prior to Substantial Completion (or use and occupancy in accordance with Article 16 of the Standard Construction Contract), wrappings and coverings shall be removed, equipment shall be cleaned and all scratches and abrasions shall be refinished.

END OF SECTION

SECTION 01 74 17 – CLEANING AND SITE MAINTENANCE
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Requirements of Regulatory Agencies

B. Scheduling of Cleaning Operations

C. Cleaning Materials

D. Site Maintenance Requirements

E. Snow and Ice Removal

F. Disposal of Waste Materials

G. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 74 20 - Construction Waste Management

B. Section 23 31 14 – Metal Ducts and Accessories

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. General Requirements

1. The Contractor shall collect and dispose of all debris and rubbish resulting from its Work. Cleaning shall be performed daily and trash removal shall be performed weekly, or more frequently, as directed by the Engineer, whenever the debris or rubbish interferes with the Work under the Contract, plant operations or presents a fire hazard and as noted below.

2. Cleaning Work shall conform to the requirements of Section 01 74 20 - Construction Waste Management.

B. Requirements of Regulatory Agencies

1. In addition to the requirements specified herein, the Contractor shall maintain the cleanliness of the Work areas and surrounding premises within the Work limits so as to comply with federal, state, and local fire and safety laws, ordinances, codes and regulations.

2. The Contractor shall comply with all federal, state and local anti-pollution laws, ordinances, codes and regulations when disposing of waste materials, debris, rubbish, snow and ice.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Cleaning Materials

1. The Contractor shall use only cleaning materials recommended by the manufacturer of surface to be cleaned.

2. Each type of cleaning material shall be used on only those surfaces recommended by the cleaning material manufacturer.

3. Use only cleaning materials which will not create hazards to health or damage property.

B. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Scheduling of Cleaning Operations

1. The Contractor shall schedule trash removal and cleaning operations as necessary and at intervals as directed by the Engineer.

a. So that dust, wash water or other contaminants generated during construction do not damage or mar painted or finished surfaces.

b. To prevent accumulation of dust, dirt, debris, rubbish and waste materials on or within the Work Site or on the premises surrounding the Work Site.

B. Site Maintenance Requirements

1. The Contractor shall keep the Work and surrounding premises within Work limits, including its staging and storage areas, free of accumulations of dirt, dust, waste materials, debris and rubbish.

2. The Contractor shall keep dust generating areas wetted down.

3. The Contractor shall provide suitable containers in sufficient quantity for storage of waste materials, debris and rubbish.

4. The Contractor shall dispose of waste materials and surplus materials off site at a regulatory-approved disposal site at intervals as needed.

3.02 IMPLEMENTATION

A. Snow and Ice Removal

1. The Contractor shall remove snow and ice from the following areas:

a. The sidewalks and parking areas associated with the Engineer's field office.

b. All construction access roads.

1) Any Plant walkways which cannot be accessed by the Plant's snow removal equipment due to construction activities.

2) Any additional areas designated by the Engineer.

c. Snow and ice removal shall be before 7:00 AM whenever there is a snowfall storm and before 7:00 AM on the day following the termination of the snowfall storm.

d. When directed by the Engineer, the Contractor shall begin snow and/or ice removal immediately (within one (1) hour of the Engineer's directive to proceed).

e. The Contractor shall haul the removed snow and ice for disposal as per the applicable local rules.

f. Spreading of Salt and Sand

1) The Contractor shall furnish all labor, tools, equipment, and materials necessary to provide the following services specifically requested and authorized in writing by the Engineer:

a) Spread calcium chloride over all areas of the Engineer's parking lot and spread sand on the steps and platforms at the entrances to the Engineer's field office.

b) Salt and sand shall be spread prior to a snowstorm.

c) Upon termination of a snowstorm, the Contractor shall remove all sand from the steps and platforms at the entrances to the Engineer's field office.

2) Disposal of sand shall be the responsibility of the Contractor.

B. Disposal of Waste Materials

1. The Contractor shall not burn or bury rubbish and waste materials on the Site.

2. The Contractor shall not dispose of volatile or hazardous wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains or on the ground.

3. The Contractor shall not discharge any wastes into waterways.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Initial Cleaning at the FBCSO Retention Facility Chemical Storage Area

1. The existing equipment, including chemical storage tanks and ductwork to remain, within the FBCSO Retention Facility Chemical Storage Area have not been in service in some years. To avoid disturbance of accumulated dust and debris that may cause an accidental triggering of the facility smoke detectors and fire alarm system, the Contractor shall thoroughly clean all materials, equipment and structures in the Chemical Storage Area so as to leave the Work in a clean appearing condition. This generally includes, but is not limited to the following:

a. Clean all glass surfaces

b. Clean and remove dirt, dust, and other foreign items or substances from the exterior of the existing equipment and piping to remain.

c. Clean and remove dirt, dust, and other foreign items or substances from the floors and gratings.

2. Sodium Hypochlorite Tank Cleaning:

a. The Contractor shall remove dirt, dust, and other foreign items or substances from interior and exterior surfaces of the existing sodium hypochlorite storage tanks.

3. HVAC Ductwork Cleaning:

a. HVAC ductwork associated with the ventilation equipment that serves the existing Chemical Storage Area shall be cleaned prior to placing the existing ventilation equipment back into service. Refer to Section 23 31 14 – Metal Ducts and Accessories for requirements and extents.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Final Cleaning

1. At the completion of the Work, the Contractor shall remove all rubbish from and about the Site of the Work, and all temporary structures, construction signs, tools, scaffolding, materials, supplies and equipment which it or any of its Subcontractors may have used in the performance of the Work. Contractor shall broom clean paved surfaces and rake clean other surfaces of grounds.

2. The Contractor shall thoroughly clean all materials, equipment and structures in it Work areas so as to leave the Work in a clean and new appearing condition.

a. All marred surfaces shall be touched up to match adjacent surfaces;

b. Dirty filters and burned-out lights shall be replaced as required;

c. All glass surfaces shall be cleaned; and

d. Floors shall be cleaned and polished.

3. The Contractor shall remove spatter, grease, stains, fingerprints, dirt, dust, labels, tags, packing materials and other foreign items or substances from interior and exterior surfaces, equipment, signs and lettering in its Work areas.

4. The Contractor shall remove paint from and clean and restore all equipment and material nameplates, labels and other identification markings in its Work areas.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the requirements for construction waste management for a project that requires measurable quantities and tracking documentation, including but not limited to those that may be submitted for Envision Certification under the Institute for Sustainable Infrastructure, or another third party sustainability rating system.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 35 27 – Environmental Health and Safety Requirements

B. Section 01 35 45 – Hazardous Materials Control

C. Section 02 24 20 – Soil Sampling and Analysis

1.04 REFERENCES

A. Diversion: To remove, or have removed, from the site for recycling, reuse or salvage, material that might otherwise be sent to a landfill. Diversion does not include using the material as alternative daily cover at a landfill site, nor does it include burning, incinerating or thermally destroying waste.

B. Electronic Waste as defined by:

1. 40 CFR Parts 260 – 272;
2. 6 NYCRR Part 370: Hazardous Waste Management System – General
3. 6 NYCRR Part 371: Identification and Listing of Hazardous Waste;
4. 6 NYCRR Part 372: Standards Applicable to Generators of Hazardous Waste;
5. The Federal CRT Rule [Federal Register: July 28, 2006 (Volume 71, Number 145)];
6. The Federal Circuit Board Rule [Federal Register: May 26, 1998 (Volume 63, Number 100)];
7. Environmental Conservation Law Article 27 Title 26 – Electronic Equipment Recycling and Reuse.

C. Hazardous Waste: Material shall be considered a hazardous waste when it exhibits any of the following: ignitability, corrosivity, reactivity, or toxicity for Volatile Organic Compounds (VOCs), semi-VOCs, metals, pesticides, or herbicides, as defined in 6 NYCRR Part 371 or 40 CFR Section 261. Under New York State (NYS) regulations, a material that contains 50 ppm or greater of PCBs is considered a hazardous waste. The Environmental Protection Agency (EPA) considers a material that contains 50 ppm or greater of PCBs to be a Toxic Substances Control Act (TSCA)-regulated waste. All hazardous waste shall be considered unsuitable, and shall be disposed of at an approved permitted hazardous waste landfill.

D. Universal Waste as defined by:

1. 40 CFR Part 273: Standards for Universal Waste Management;
2. 6 NYCRR Subpart 374-3: Standards for Universal Waste;
3. 6 NYCRR 373-3.10: Interim Status Standards for Owners and Operators of Hazardous Waste Facilities, Tank Systems;
4. Use of Enforcement Discretion for Discarded Mercury-Containing Equipment, NYS DEC Commissioners Policy (CP-39);
5. Mercury Added Consumer Products Law (Chapter 145 Laws of New York 2004 and Chapter 676 Laws of New York 2005);
6. 49 CFR Part 172: Hazardous Materials Regulations.

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Regulatory Requirements: Contractor(s) shall meet all applicable federal, state, and local regulatory requirements as well as DEP EHS Policies and Procedures for the on-site management, transportation, and recycling or disposal of all construction waste materials generated during construction.

1.07 SUBMITTALS

A. Construction Waste Management Plan: The Contractor shall be responsible for the development and implementation of the Construction Waste Management Plan ("Plan") for the Project. Waste and recyclable materials shall be collected, sorted, and deposited in accordance with the approved Plan.

1. The Contractor shall prepare and submit the Plan for review and approval by the Engineer 30 days after receipt of Notice to Proceed and prior to the removal of any construction waste from the Project site. The Plan shall be based on the construction waste recycling percentage goal ("percentage goal") established via the Design Sustainability Program. The percentage goal of 95% end-of-Project rates of salvage/recycling of construction waste is detailed in the Construction Waste Estimate Report ("CWER") generated by the Design Engineer and is included in the bid exhibit documents. The CWER dated October 2025 is expressly excluded from and is not a part of this Contract and is available for information purposes only. Copies of this document have been provided on CD for reference.

2. The Plan shall contain the following:

a. Construction and Demolition Diversion: Estimate of the total proposed construction and demolition waste to be generated, and the percentage of this waste to be diverted from landfill (including types and quantities) during prosecution of the Work. Identify at least five materials (both structural and non-structural) targeted for diversion. Approximate a percentage of the overall Project waste that these materials represent. This diversion shall be developed based on the estimates included in the CWER. Percent diverted from landfill shall be calculated using the following formula:

$$Diversion\ Percentage = \frac{Total\ Estimated\ Waste\ Diverted\ from\ Landfill}{Total\ Estimated\ Waste\ Produced\ by\ Project}\ x\ 100$$

The estimates shall be calculated by weight (tons). The list of construction waste materials shall be specific to the project site and may include, but not be limited to, the following materials:

1) Asphalt

2) Cast iron
3) Concrete
4) Copper wiring
5) Copper
6) FRP
7) HVAC/Ductwork
8) Land clearing debris
9) Lighting
10) Mercury containing light bulbs
11) Paints, solvents, and other hazardous fluids
12) Piping
13) Plastics
14) Plumbing fixtures
15) Plywood
16) Polyethylene
17) PVC
18) Recyclable office wastes such as paper and toner and ink cartridges
19) Stainless steel
20) Steel
21) Reinforcing steel

b. Soil Diversion: Estimate of the total proposed excavated soil to be generated, and the percentage of this soil to be diverted from landfill via onsite and/or offsite reuse (including types and quantities) during prosecution of the Work. Soil diversion may be achieved through onsite or offsite reuse. Whenever possible, reuse of excess excavated soils on site should be prioritized over off site reuse. Refer to 02 24 20 - Soil Sampling and Analysis for sampling and regulatory requirements. The estimates shall be calculated by weight (tons). Percentage of soil diverted from landfill shall be calculated using the following formula:

$$Soil\ Diversion = \frac{Total\ Estimated\ Soil\ Diverted\ from\ Landfill}{Total\ Estimated\ Soil\ Produced\ by\ Project}\ x\ 100$$

c. Materials handling procedures. A description of the means by which any waste materials will be protected from contamination via segregation, and a description of the means to be employed in recycling the above materials consistent with the requirements for acceptance by recycling processors to be utilized and the New York City Department of Sanitation (NYCDOS). Hazardous waste, universal waste, and used oil must be separated and stored in their own dedicated storage areas and managed in compliance with NYSDEC Hazardous Waste, Universal Waste and Used Oil Regulations, USDOT 49 CFR Hazardous Material Transportation Regulations, and in accordance with DEP EHS Policies and Procedures.

d. List of waste transporters, transfer stations, beneficial use facilities, disposal facilities and recyclers with addresses, phone numbers, and permits, which the Contractor intends to utilize during the Project for the purpose of complying with the Construction Waste Management Plan. The Plan should list where both recyclable and non-recyclable materials will be recycled, reused, or disposed, and how those materials will be transported.

3. Hazardous wastes: The Plan shall specifically note the proper method of disposal for anticipated hazardous wastes or potentially hazardous wastes as detailed in 01 35 45 – Hazardous Materials Control. The Plan shall state that the hazardous waste transporter must hold a current New York State Part 364 Waste Transporter Permit in accordance with NYCRR Part 364. The permit must authorize the transporter to take the hazardous waste to the Transportation, Storage and Disposal Facility (TSDF) identified in the permit. The Construction Waste Management Plan must state that the hazardous waste will be transported in compliance with USDOT Hazardous Materials Transportation regulations in Title 49 of the CFR.

4. Non-hazardous wastes: The Plan shall specifically note the proper method of removal of anticipated non-hazardous waste. The Plan shall state the transporter must hold a current New York State Part 364 Waste Transporter Permit to transport the waste to a TSDF that accepts non-hazardous waste.

5. The Plan shall include the method of recycling office materials such as clean white paper, mixed paper, toner cartridges for laser printers, copiers, fax machines, and other electronic waste. Each item shall be recycled in accordance with the manufacturer's instructions.

6. The Plan shall include the coordination of product deliveries to designated prepared areas in order to minimize site storage time and potential damage to stored materials and the return of packing materials, where economically feasible.

B. Final Submittal: The Contractor shall submit a Construction Waste Management Final Summary Report ("Final Summary Report") upon Substantial Completion. The Summary Report should tabulate total waste material, quantities diverted from landfill and means by which it is diverted, and shall include a statement noting that the recycling/diversion goal outlined in the CWER has been met.

C. Monthly Submittals: Monthly waste and soil generation/diversion/disposal data shall be tracked in accordance with Section 01 35 27 – Environmental Health and Safety Requirements, paragraph 1.07.C Monthly Contractor EHS Report.

D. Project Meetings: The Construction Waste Management Plan and implementation shall be discussed at the following meetings:

1. Pre-construction Meeting
2. Regular monthly Progress Meetings

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall designate separate receiving/storage areas for delivered materials and equipment to minimize waste due to excessive materials mishandling, misapplication, weather and other damage.

1. Promptly inspect shipments to assure products comply with requirements, quantities are correct, and products are undamaged.
2. Promptly return damaged shipments or incorrect orders to manufacturer.
3. For materials or equipment to be reused or salvaged, use special care in removal, storage and reinstallation to insure proper function in completed work.

B. Periodically inspect stored products to assure products are undamaged and are maintained under required conditions.

C. Training of employees for handling and storing waste materials shall be in accordance with DEP EHS Policies and Procedures.

D. The requirements herein shall supersede any conflicting statements wherever they may appear in the Contract Documents.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. The Contractor shall be responsible for the implementation of the approved Construction Waste Management Plan. The Contractor shall be responsible for the provision of containers and the removal of all waste, non-returned surplus materials, and debris from the site in accordance with the Plan and in compliance with all federal, state, and local regulations, as well as DEP EHS Policies and Procedures.

B. Monies received for recycling and/or salvaged materials shall remain with the Contractor, except for items specifically identified in the Contract Documents.

C. Contractor(s) shall use construction and demolition methods and processes to ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

D. When encountered as part of the Work, the Contractor shall dispose of construction waste by recycling methods in accordance with the NYC Recycling Law: Local Law 19 (1989) and Local Law 87 (1992), and NYC's Commercial Recycling Regulations: Rules Governing the Recycling of Private Carter-Collected Waste (September 1993).

All material to be recycled shall be separated from normal refuse, per NYCDOS Rules. Material not required to be recycled shall be disposed of by the Contractor as specified and in accordance with all applicable federal, state, and local regulations and DEP EHS Policies and Procedures.

E. When encountered as part of the Work for sites outside New York City, the Contractor shall dispose of construction waste by recycling methods in accordance with all federal, state, and local regulations and DEP EHS Policies and Procedures.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 01 75 10 – PRELIMINARY AND FINAL FIELD TESTS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Field Test Schedule and Updates
2. System Test Procedures
3. Contractor Responsibilities
4. Preliminary Field Tests of Equipment
5. Preliminary Field Tests of Systems
6. Final Field Tests of Equipment
7. Final Field Tests of Systems

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 32 10 - Progress Scheduling

B. Section 01 43 05 - Contractor's Work Quality

1.04 REFERENCES

A. "System": A System, for purposes of testing, is defined as consisting of the component equipment, valves, piping, instrumentation, controls, ducts, accessories, etc., which are required for the proper functioning of each piece of equipment and the System as a whole. The purpose of the System testing is to demonstrate the capability of the equipment, interconnections and accessories to perform as specified.

1.05 DESCRIPTION

A. All field tests, including equipment and Systems tests, shall be performed in accordance with the requirements of this Section. The requirements contained herein shall apply, whether or not this Section is specifically referenced elsewhere in the Contract Documents.

B. Field tests shall include preliminary and final field tests of equipment and Systems.

1. Preliminary field tests of equipment and Systems shall be made with water and air in lieu of the wastewater components and chemicals for which the equipment and Systems are designed.

2. Final field tests of equipment and Systems shall utilize the wastewater, wastewater components, chemicals and air for which the equipment and Systems are designed.

3. All tests shall be performed in strict compliance with applicable manufacturer's and Engineer's instructions.

4. No testing of Systems shall commence before the associated pipelines have been satisfactorily tested for leakage in accordance with the requirements of the Contract.

C. For a successful test of equipment or System, the equipment or System shall operate trouble free for the continuous period of time, as specified below. If there are any interruptions in operation during the test, the test shall be repeated until the equipment or System operates trouble free for the specified time period.

D. System Test Procedures:

1. The following are to be considered a part of all System test procedures:

a. Variable capacity equipment shall be operated over the full capacity range of the maximum, minimum and at least three (3) intermediate points for a minimum of 30 minutes at each point.

b. Multiple equipment groupings are to be operated both singly and together up to the maximum capacity of the System.

c. Header and cross connected groups of units are to be operated using all connecting combinations.

d. All equipment items, including standby units are to be tested. It may be necessary to repeat System tests at maximum condition to insure that standby units are included in System tests.

e. Each operating unit shall be run for at least one hour alone (equipment field test) and for four hours as a System at maximum capacity after reaching stable operating conditions.

f. All equipment, interconnecting piping and accessories are to be checked for leakage and specified rate performance capability. Instrumentation and controls shall be tested as part of the equipment.

E. Contractor Responsibilities:

1. For preliminary field tests of equipment and Systems, the Contractor shall furnish all labor, lubricants, fuel, power, water, materials, plant and instrument air, instruments and equipment required for the tests.

2. For final field tests of equipment and Systems, the Contractor shall furnish all labor, lubricants, materials, fuel, power, instruments and equipment required for the tests. DEP will furnish all water necessary.

3. All testing shall be performed by the Contractor and witnessed by the Engineer, DEP Operations personnel and, when applicable, representatives of the Electrical Division, Department of Buildings. Preliminary field testing of equipment and systems and final field testing of equipment and systems shall be performed within the time periods designated in the preliminary construction schedule (CPM) during regular weekday daytime working hours.

1.06 QUALITY ASSURANCE

A. Nothing stated herein shall affect the requirements contained in Section 01 43 05 – Contractor's Work Quality; or the specific pressure testing requirements for piping systems specified in the Contract Documents. Such tests shall be performed at the scheduled time, prior to backfilling, encasement or enclosure, if applicable. However, checking the systems for leakage at the pressures developed, particularly for leakage of the visible type, shall be performed as part of the tests included herein.

1.07 SUBMITTALS

A. The Contractor shall submit a preliminary and final field test schedule to the Engineer within 120 days after the date for commencing work in the Notice to Proceed. The test schedule shall be updated every 2 months or sooner if necessary, until completion of the required testing. The field test schedule shall itemize all key tasks in chronological order, based on the Construction CPM Schedule specified in Section 01 32 10 – Progress Scheduling, to meet all the requirements of this Section. All preliminary and final field testing to be conducted shall be organized and scheduled in accordance with the approved test procedure.

B. The field test schedule shall include proposed test dates, preliminary or final field test, equipment or System being tested, specification references, equipment identification numbers, and indication of whether the test procedure has been submitted for approval and approval status.

C. The Contractor shall notify the Engineer in writing 30 days prior to any testing. The Contractor shall not proceed with any testing until the test procedure has been approved by the Engineer.

D. Before each test commences, the Contractor shall submit a detailed test procedure and manpower schedule to the Engineer for approval.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Preliminary Field Tests of Equipment:

1. Each item of equipment shall be field tested with either water or air as suitable for the system, and shall operate trouble free in accordance with the procedures prescribed in the Contract Documents, preliminary tests shall demonstrate that equipment and appliances were properly installed, meet their specified operating cycles and characteristics, and are free from defects such as overheating, overloading and undue vibration.

2. A successful test shall consist of at least one continuous hour of trouble free operation unless a longer period is specified in the Contract Documents.

B. Preliminary Field Tests of Systems:

1. All Systems shall be field tested with either water or air as suitable for the system and shall operate trouble free for four continuous hours, or longer if so specified in the Contract Documents.

2. The Systems shall be tested by operating the systems equipment together as a unit with all related piping, valves, electrical controls and mechanical operations.

3. The tests shall prove that all equipment and appurtenances of each system are properly installed, free from defects, meet their specified operating cycles and characteristics when operating as part of the system.

4. Systems with automatic control systems shall be operated continuously by the automatic control system for four continuous hours, or longer if specified in the Contract Documents.

5. To satisfy the requirements for preliminary testing of equipment and Systems, the Contractor shall submit data per the approved test procedure and receive approval from the Engineer.

C. Final Field Tests of Equipment and Systems:

1. The following requirements shall be met prior to the final field testing of equipment and systems:

a. All required operating instructions, maintenance manuals, bulletins, and shop drawings shall be approved and distributed unless otherwise specifically allowed by the Engineer.

b. All spare parts shall be delivered unless otherwise specifically allowed by the Engineer

c. The equipment and systems shall be inspected, operated, successfully tested, and adjusted by the manufacturer's representative in the presence of the Engineer and representatives of DEP. All instruction sessions for operating personnel shall also be completed unless otherwise specifically allowed by the Engineer. All instrumentation shall be field calibrated and previously tested.

d. After completion of Item c above and when leakage tests of pipelines are completed, the equipment or system shall then be given a final field test.

2. Equipment and systems shall be subject to final field tests in accordance with the procedures prescribed in the Contract Documents and approved test procedure for each test and as supplemented herein.

3. Equipment shall be given a running test, at its rated capacity, of normal (start-and-stop) operation and during such test shall demonstrate its ability

to operate without vibration or overheating, and shall prove without question its fitness for services in accordance with the approved test procedures. Unless otherwise specified, final field tests of equipment which will be operating continually shall be given a minimum running test of three continuous 8-hour tests for each unit. Other equipment shall be given a running test for a minimum period of four continuous hours, or as otherwise approved by the Engineer. For final field tests of equipment and Systems to be deemed successful, they shall be run continuously and trouble – free in accordance with the approved test procedure for each test, and data shall be submitted and approved by the Engineer.

4. The Contractor shall provide all labor and materials needed to supply all water or other media needed for final field testing.

5. After completion of final System and equipment tests, the equipment and systems shall be operated by DEP for a two-week period under normal operating conditions. The Contractor shall schedule and have delivered sufficient training and instruction to City personnel to ensure that during the two week test the equipment and Systems will be operated properly and safely. Should the equipment and Systems function normally during this period the equipment and Systems shall have successfully passed the final field tests and will be accepted for additional testing and/or operation by DEP. The Contractor shall warrant and guarantee that all equipment shall function satisfactorily for a period of one year from Substantial Completion.

D. Systems:

1. The following equipment groupings shall be tested together as Systems, in accordance with the Contract Documents:

a. TI-010 Chlorination Facilities:

1) Chlorination System, including: sodium hypochlorite metering pumping units, piping, valves, diffusers, accessories, instrumentation, and controls.

2) Sodium Hypochlorite Tank Transfer System, including: sodium hypochlorite transfer pumping units, piping, valves, accessories, instrumentation, and controls.

3) Sodium Hypochlorite Fill Station System, including: sodium hypochlorite fill station panel, piping, valves, accessories, instrumentation, and controls.

4) TRC Sample Pump System, including: sample pumps, automatic strainers, piping, valves, TRC analyzers, accessories, instrumentation, and controls.

5) Sodium Hypochlorite Chemical Sump Pump System, including: chemical sump pumps, piping, valves, accessories, instrumentation, and controls.

6) DC-5 Ventilation System, including: Exhaust fan and controls.

b. TI-010 Dechlorination Facilities:

1) Dechlorination System, including: sodium bisulfite metering pumping units, piping, valves, accessories, diffusers, instrumentation, and controls.

2) Sodium Bisulfite Tank Transfer System, including: sodium bisulfite transfer pumping units, piping, valves, accessories, instrumentation, and controls.

3) Sodium Bisulfite Fill Station System, including: sodium hypochlorite fill station panel, piping, valves, accessories, instrumentation, and controls.

4) TRC Sample Pump System, including: sample pumps, automatic strainers, piping, valves, TRC analyzers, accessories, instrumentation, and controls.

5) Sodium Bisulfite Chemical Sump Pump System, including: chemical sump pumps, piping, valves, accessories, instrumentation, and controls.

6) Chemical Room Ventilation System, including fans, ductwork, motorized dampers, electric duct heaters, and controls.

7) Electrical Room Ventilation System, including fans, ductwork, motorized dampers, electric duct heaters, and controls.

c. TI-011 Disinfection Facilities:

1) Chlorination System, including: sodium hypochlorite metering pumping units, piping, valves, diffusers, accessories, instrumentation, and controls.

2) Sodium Hypochlorite Tank Transfer System, including: sodium hypochlorite transfer pumping units, piping, valves, accessories, instrumentation, and controls.

3) Sodium Hypochlorite Fill Station System, including: sodium hypochlorite fill station panel, piping, valves, accessories, instrumentation, and controls.

4) TRC Sample Pump System, including: sample pumps, automatic strainers, piping, valves, TRC analyzers, accessories, instrumentation, and controls.

5) Sodium Hypochlorite Chemical Sump Pump System, including: chemical sump pumps, piping, valves, accessories, instrumentation, and controls.

6) Dechlorination System, including: sodium bisulfite metering pumping units, piping, valves, accessories, diffusers, instrumentation, and controls.

7) Sodium Bisulfite Tank Transfer System, including: sodium bisulfite transfer pumping units, piping, valves, accessories, instrumentation, and controls.

8) Sodium Bisulfite Fill Station System, including: sodium hypochlorite fill station panel, piping, valves, accessories, instrumentation, and controls.

9) Sodium Bisulfite Chemical Sump Pump System, including: chemical sump pumps, piping, valves, accessories, instrumentation, and controls.

10) Chlorination Chemical Room Ventilation System, including fans, ductwork, motorized dampers, electric duct heaters, and controls.

11) Dechlorination Chemical Room Ventilation System, including fans, ductwork, motorized dampers, electric duct heaters, and controls.

12) Electrical Room Ventilation System, including fans, ductwork, motorized dampers, electric duct heaters, and controls.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 01 78 10 – PROJECT CLOSEOUT
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Items to be completed
2. Final record documents
3. Special tools and appliances
4. Spare parts and maintenance materials
5. Asset and preventative maintenance forms
6. Lubricants
7. Piping and equipment identification

B. The following index of this Section is presented for convenience:

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3.02	Installation	5
3.03	Field Testing / Quality Control	5
3.04	Startup / Demonstration	5
3.05	Adjusting / Protection / Cleanup	5

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the

applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 78 39 – Final Record Documents

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. As construction of the Project enters the final stages of completion, the Contractor shall, in concert with accomplishing the requirements set forth in the Contract Documents, attend to or have already completed the following items as they apply to the Contract:

1. Scheduling equipment manufacturers' visits to the Site.
2. Required testing of project components.
3. Scheduling start-up and initial operation.
4. Scheduling and furnishing skilled personnel during initial operation.
5. Correcting or replacing defective work, including completion of items previously overlooked or work which remains incomplete, all as evidenced by the Engineer's "Punch" Lists.
6. Attend to any other items listed herein or brought to the Contractor's attention by the Engineer.

B. The Contractor's attention is directed to the fact that required certificates and information listed herein must be submitted earlier in accordance with other Specifications.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. In addition to any requirements of the New York City Standard Construction Contract, before the determination of Substantial Completion is issued, the Contractor shall submit to the Engineer all required records, certifications, etc., which are specified in the Contract Documents. A partial list of such items appears below, but it shall be the Contractor's responsibility to submit all items which are required by the Contract Documents:

1. Test results of project components.
2. Performance Affidavits for equipment.
3. Certification of equipment or materials in compliance with Contract Documents.
4. Operation and maintenance instructions or manuals for equipment.

5. One set of neatly marked-up record drawings showing as-built changes and additions to the work under his Contract.

6. Any special guarantees or bonds.

B. Final Record Documents

1. In addition to any requirements of the New York City Standard Construction Contract, in order to obtain Final Acceptance, the Contractor shall furnish Final Record Documents in accordance with Section 01 78 39 – Final Record Documents.

C. Lubricant Survey

1. A lubrication survey, made by a lubricant supply firm, subject to the approval of the Engineer shall be provided by the Contractor.

2. The lubrication survey shall list all equipment furnished, under this Contract, with the equipment manufacturer's lubrication recommendations and an interchangeable lubricants tabulation standardizing and consolidating lubricants whenever possible.

D. Spare Parts List

1. A complete list of spare parts and maintenance materials to be furnished shall be submitted to the Engineer for approval as part of the Shop Drawing submittals.

E. Special Tools List

1. The Contractor shall submit a complete list of special tools and appliances to be furnished, for approval by the Engineer, as a part of the Shop Drawing submittals.

F. Asset and Preventative Maintenance Forms

1. The Contractor shall submit the completed BWT "Assets Installed and PM List", in Excel format compatible with BWT's existing Computerized Maintenance Management System (CMMS), for all installed equipment, facility appurtenances and site features. The Contractor shall revise all asset tag numbers and tag number signage to match the asset IDs approved by the BWT Asset Management Planning Section as needed. Contractor shall respond to questions and update as requested corrected data into these data entry forms, to the satisfaction of the BWT, until final acceptance. A preliminary list of the assets and asset IDs and a blank unformatted table may be obtained from the Resident Engineer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery

1. Spare Parts

a. Upon acceptance of the spare parts by the Engineer, the Contractor shall deliver the spare parts for storage to the location within the City limits designated by DEP upon request by the Engineer.

2. Lubricants

a. The Contractor shall furnish lubricants for all equipment supplied under this Contract in one delivery consisting of a minimum number of products, reflecting the results of the lubrication survey, as specified herein.

B. Storage

1. Spare Parts

a. All parts shall be securely boxed and tagged, and clearly marked on the box and individually for identification as to the name of manufacturer or supplier, applicable equipment, part number, description and location within the equipment or system that the part is installed.

b. Complete information shall also be provided for use and reordering of spare parts.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Spare Parts

1. Spare parts and maintenance materials shall be furnished in accordance with all applicable Specifications.

2. Two complete spare sets of all lamps supplied as a part of electrical control equipment shall be furnished by the Contractor, unless otherwise called for in the Contract.

B. Special Tools

1. Special tools and appliances which are needed to adjust, operate, maintain or repair the equipment furnished under this Contract shall be provided in accordance with the Contract.

2. Special tools and appliances shall be furnished in approved painted steel cases, properly labeled and equipped with heavy duty cylinder locks and duplicate keys.

1.10 WARRANTY

A. All spare parts shall be protected and packaged for a shelf life of at least ten (10) years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Lubricants

1. The Contractor shall furnish and deliver such oil, grease and any special lubricants that are necessary for proper operation of all equipment furnished under this Contract. Identification and listing of such lubricants shall be made as part of the Shop Drawing submittals. The quantity furnished shall be sufficient for equipment start-up, operation prior to final acceptance of the Work, and for operation during the guaranty period as defined in Article 24 of the Standard Construction Contract. The grade of lubricants furnished shall be in accordance with the recommendations of the equipment manufacturers made on the approved equipment shop drawings.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Piping and Equipment Identification

1. The Contractor shall furnish and install identification signs for all equipment, control panels, valves and piping identification in accordance with specific requirements of the Contract for piping and equipment identification.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. In addition to any requirements of the New York City Standard Construction Contract, before the determination of Substantial Completion is issued, the Contractor shall clean and perform final adjustment of the various building components as specified in the Specifications, including but not limited to the following:

1. Clean all glass and adjust all windows and doors for proper operation.

2. Clean all finish hardware after adjustment for proper operation.

3. Touch up marks or defects in painted surfaces and touch up any similar defects in factory finished surfaces.
4. Wax all resilient flooring materials.
5. Remove bitumen from gravel stops, fascias and other exposed surfaces.
6. Remove all stains, marks, fingerprints, soil, spots and blemishes from all finished surfaces, tile, stone, brick and similar surfaces.

END OF SECTION

SECTION 01 78 24 – SPARE PARTS AND MAINTENANCE MATERIALS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Contractor shall inventory, store, and deliver all spare parts and maintenance materials as shown, specified, and/or required.

B. The following index of this Section is presented for convenience:

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C. The following schedule, attached after the "End of Section" designation, is a part of this Section:

1. Schedule 01 78 24-1, Spare Parts and Maintenance Materials Schedule.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Furnish all spare parts and maintenance materials shown, specified, and/or required by the Contract Documents.

B. Contractor shall provide data for each distinct spare part or maintenance material, in paper and electronic format, as specified herein.

C. Contractor shall attach bar-code tag stickers, furnished by the Engineer, to each distinct spare part or maintenance material.

D. Schedule delivery of all spare parts and maintenance materials for the Work over a reasonable period of time and in coordination with DEP personnel and the Engineer.

E. All spare parts and maintenance materials shall be turned over to DEP in new condition and shall be furnished in manufacturers' unopened cartons, boxes, crates, or other protective covering, suitable for preventing corrosion or deterioration, for the maximum length of storage indicated by the part manufacturer.

F. The Contractor shall turn over spare parts and maintenance materials to DEP upon completion of the Work or when DEP assumes beneficial occupancy or as directed by DEP or Engineer. Contractor shall then place them in permanent storage rooms or areas designated by the DEP or Engineer.

G. Contractor shall be fully responsible for loss or damage to all spare parts and maintenance materials until such time they are handed over and accepted by DEP.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Submittals shall include, but not be limited to:

1. Action Submittals:

a. List of all spare parts and maintenance materials and data:

1) The spare parts and maintenance materials list and data shall be submitted in paper and electronic format:

a) The electronic format shall be a spreadsheet that allows data to be uploaded into a commercial database system owned by DEP.

b) Refer to Schedule 01 78 24-1, Spare Parts and Maintenance Materials Schedule, located after the "End of Section" designation, for the paper and electronic format.

2) The spare parts and maintenance materials list and data shall be submitted to the Engineer at least 120 Days prior to delivery.

2. Information Submittals:

a. Schedule of the intended dates for spare parts and maintenance materials deliveries.

b. Submit a letter of transmittal for each part or maintenance material shipment, including the following information, at a minimum:

1) Date of letter and transfer of parts and materials.

2) Contract title and number.

3) Contractor's name and address.

4) A complete inventory of the parts and materials, listing the applicable Specification Section and equipment item for each.

5) A place for DEP to sign and confirm receipt of the parts and materials.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver spare parts and maintenance materials in accordance with the requirements of the Contract Documents. In addition:

1. Spare parts and maintenance material delivery shall require a minimum written notice to Engineer of 7 Days.

2. The Contractor shall attach bar-code stickers to each approved spare part or maintenance material, upon receipt.

a. The Engineer shall furnish bar code stickers and transmit the bar code stickers to the Contractor.

b. The sticker for any spare part shall be affixed to shipment packaging for that part.

c. If additional stickers are required for split deliveries or re-delivery of previously rejected parts, they will be furnished by the Engineer and transmitted to the Contractor.

B. The Contractor shall store and handle spare parts and maintenance materials in accordance with the requirements of the Contract Documents. In addition:

1. Store and handle spare parts and maintenance materials in accordance with manufacturer recommendations.

2. During construction and prior to acceptance by DEP, the Contractor shall store spare parts or maintenance materials in the Contractor's buildings or construction trailers. Storage locations shall have floor, roof, and closed sides, and be in accordance with the part manufacturers' recommendations.

a. Contractor shall protect spare parts and maintenance materials from weather, condensation, and humidity.

b. If the Contractor's assigned location is inappropriate, an alternate storage location shall be used, as designated by DEP, and at no additional cost to DEP.

c. Upon placement of each item in the storage location, the item bar-code sticker or tag shall be scanned into DEP Database along with the shelf bar-code sticker using handheld Radio Frequency Computers.

3. DEP personnel reserve the right to inspect each spare part or maintenance material upon delivery for adherence to approved submittals and reject any part or parts in accordance with said inspection.

a. Packaging shall be opened by the Contractor to allow such inspection.

b. DEP personnel reserve the right to reject any spare parts or maintenance materials during such inspection.

c. Any spare parts or maintenance materials rejected shall be taken back by Contractor and the Contractor shall resubmit a new spare part or maintenance material at no additional cost to DEP.

d. The Contractor shall provide DEP personnel with access, and transport if required, to the Contractor's storage facilities.

4. After acceptance of delivered spare parts and maintenance materials, the Contractor shall place accepted spare parts and maintenance materials in a storeroom directed by DEP personnel.

a. All spare parts and maintenance materials shall be identified, assigned a storeroom and location as directed by DEP personnel, delivered, shelved, and logged into the shelf or bin via scanning the barcode to the database referenced herein.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Data for each distinct spare part or maintenance material, per approved submittals, shall be recorded and entered into the existing computer database, provided by DEP and as directed by the Engineer.

1. Reference Schedule 01 78 24-1, Spare Parts and Maintenance Materials Schedule, located after the End of Section designation.
2. Data shall include, but not necessarily be limited to:
    a. Contract number.
    b. Specification Section number.
    c. Description of equipment for which part is being provided.
    d. Equipment number (per DEP numbering system).
    e. Manufacturer of part, manufacturer's part number.
    f. Supplier / vendor for part, with name and contact information.
    g. Unit price of part.
    h. Quantity required to be delivered.
3. No spare parts or maintenance materials shall be accepted by DEP unless all data listed above has been entered into the database and barcodes have been applied as specified.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SCHEDULE 01 78 24-1
SPARE PARTS AND MAINTENANCE MATERIALS SCHEDULE

CONTRACT _____EQUIPMENT DESCRIPTION AND NUMBER _____

EQUIPMENT SPEC. SECTION _____SUBMITTAL # _____REVIEW CYCLE # _____

PART DESCRIPTION	MANUFACTURER NAME	MANUFACTURER PART NO.	VENDOR NAME	VENDOR PART NO.	COMPONENT Y/N?	COMPONENT SERIAL #	QUANTITY ON ORDER (PER SPEC)

SECTION 01 78 25 – OPERATIONS AND MAINTENANCE MANUALS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. General requirements.
2. Operation and maintenance Manual requirements.
3. Binding and format requirements.
4. Submittals.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 78 39 – Final Record Documents

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. As a prerequisite to obtaining payments in excess of 50 percent of the equipment cost for equipment furnished under this Contract, the Contractor shall prepare, submit and obtain the Engineer's approval, as designated by "Approved," of an operation and maintenance Manual ("Manual") for each item of equipment supplied under the Contract. Approval is a prerequisite for continuing payments for equipment furnished by the Contractor, providing instructional services and equipment start-up.

B. Each Manual shall be prepared especially for each installation and shall include all pertinent and legible instructions, preventative maintenance instructions, technical bulletins and other printed matter required to provide accurate and comprehensive information for the safe and proper operation, maintenance and repair of the equipment.

C. Operation and Maintenance Manual Requirements:

1. The Manuals shall include, but not be limited to, the following:

a. Complete, detailed written operating instructions for each product or piece of equipment including: equipment function; operating characteristics; limiting conditions; operating instructions for startup, normal and emergency conditions; regulation and control; and shutdown.

b. Complete, detailed written preventive maintenance instructions, including all information and instructions required to keep a product or piece of equipment properly lubricated, adjusted and maintained so that the item functions economically throughout its full design life. Preventive maintenance instructions include, but are not limited to, the following:

1) A written explanation with illustrations for each preventive maintenance task.

2) Recommended schedule for execution of preventive maintenance tasks.

3) Lubrication charts.

4) Table of alternative lubricants.

5) Troubleshooting instructions.

6) List of required maintenance tools and equipment.

7) Nameplate data of each component, year of installation, Contract number and Specification number.

c. Name, address and telephone number of the manufacturer and the manufacturer's local representative(s).

d. Installation instructions.

e. Emergency operating instructions and capabilities.

f. Troubleshooting and corrective maintenance (repair) procedures.

g. Drawings suitable for assembly and disassembly of entire system or unit, and each component, and approved wiring and control diagrams, all as required for operation, maintenance and repair of the equipment supplied. Drawings shall be black on white, clearly legible and no larger than 11" x 17".

h. Parts list with current prices and ordering information.

i. List of recommended spare parts and the recommended number of each.

j. Name, address and telephone number of nearest parts supply house and nearest repair service center.

k. Warranties, guarantees, bonds and service contracts.

l. Long-term and short-term manufacturer's recommended equipment storage procedures.

m. Written explanations of all safety considerations relating to operation and maintenance procedures.

n. Name, address and telephone number of manufacturer, manufacturer's local service representative, and subcontractor or installer.

o. Copy of all approved shop drawings.

p. Catalogs, diagrams, schematics, drawings, instruction bulletins and manuals marked by underlining, checking, the use of arrows or the obliteration or removal of extraneous data, so as to pertain only to the specific equipment item for which the manual is supplied.

q. Complete electrical schematics and wiring diagrams. Complete wiring between terminal points must be shown. Computerized diagrams are not acceptable.

2. Reference to features and elements of equipment, such as operational limits of time, speed, pressure, temperature, etc. shall be clear, complete and compatible with authoritative published engineering reference documents. All functional components, electrical systems, equipment, etc. shall be shown on diagrams and discussed in the text so as to identify their proper system relationship. Operation, service, trouble-shooting, checkout and in-line and bench repair procedures, identifying specific system characteristics of the equipment shall be provided. The information shall

include recommended procedures and frequencies for preventive maintenance such as inspection, adjustment, lubrication, calibration and cleaning.

3. Equipment parts shall be identified by manufacturer's part number and located with relation to other components of the equipment utilizing "exploded" type drawings for clarity, if required. Complete parts lists shall be included, which indicate the part number, the part description, applicable serial and model numbers, current unit prices and the name, address and telephone number of the nearest equipment manufacturer's representative and nearest service and spare parts warehouse. Complete instructions for the ordering of all replaceable parts shall be noted in this section of a Manual. Recommendations as to spare parts and spare inventory levels shall be made. Where pertinent, lead time and shelf life values and preservation, packaging and labeling methods shall be also recommended.

4. All copyrighted material used in the Manual or in any operation required in the performance of the Contract will be preceded by the Contractor obtaining the copyright holder's written permission on behalf of DEP to use such material in perpetuity.

D. Binding and Format Requirements:

1. Each Manual shall be bound in a durable, permanent, hard cover binder of one (more if required) volume with a complete index of the Manual's contents arranged by subject matter and in order of presentation in each volume. Applicable equipment item numbers, as shown in the Contract Documents shall be prominently included at their appropriate location in the index. The title of the Manual shall be securely affixed to the binder in two places: the front cover and the binder back edge. The title shall identify the Project by number and name, location of the site, state the volume is an O&M Manual, generally classify the equipment and state the manufacturer's name and equipment model number.

2. Intermediate submittals of the Manual for approval by the Engineer need not be hard bound.

3. Use 8½-inch by 11-inch paper of high rag content and quality. Larger drawings or illustrations (no larger than 11" x 17") are acceptable if neatly folded to the specified size in a manner which will permit easy unfolding without removal from the binder. Provide reinforced punched binder tab. Or provide fly-leaf for each product.

4. All text must be legible typewritten or machine printed originals or high quality copies of same.

5. Each page shall have a binding margin of approximately 1½ inches and be punched for placement in a three-ring loose-leaf or triple post binder. Provide binders. Identify each binder with the following:

a. Title "OPERATING AND MAINTENANCE MANUAL"

b. Project title and number.

c. Contract title and number.

d. Identity of building or structure as applicable.

e. Identity of general subject matter covered.

6. Use dividers and indexed tabs between major categories of information such as operating instructions, preventive maintenance instructions, or other. When necessary, place each major category in a separate binder.

7. Provide a Table of Contents for each binder. Identify products by their functional names in the Table of Contents and at least once in each chapter or section. Thereafter, abbreviations and acronyms may be used if their meaning is explained in a table in the back of each binder. Use of model or catalog numbers or letters for identification is not acceptable.

E. Submittals:

1. The Contractor's submittal to the Engineer for approval shall consist of three (3) complete sets of each Manual and three (3) copies of an itemized listing providing cross-references between the Specification, the approved Shop Drawings, and the Manual submittal.

2. A transmittal will be returned to the Contractor indicating the status of the Manual and will include a tabulation of any pages being returned with review comments and noting any extra pages required clarifying or amplifying the comments. Copies of only the pages containing comments and any additional pages needed to clarify or amplify the comments will be attached to the transmittal. The status of the Manual will be noted on the front page of the Manual, which will also be attached to the transmittal, and will be stamped either, "Furnished as Submitted" or "Furnish as Corrected", when the Manual submittal substantially conforms to the requirements of this Section and requires minor corrections; or "Revise and Resubmit" when the Manual submittal is considered inadequate, inaccurate or lacking essential information.

3. The submitting Contractor shall rectify all submittals annotated "Furnish as Corrected," or "Revise and Resubmit" within 15 days of receipt of such notice by replacing pages or adding additional data, as required. The Manual's Index of Contents and the itemized, cross-referenced listing shall be revised to reflect all revisions or additions made. Then, three (3) copies of the revised material shall be resubmitted to the Engineer for approval.

4. When the status of the Manual is stamped "Rejected," a transmittal to the submitting Contractor will return the copies of the Manual intact with the reason for the rejection stated. The Manual will be stamped "Rejected" when the submittal is considered illegible, or does not contain a complete index of contents and/or an itemized list of cross references, or is so incomplete and lacking in required documentation as to preclude a meaningful review by the Engineer. Within 15 days of receipt of such notice

the submitting Contractor shall revise the Manual and resubmit to the Engineer for approval.

5. Final Approved Copies of the Manuals:

   a. After a Manual submittal receives final approval status, signified by the annotation "Furnish as Submitted", the Contractor shall furnish the final Manual to the Engineer in the quantities and formats specified in Section 01 78 39 – Final Record Documents.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 78 39 – FINAL RECORD DOCUMENTS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the requirements for all Final Record Documents.

B. The following index of this Section is presented for convenience:

Article	Title	Section Page
PART 1	GENERAL	1
1.01	Summary	1
1.02	Payment	1
1.03	Related Sections	1
1.04	References	2
1.05	Description	3
1.06	Quality Assurance	3
1.07	Submittals	3
1.08	Delivery, Storage, and Handling	4
1.09	Spare Parts, Special Tools, and Supplies	4
1.10	Warranty	4
PART 2	PRODUCTS	4
2.01	Manufacturers	4
2.02	Materials / Equipment	4
2.03	Fabrication / Assembling / Finishes	4
2.04	Source Quality Control / Shop Tests	4
PART 3	EXECUTION	4
3.01	Examination / Preparation	4
3.02	Implementation	4
3.03	Field Testing / Quality Control	9
3.04	Startup / Demonstration	9
3.05	Adjusting / Protection / Cleanup	9

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 29 10 – Schedule of Values

B. Section 01 32 30 – Job Photographs and Videos

C. Section 01 33 00 – Submittal Procedures

D. Section 01 78 40 – Records in Paper Formats

E. Section 01 78 42 – Records in Electronic Formats

F. Section 01 78 25 – Operation and Maintenance Manuals

1.04 REFERENCES

A. Archive: For the purposes of this Section, to Archive means to furnish as a final record document.

B. As-Built Drawings. The "As-Built Drawings" reflect the "as constructed" final product. These drawings shall use the same title blocks and sheet numbers as the original "Bid Set Drawings", with the exception that an "AB" is prefixed onto the original drawing number.

C. Final Copy Shop Drawing (FCSD): Final Copy Shop Drawing means the approved copy (Furnish as Submitted (FAS), Furnish as Noted (FAN), or Furnish as Corrected (FAC)) of the Shop Drawing as described in Section 01 33 00 - Submittal Procedures, corrected to reflect any deviations made for the installed condition showing the actual construction.

D. Conformed Drawings: The Conformed Drawings are the original Bid Set Contract Drawings modified to incorporate the changes made by addenda to the Invitation for Bids issued during the bid period.

E. Conformed Set Contract: The Conformed Set Contract is the original Bid Set Contract modified to incorporate the changes made by addenda to the Invitation for Bids issued during the bid period.

F. Bid Set Drawings (or Design Drawings): The Bid Set Drawings consist of the original Contract Drawings issued by DEP with the Invitation for Bids.

G. Bid Set Contract (including Addenda): The Bid Set Contract is the text of the original Contract (excluding Contract Drawings) issued by DEP with the Invitation for Bids, including any Addenda issued during the bid period.

H. Change Orders: The Change Orders include registered Change Order forms and the complete sets of attached text and/or drawings for all design and field Change Orders.

I. Operations and Maintenance Manuals: When specified, Operations and Maintenance Manuals ("O&M Manuals") shall be prepared by the Contractor in conformance with Section 01 78 25 - Operation and Maintenance Manuals. Final copies of the O&M Manuals shall be submitted in accordance with the requirements of this Section.

J. EPMIS: DEP's web-based Enterprise Project Management Information System ("EPMIS" or "the System") used to manage all Project communications, workflows and document submittals.

K. Key Documents: For purposes of this Section, Key Documents shall include, but not be limited to, the following items:

1. Signed copy of the Contract;

2. The Contractor's bonds;

3. Signed and submitted Bid Schedule of Prices;
4. DEP Award Folder contents;
5. Contract Notice of Award letter;
6. Notice to Proceed letter;
7. Approved Schedule of Values as described in Section 01 29 10 – Schedule of Values;
8. Written determination by the Engineer or Resident Engineer, as applicable, that the Work is substantially complete, as described in Article 14 of the Standard Construction Contract;
9. Final Approved Punch List
10. Final evaluation;
11. Final extension of time (if applicable);
12. Claim settlements (if applicable);
13. Certificate of Occupancy;
14. Warranties;
15. Structure Survey (per Article 9 of the General Conditions);
16. Regulatory Transition Plan (where applicable).

L. Job Photographs and Videos: The photographs and videos furnished in accordance with Section 01 32 30 – Job Photographs and Videos.

M. Additional Documents: Any additional documents that the Engineer directs to be furnished as a final record document in accordance with the requirements of this Section.

1.05 DESCRIPTION

A. Not Used.

1.06 QUALITY ASSURANCE

A. Project records in electronic and paper formats shall be submitted in conformance with the following specifications, as applicable:

1. All records in electronic format shall be produced in conformity with Section 01 78 42 – Records in Electronic Formats.
2. All records in paper formats shall be produced in conformity with Section 01 78 40 – Records in Paper Formats.

1.07 SUBMITTALS

A. Format

1. The Contractor shall submit the final record documents in electronic and paper formats, according to the requirements of Table 1 – Summary of Final Record Documents to be Furnished, attached at the end of this Section.

B. Quantities

1. The quantities and formats to be furnished for each Final Record Document shall be as shown in Table 1.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Final Record Documents shall be delivered to the Engineer.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. As-Built Drawings

1. The Contractor shall create an As-Built Drawing Set by revising the Conformed Drawings electronically using AutoCADin .DWG or .RVT or in some cases a combination of both formats conforming to ISO 13567 and the NYCDEP BIM/CAD Standard Manual. If no Conformed Drawings were created, then the Contractor shall use the original Bid Set Drawings. When using the Conformed Drawings, the Contractor shall independently confirm that the changes made by the Addenda to the original Bid Set Drawings were correctly reflected in the Conformed Drawings. Files submitted in AutoCAD format.DWG or .RVT format will be bound

to include all related matter (e.g., base files, font files and shapes). If submitting in .RVT format, the file must contain the 3D discipline models, discipline links, and all associated drawing sheets. Each file shall be viewable and printable in its entirety without recourse to external files. In addition to .DWG or .RVT or a combination of both formats of deliverables, the Contractor shall also submit a point cloud deliverable, supplied in industry-standard formats such as .RCP/.RCS, and shall accurately capture the completed conditions of the project and be aligned to the established project coordinate system.

2. The Contractor shall use the information compiled during construction to create an As-Built Drawing Set. The Contractor shall document any deviations and/or changes from the configurations shown on the original Contract Drawings or revised drawings issued during the course of executing the Work including Change Orders, Design During Construction (DSDC) memoranda and Requests for Information (RFIs). These deviations and/or changes shall generally relate to topographic features, relocation of structures, or locations of underground items such as pipelines, duct banks, manholes or footings. Survey distances, coordinates and/or elevations shall be included to accurately locate all such items. All deviations and/or changes shown shall be field verified.

3. The Contractor should have the electronic files of the Contract Drawings. However, should the Contractor require an additional copy, the Engineer will supply the Contract Drawings in AutoCAD files upon written request, if such copies are available. The AutoCAD files will consist of a bound set of drawings.

4. Drawing Size – The As-Built Drawings are to be the same size as the full size Contract Drawings (22-inches by 34-inches).

5. The new As-Built Drawing number shall be generated as per the following steps:

    a. The As-Built Drawing number is the original Bid Set Drawing number prefixed by an "AB" for As-Built.

        1) Example: If the drawing number for a Contract Drawing is 36G-02S-14, the As-Built Drawing number will be "AB-36G-02S-14".

    b. If a new drawing is produced, its number can be added to the end of the series (i.e., if 14 is the last drawing in the series, then the first new drawing becomes 15; the second new one becomes 16, etc.).

    c. If a new drawing is inserted into the middle of a series, it is assigned a letter suffix starting with A (i.e., 02A, 02B, etc.).

        1) Example: If the drawing number for a Contract Drawing is 36G-02S-02, the new, additional As-Built drawing will be numbered "AB-36G-02S-02A".

6. Designation – The designation “As-Built Drawing” is to be added to the drawing. Insert the words “As-Built Drawing” above the title box in the right hand corner of the drawing. (Do not include the quotation marks in “As-Built Drawing” when marking the drawing.)

7. Modifying the Contract Drawings – Prior to submitting an As-Built Drawing made from a Contract Drawing for review and acceptance, the Contractor is to create a “clean” finished copy of the drawing by undertaking the following:

   a. Remove all signatures and certifications from the Contract Drawing

   b. Remove all previous revisions and references from the revision boxes

   c. Remove the Professional Engineers seal, Engineer’s company names, and any initials from the drawing title block

   d. Modify all of the original title boxes to show the Contractor information including the name of the Contractor and the date.

   e. Remove all previous markings (notes, revision indicators, balloons, submittal stamps, etc.) from the drawing.

8. Contractor’s Information – The Contractor’s name, address, contact information and date (month and year) the Project is completed is to be added to the drawing. Place this information in the title block in the space previously utilized for the Engineer’s name.

9. Adding Revisions – Items/areas changed are to be enclosed within a cloud line. The revision cloud layer is to be a 0.024-inch line thickness.

10. The Contractor shall submit copies of the As-Built Drawings for review and approval by the Engineer. These submittals shall show the deviations and changes from the original design drawings by using red-line mark-ups. The Contractor shall make modifications to the submitted As-Built Drawings as required by the Engineer. In the final, approved set of As-Built Drawings, the red lines shall be converted to black.

11. The final approved set of As-Built Drawings shall have the following statement on the cover sheet:

"These As-Built Drawings for Contract ###, as prepared by XYZ Company, have been prepared as Record Copy Drawings.”
The above statement shall be signed by the representative of the Contractor. The signer shall be identified along with the Contractor.

B. Final Copy Shop Drawings (FCSDs)

1. The Contractor shall furnish all FCSDs to DEP.

   a. The FCSD shall be the approved copy (FAS or FAC) of the Shop Drawing, corrected to reflect any deviations made for the installed condition showing the actual construction.

2. In addition to submitting the complete set of FCSDs as a final item at the end of construction, the Contractor shall prepare and submit FCSDs for approval on a continual basis during the performance of the Work when the particular item of Work for a FCSD has been completed. The Contractor shall submit the FCSD within 30 days after the completion of the Work item.

3. The drawing revision boxes shall have all previous revisions and references removed from the drawings. The revision boxes shall indicate "Final Copy Shop Drawing."

4. Each drawing shall bear the original submittal file number, without the revision number, which shall be written in the lower right hand corner of a drawing above the title box. The file number shall also have a prefix, which identifies it as a FCSD.

   a. For example, if the file number for an approved Shop Drawing is 26 05 91-002, the FCSD will be numbered "FCSD-26 05 91-002",

5. Supporting Documentation: Supporting documentation shall bear the correlating FCSD file number so as to identify it. All supporting documentation (e.g., catalog cuts, test results, calculations, etc.) shall be submitted, together with the related FCSD so as to maintain a complete set of all documents submitted with each FCSD.

6. FCSD Submittal for Approval

   a. Two (2) paper prints of each FCSD full size where applicable shall be submitted for approval. The drawing shall be checked by the Resident Engineer against the field records and a copy shall either be stamped "Approved" or returned with comments for correction and re-submittal by the Contractor. The Contractor shall retain one (1) approved set of the FCSDs for use in submitting the entire set in paper and electronic copies.

C. Bid Set Contract

1. If the Contractor does not have a complete set of the original Bid Set Contract (including Addenda) in the original PDF format (non-scanned), it may request a set from the Engineer. Upon request, the Bid Set Contract and Addenda will be provided to the Contractor in PDF format if possible. If a PDF format is not available, then a paper copy set may be utilized. This may also be requested from the Engineer if required and shall be provided if possible.

2. The Contractor shall Archive the entire set of Contract Documents, except Contract Drawings, as discussed below. This set shall include all the sequential pages of the Contract Documents and shall include:

   a. Front and back covers

   b. Invitation for Bids

c. Information for Bidders

d. Table of Contents

e. Notice to Bidders

f. Standard Construction Contract

g. General Conditions

h. Schedule of Wage Rates

i. Specification Sections

j. Addenda

3. On a multiple contract project, the "E," "P," and "H" Contractors shall only Archive the Detailed Specifications respective to their Work. These are only required in electronic Archives. No paper version is required as that will be produced by the “G” Contractor.

4. The signed (executed) parts of the Standard Construction Contract shall be included by the Contractor as part of the Key Documents.

D. Bid Set Drawings (Design Drawings).

1. The Bid Set Drawings shall be Archived. If the Contractor does not have a complete set of the original Bid Set Drawings in .DWG or .RVT format, the Contractor may request a set from the Engineer. If possible, the Bid Set Drawings will be provided to the Contractor in .DWG or .RVT format, bound with their respective data sets.

E. Conformed Set Contract

1. The Conformed Set Contract shall be Archived.

F. Conformed Drawings

1. The Conformed Drawings shall be Archived. If the Contractor does not have a complete set of the Conformed Drawings in the .DWG or .RVT format, it may request a set from the Engineer. If possible, the Conformed Drawings will be provided to the Contractor in .DWT or .RVT format, bound with their respective data sets.

G. Change Orders

1. All Change Orders (both field and design) produced during the construction of the Project shall be Archived.

H. Operations and Maintenance (O&M) Manuals

1. The O&M Manuals shall be Archived.

2. O&M Manuals should have been submitted and reviewed as part of the shop drawings submission and review process in accordance with Section 01 78 25 - Operations and Maintenance Manuals.

3. Final, approved copies of the O&M Manuals shall be furnished during the progress of the work in accordance with Section 01 78 25 - Operations and Maintenance Manuals. Additional electronic copies of each manual shall be submitted as part of the Final Record Documents.

I. Key Documents

1. Key Documents produced during the construction of the Project shall be Archived. They shall consist generally of the items defined above.

J. Additional Documents

1. Any Additional Documents such as Soil Classification Reports, Environmental Impact Statements, Site Assessments, Geotechnical Reports, permits and RFIs shall also be Archived when directed by DEP. If the Contractor does not have copies of any documents, they will be provided by the Engineer, when possible, in electronic or paper format.

K. Job Photographs and Videos

1. Job Photographs and Videos produced during the performance of the Work shall be Archived.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

Table 1
Summary of Final Record Documents to be Furnished

Final Record Document Type	EPMIS	Electronic (USB Drive)	Paper
As-Built Drawings	1 set (PDF/A & .DWG or .RVT)	4 sets (PDF/A & .DWG or .RVT)	2 sets
Final Copy Shop Drawings	1 set (PDF/A & .DWG or .RVT)	4 sets (PDF/A & .DWG or .RVT)	1 set
Conformed Drawings	1 set (PDF/A & .DWG or .RVT)	4 sets (PDF/A & .DWG or .RVT)	NA
Bid Set Drawings	1 set (PDF/A & .DWG or .RVT)	4 sets (PDF/A & .DWG or .RVT)	NA
Bid Set Contract (including Addenda)	1 set (PDF/A)	4 sets (PDF/A)	1 set
Conformed Contract	1 set (PDF/A)	4 sets (PDF/A)	NA
Change Orders (Text & Drawings) (Design & Field)	1 set (PDF/A)	4 sets (PDF/A)	NA
O&M Manuals	1 set (PDF/A)	6 sets (PDF/A)* 2 compilation sets*	4 sets *
Key Documents	1 set (PDF/A)	4 sets (PDF/A)	NA
Additional Documents	1 set (PDF/A)	4 sets (PDF/A)	NA
Job Photographs	1 set (TIFF)	2 sets (TIFF)	NA
Job Videos	1 Set (MPEG 2)	2 Sets (MPEG 2)	NA

* Each paper copy of an O&M manual shall have an eletronic copy of the Manual in a fitted sleeve attached on the inside of the front cover of the binder for the Manual. These shall be furnished to the Operating Bureau in accordance with the requirements Section 01 78 25 - Operation and Maintenance during the progress of the work. Two extra eletronic sets of each manual or two compilation sets be furnished as part of the Final Record Documents.

SECTION 01 78 40 – RECORDS IN PAPER FORMATS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the requirements for all Final Record Documents to be produced in paper formats.

B. Expected longevity of paper documents without significant deterioration under normal use and storage conditions.

C. Properties of the paper and of the printing processes, and the tests required to demonstrate these properties.

D. The following index of this Section is presented for convenience:

Article	Title	Section Page
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1.02	Payment	1
1.03	Related Sections	1
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1.05	Description	2
1.06	Quality Assurance	3
1.07	Submittals	3
1.08	Delivery, Storage, and Handling	3
1.09	Spare Parts, Special Tools, and Supplies	3
1.10	Warranty	4
PART 2	PRODUCTS	4
2.01	Manufacturers	4
2.02	Materials / Equipment	4
2.03	Fabrication / Assembling / Finishes	5
2.04	Source Quality Control / Shop Tests	5
PART 3	EXECUTION	5
3.01	Examination / Preparation	5
3.02	Application	5
3.03	Field Testing / Quality Control	5
3.04	Startup / Demonstration	5
3.05	Adjusting / Protection / Cleanup	5

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 78 39 - Final Record Documents

B. Section 01 78 25 - Operation and Maintenance Manuals

1.04 REFERENCES

A. Definitions:

1. Small-Format Documents: 11 inches by 17 inches or smaller
2. Large-Format Documents: larger than 11 inches by 17 inches

B. Reference Standards:

1. ANSI/NISO Z39.48 - Permanence of Paper for Publications and Documents in Libraries and Archives

1.05 DESCRIPTION

A. Final Record Documents

For the Final Record Documents specified in Section 01 78 39 - Final Record Documents, the following directions shall apply.

1. Drawings
   a. As specified in Section 01 78 39 - Final Record Documents, provide full size, paper copies of the Final Copy Shop Drawings and As-Built Drawings (if required).
      1) Bid Set and Conformed Drawings are not required to be furnished as paper copies but shall be furnished as part of the electronic archives.
   b. Paper copies are to be produced from the electronic copies.
2. Bid Set - Contract
   a. A single set of the Bid Set Contract in paper format shall be provided by the Contractor, and it shall be identical to the copy distributed for bid. They shall be furnished as bound volumes.
   b. All Addenda shall be produced in paper format by the Contractor. Each Addendum shall be bound separately and include all attachments including sketches and drawings. Drawings shall be attached using half-size drawings (11 inches x 17 inches).
3. O&M Manuals
   a. As required in Section 01 78 25 - Operation and Maintenance Manuals, submit hard bound copies and electronic copies of each O&M Manual during the progress of the Work.
   b. No additional paper copies are required to be submitted as part of the Final Record Documents.
4. Key Documents

a. Key Documents, as defined in Section 01 78 39 - Final Record Documents, are not required to be produced in paper format.

5. Change Orders

a. Change orders are not required to be produced in paper format.

6. Job Photographs

a. The job photographs are not required to be produced in paper format for purposes of the Final Record Documents.

7. Additional Documents

a. Additional Documents are not required to be produced in paper format.

1.06 QUALITY ASSURANCE

A. Testing

1. Test Method: All printing processes and materials used to produce the documents covered by this Section shall be tested periodically to ensure proper function, using the National Archives and Records Administration Technical Information Peel Test.

2. Test Frequency: All printing processes and materials used to produce the documents covered by this Section shall be tested not less than twice a day, once at the beginning of the work day, and once at the end of the work day.

B. Inspections

1. DEP may carry out inspections of the production facilities without notice.

1.07 SUBMITTALS

A. Paper Certification: All documents covered by this Section shall be accompanied by a certification from the manufacturer of the paper that it complies with ANSI/NISO Z39.48.

B. Printing Test Certification: The organization that operates the printing processes and materials used to produce the documents covered by this Section shall submit the following documentation as proof that the tests have been carried out:

1. An affidavit, signed by the supervisor responsible for the production area, certifying that the tests have been performed in accordance with the procedures described in the National Archives and Records Administration Peel Test.

2. All of the Peel Test targets actually used to perform the tests.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Properties of Paper

1. All paper used for documents covered by this Section shall conform to the standards of ANSI/NISO Z39.48, as amended herein, for pH, tear resistance, alkaline reserves and paper stock.

2. Paper Stock

a. Uncoated paper shall be used.

b. Uncoated paper shall not be less than 24 pounds basis weight.

B. Printing Processes

1. Small Format Documents, With Color Images and with Black and White Images

a. Only electro-photographic printing shall be used. When color electro-photographic printing is used, the process shall be certified by the manufacturer of the printer as not soluble in water, chemically stable, and resistant to fading, for a period of not less than 50 years. All documents printed using a color electro-photographic printer shall be accompanied by a certification from the manufacturer of the printer that the process is in compliance with this requirement.

2. Large-Format Documents, With Black and White Images

a. Only electro-photographic printing shall be used. Large-Format Documents shall be printed in black and white, unless color is an essential information component of the document. An example of documents where color may be an essential information component is a topographic drawing produced from data in a Geographic Information System. Color prints, when required, shall comply with the provisions specified below.

3. Large-Format Documents, With Color Images and with Black and White Images

a. Either electro-photographic or inkjet printing shall be used. When inkjet printing is used, a formulation of ink shall be used that is certified by the manufacturer of the printer as not soluble in water, chemically stable, and resistant to fading, for a period of not less

than 50 years. All documents printed using an inkjet printer shall be accompanied by a certification from the manufacturer of the inks that the inks are in compliance with this requirement.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 APPLICATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 78 42 – RECORDS IN ELECTRONIC FORMATS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Specification describes the requirements for the electronic records for the items specified in Section 01 78 39 - Final Record Documents

B. This Specification does not cover digital objects which include a time base correction code (e.g., analogue or digital video recordings, analog or digital audio recordings, instrumentation data feeds, etc.), or geo-coded objects (produced by Geographic Information Systems (GIS)).

C. This Specification does not cover digital records stored in EPMIS.

D. Exhibit A – Folder Structure

E. The following index of this Section is presented for convenience:

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1.08	Delivery, Storage, and Handling	2
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PART 2	PRODUCTS	3
2.01	Manufacturers	3
2.02	Materials / Equipment	3
2.03	Fabrication / Assembling / Finishes	3
2.04	Source Quality Control / Shop Tests	3
PART 3	EXECUTION	3
3.01	Examination / Preparation	3
3.02	Implementation	6
3.03	Field Testing / Quality Control	6
3.04	Startup / Demonstration	6
3.05	Adjusting / Protection / Cleanup	6

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 32 30 - Job Photographs and Videos

B. Section 01 78 39 - Final Record Documents

C. Section 01 78 40 - Records in Paper Formats

1.04 REFERENCES

A. ANSI/AIIM MS44 – Recommended Practice for Quality Control of Image Scanning

B. ANSI/AIIM MS52 – Recommended Practice for the Requirements and Characteristics of Original Documents Intended for Optical Scanning

C. ANSI/AIIM TR34 – Sampling Procedures for Inspection by Attributes of Images in Electronic Image Management and Micrographic Systems

D. ISO 19005-1 - Document Management -- Electronic document file format for long-term preservation - Part 1: Use of PDF 1.4 (PDF/A-1).

1.05 DESCRIPTION

A. Archive: For the purposes of this Section, to Archive shall mean to furnish as a Final Record Document.

B. Metadata: Metadata is commonly defined as “data about data.” For the purposes of this Section, Metadata refers to the “descriptive metadata” that describes the content and form of the construction records known as Final Record Documents (i.e. contract name, document date, construction phase, engineer of record, etc.) and supports the discovery (searching) and identification of the resources.

C. Portable Document Format-Archival (PDF/A): A standard that identifies a "profile" for electronic documents that ensures the documents can be reproduced the exact same way. A key element to this reproducibility is the requirement for PDF/A documents to be 100% self-contained. All of the information necessary for displaying the document in the same manner every time is embedded in the file. This includes, but is not limited to, all content (text, raster images and vector graphics), fonts, and color information. A PDF/A document is not permitted to be reliant on information from external sources (e.g. font programs and hyperlinks).

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. File Transfer Media

1. The current file transfer medium is a waterproof USB solid state drive (SSD) also known as a flash drive. Alternative file transfer media may be used, at the discretion of DEP.

2. The USB SSD used for producing the electronic Archives shall be:

a. Corsair Flash Survivor USB 3.0 with 256 gigabytes storage

b. Or approved equal.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Source of Electronic Records

1. In preparing the electronic records, the Contractor shall make every reasonable effort to obtain from the originator (e.g., the manufacturer) documents in their original electronic format and incorporate these in the Final Record Documents. Subject to the approval of the Engineer, electronic records may be scanned from a paper version only when the Contractor cannot obtain the electronic version from the originator.

B. Metadata

1. For each type of Final Record Document, a Metadata table shall be prepared in Microsoft Excel which will furnish the specified data for that document. The data elements shall be furnished to the Contractor by DEP prior to production of the Final Record Documents USB SSD.

2. The Metadata Excel tables shall be utilized as the Final Record Document Log. Templates for the Metadata Excel table for each Final Record Document will be provided by the DEP.

3. The Metadata Excel Table shall be included in the USB SSD of each Final Record Document type and shall serve as an index for the files of the record in the USB SSD. Each file indexed in the Metadata Table shall be hyperlinked so that clicking on the file name opens that file. The filenames given on the Metadata Table must exactly match the files on the USB SSD to which they are hyperlinked.

4. A sample Metadata Excel table will be provided by DEP.

C. File Compression, File Formats, and Quality Control

1. File compression is not permitted for any of the files in any format.

2. File formats acceptable to DEP are ISO 19005-1 Portable Document Format-Archival (PDF/A); Tagged Image File Format (TIFF), version 6.0 ("II" format); AutoCAD and Revit. All files shall be delivered to DEP with file names that use the default file extension for each of the above formats.

3. Portable Document Format-Archival (PDF/A)

   a. Security Settings: Records converted to PDF/A must have all security settings deactivated (e.g., encryption, master passwords, and/or permissions) prior to transfer to DEP. Deactivating security settings ensures DEP's ability to support long term migration and preservation of the records.

   b. Review of Special Features: Because of the complexities associated with certain PDF features, DEP will review PDF/A records containing special features on a case-by-case basis when the records are scheduled. Examples of special features include but are not limited to: digital signatures; links to other documents, files or sites; embedded files (including multimedia objects); form data; comments and/or annotations.

   c. Fonts: Electronic records that have been converted to PDF/A from their native electronic formats must have all fonts referenced in the record embedded within the PDF file to guarantee the visual reproduction of all text as created. This requirement is met by having, as a minimum, subsets of all referenced fonts embedded within the PDF/A file. All fonts embedded in PDF/A records must be publicly identified as legally embeddable (i.e., font license permits embedding) in a file for unlimited, universal viewing and printing;

   d. Scanning Production Requirements: Records converted from scanned images also must adhere to the production requirements described in Paragraph 6 below.

4. Tagged Image File Format (TIFF)

   a. In the "II" format (i.e., little-endian), byte order is always from the least significant byte to the most significant byte.

5. Vector Drawings

   a. Each vector drawing produced by Computer-Assisted Design (CAD) system shall be delivered to DEP in two different file formats: Native AutoCAD or Revit; and PDF/A.

   b. Drawings will be "bound" to include all related matter, such as base files, font files, and shapes. Each file shall be viewable and printable, in its entirety, without recourse to external matter.

6. Text Files

   a. The file format for all text files, whether converted from office automation systems or scanned, is PDF/A.

   b. The quality of documents to be scanned shall be governed by ANSI/AIIM MS52 "Recommended Practice for the Requirements and Characteristics of Original Documents Intended for Optical Scanning".

   c. Quality Control in the scanning process shall follow the practices established in ANSI/AIIM MS44 "Recommended Practice for Quality Control of Image Scanning" and ANSI/AIIM TR34 "Sampling Procedures for Inspection by Attributes of Images in Electronic Image Management and Micrographic Systems". The sampling rates for each type of Quality Control (visual and printed) shall be established by written agreement with DEP. The Subcontractor producing Final Record Documents shall supply a description of the Quality Control inspection performed as part of the scanning process and a report on the results of the last inspection performed on the images and the date of that inspection.

   d. Documents shall be scanned using equipment and scanning parameters sufficient to ensure full reproduction of all significant detail in the documents, such as (but not limited to) curved lines and fill in drawings, color and tonal gradations in photographic images, the smallest printed text, handwritten notes, and signatures. Records may be scanned in bitonal (1-bit) mode and 300 pixels per inch (ppi) or better only when the records consist exclusively of clean printed type possessing high inherent contrast (e.g., laser printed or typeset on a white background). Records shall be scanned in gray scale (8-bit) and 300 ppi or better when the records consist of textual documents of poor legibility because of low inherent contrast, staining or fading (e.g., carbon copies, thermofax, or documents with handwritten annotations or other markings), or that contain halftone illustrations or photographs. Records shall be scanned in color (24-bit RGB) and 300 ppi or better when the records contain color information important to interpretation or content.

7. Digital Photographs

a. The file format for digital photographs is TIFF.

b. Photographic (raster) images shall be produced directly by digital cameras.

c. Digital cameras shall produce records with true optical resolution. Images shall not be resized or interpolated to a higher resolution from a lower resolution.

d. Photographic images shall be provided as continuous-tone (8-bit) gray scale or color (24-bit or 48-bit RGB) raster images.

e. Digital camera files shall be captured as specified in Section 01 32 30 - Job Photographs and Videos.

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

EXHIBIT A

USB SSD Folder Structure

The USB SSD shall have a folder structure similar to the ones shown below.

For a USB SSD with one set of Final Record Documents

"Contract # – Bid Drawings (PDF Files)
Metadata Table- Contract # – As-Built Drawings - PDF.xls"

For a USB SSD with more than one set of Final Record Documents:

"Contract # – Bid Drawings (PDF)
Contract # – Bid Drawings (PDF Files)
Metadata Table- Contract ### – As-Built Drawings - PDF.xls"
"Contract # – Bid Drawings (AutoCAD or Revit)
Contract # – Bid Drawings (AutoCAD or Revit Files)
Metadata Table- Contract # – As-Built Drawings - AutoCAD.xls or Revit.xls"

NO TEXT ON THIS PAGE

SECTION 01 79 05 – EQUIPMENT START-UP AND TRAINING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Representatives of Equipment Manufacturers
2. Start-up Services
3. Training of plant personnel
4. Lesson plans
5. Training aids
6. Qualifications of training specialists

B. The following index of this Section is presented for convenience:

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3.05	Adjusting / Protection / Cleanup	7

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 75 10 – Preliminary and Final Field Tests

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Representatives of Equipment Manufacturers:

1. The Contractor shall provide the services of qualified factory trained representatives of the equipment manufacturers, who shall provide the following services:

a. Supervise and assist in the installation of the equipment to ensure a proper installation of the equipment.

b. Check the installation of the equipment and make all necessary adjustments prior to placing the equipment in service.

c. Supervise the preliminary and final equipment and system field test work specified in Section 01 75 10 - Preliminary and Final Field Tests.

1) Additional acceptance testing supervision resulting from the failure to meet the specified performance requirements shall be at the Contractor's expense.

d. Conduct training of DEP personnel as specified herein. One day of training by a manufacturer's representative shall be defined as a minimum of eight (8) hours on-Site.

2. The manufacturers' representatives shall devote, at a minimum, the amount of full time specified under the Contract Documents.

3. The Contractor shall coordinate all equipment start-up services and training with the City, the Engineer and the manufacturers.

B. Start-Up Services:

1. The equipment start-up and initial operating period shall begin after satisfactory completion and acceptance of the preliminary and final equipment field tests and preliminary system field tests. The start-up and initial operating period shall demonstrate that the equipment functions as specified and shown under actual operating conditions by operating continuously for at least twenty-eight (28) days with no more than twenty-four (24) hours of total down time and no more than four (4) unscheduled shutdowns. Equipment start up and initial operating period shall be complete after a minimum of twenty-eight (28) days of continuous operation and when the manufacturer and the Engineer have mutually agreed that the equipment is in suitable condition for continuous operation.

2. During the equipment start up and initial operating period, the Contractor shall furnish the services of factory trained specialists of the equipment manufacturers for the equipment to assist in the start-up and operation of the equipment.

C. Training:

1. As part of these services, the City will provide the necessary personnel to be trained in the operation and maintenance of the equipment. Training shall occur after the initial operational period is complete.

2. The training shall consist of both classroom and field instruction. The purpose of field instruction shall be to reinforce topics covered in the classroom and to identify the location of any valves, pushbuttons, control panels switches, and other equipment required for operation; and to identify the location of any maintenance equipment such as grease fittings, oilers, isolation valves, safety lockout switches, and other equipment.

3. All training shall take place at the Work Site at a place specified by the City and shall be conducted by qualified training specialists.

4. Separate training sessions shall be conducted for City mechanical operations and maintenance personnel and for City electronic and electrical maintenance personnel.

5. The Contractor shall coordinate the manufacturers training services with the City and the Engineer, providing a minimum of fourteen (14) days prior notice of training, subject to the approval of the Engineer and the City.

6. In order to provide training for an adequate number of City operation and maintenance personnel, a minimum of two 8-hour training days shall be provided for each item of equipment, unless otherwise specified in the Contract Documents.

7. Training shall be limited to no more than three days per week. No training shall be conducted on Mondays and Fridays.

8. The Contractor shall deliver all training material to the Engineer and the City a minimum of 14 days prior to the scheduled training.

D. Lesson Plans:

1. The Contractor shall submit the equipment manufacturer's lesson plans, which shall include specific information about each item of equipment or equipment system, including controls. Lesson plans shall include but not be limited to the following information and meet the following requirements:

a. The Contractor shall submit the equipment manufacturer's lesson plans for approval by the Engineer no less than sixty (60) days prior to the date that the training is to take place.

b. Lesson plans shall indicate the estimated duration of each segment of the training and the training audience that the instruction is to

address. The training audience refers to City mechanical operation and maintenance personnel and City electronic/electrical maintenance personnel, as appropriate.

c. The lesson plan shall indicate when training aids are used or referred to during the course of instruction.

d. An outline of required lesson plan contents is included below:

2. Equipment Description:

a. Purpose and function of equipment and auxiliary equipment and systems.

b. Physical arrangement of equipment components and electrical supply.

c. General function of controls, including automatic and manual operation, interlocks, and shutdowns.

3. Equipment Operation:

a. Operating requirement for equipment to perform satisfactorily.

b. Typical operating characteristics.

c. Start-up and shutdown procedures.

d. Use of controls.

4. Equipment Monitoring:

a. Recommended routine instrument readings and operational checking.

b. Early warning signs of developing operational or equipment problems.

c. Procedures for handling non-routine problems such as alarms, power failures, component failures, etc.

5. Equipment operational trouble-shooting procedures.

6. Safety and Housekeeping:

a. Safety features of the equipment.

b. Safe practices.

c. Housekeeping practices.

7. Description of the use of the equipment manufacturer's O&M Manual as regards operation.

8. Preventive Maintenance Requirements:

a. Maintenance needs for equipment.

b. Identification of procedure to satisfy maintenance need (relate to equipment manufacturer's O&M Manual, which should have detailed descriptions of maintenance procedures).

c. Outline or summarize procedures.

d. Recommended schedule for performing preventive maintenance.

e. Provide preventive maintenance record forms (if available).

9. Maintenance Inspection Program:

a. Parts, components and areas of equipment to inspect for routine preventive maintenance.

b. Recommended frequency of inspection.

c. Inspection procedures.

d. Problem identification.

10. Maintenance Trouble-shooting:

a. Sections in O&M Manual detailing trouble-shooting procedures.

b. Summarize trouble-shooting procedures.

c. Testing equipment used in trouble-shooting.

1) Demonstration of use of specialized testing equipment if supplied with equipment.

2) Other testing equipment.

d. Tests used to verify trouble-shootings findings.

11. Disassembly and Assembly:

a. Summarize disassembly and assembly procedures.

b. O&M Manual coverage of subject.

c. Testing to verify success of corrective maintenance.

12. Equipment Calibration:

a. Calibration needs and tolerances.

b. Calibration equipment.

c. O&M Manual listing of calibration ranges, tolerances and settings.

13. Name, address and telephone number of nearest parts supply house and nearest repair service center.

14. Warranty information and service contract description, if applicable.

E. Training Aids:

1. Training aids shall be used as an integral part of the training program. Training aids shall include text and/or pictorial handouts specific to the

equipment supplied. Handouts shall be legible and printed on good quality stock. Handouts shall be submitted when lesson plans are submitted.

2. Additional training aids shall be used for maximum training effectiveness and shall include the following as appropriate:

   a. Audio-visual aids, for example, videos, PowerPoint presentations, flow charts, posters, diagrams, and catalogue cuts.

   b. Models and samples, for example, cutaways, spare parts, tools, miniature models, equipment assemblies, and damaged parts.

3. The use of additional training aids shall be identified in the lesson plan, and a description of the additional training aids shall be given.

1.06 QUALITY ASSURANCE

A. The Contractor shall submit the equipment manufacturer's documentation of the qualifications of their proposed training specialists for approval by the Engineer sixty (60) days prior to the date of proposed training. The documentation shall include the experience of the training specialists in operation and maintenance of the equipment and a summary of training experience.

B. Only those training specialists whose qualifications have been approved by the Engineer shall conduct training.

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 APPLICATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the Commissioning requirements of this Project. This Section includes requirements for commissioning of facilities and facility systems to verify compliance with design, including optimum energy efficient operations. This Section includes requirements for commissioning activities and documentation in compliance with the sustainability certification system used.

B. Commissioning does not take away from, or reduce, the Contractor's responsibility to provide a finished and fully functioning product and installation as per the Contract Documents.

C. This Section will in no way diminish the responsibility of the Contractor in performing all aspects of work and testing as outlined in the Contract Documents. Any requirements outlined in this Section are in addition to requirements required in the Contract Documents,

D. Section Includes

1. Building commissioning of the following systems:
    a. Building Enclosure
        1) Below Grade Waterproofing Systems
    b. HVAC
        1) HVAC components and equipment.
        2) HVAC system: interaction of cooling, heating, and comfort delivery systems.
    c. Lighting
        1) Indoor Lighting Control System and interface with daylighting.
        2) Outdoor Lighting Control System
    d. Domestic hot water systems.
    e. Renewable energy generation systems.
2. Building commissioning activities and documentation in support of the Institute for Sustainable Infrastructure Envision Rating System
    a. Commissioning activities and documentation for the Envision section "Resource Allocation" credit "RA2.4 Commission and Monitor Energy Systems" – Documentation

E. Attachments

1. Attachment A: Equipment and System Schedule after the "End of Section" are included herein and are part of this Section.

F. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Commissioning Plan

1. The Commissioning Plan provides guidance in the execution of the commissioning process. After the initial construction phase Commissioning kickoff meeting, the Contractor will update the plan. This plan is a living document that must evolve and expand as the Project progresses.

2. The Commissioning Plan shall include:
   a. Description of the facility and Project.
   b. Description of the commissioning process and associated deliverable documents.
   c. Description of equipment and systems to be commissioned.
   d. Description of schedules for testing procedures along with identification of parties involved in performing and verifying tests.
   e. Sampling frequency for equipment to be tested.
   f. Identification of prerequisites/tasks that must be completed before the next operation can proceed.
   g. Organization Chart and Contact List.
   h. Description of roles and responsibilities of Commissioning team members.
   i. Description of observations to be made and reported on during testing and witnessing of testing by all parties involved in the Project.

B. Commissioning Schedule: Contractor shall provide construction schedules to DEP, in accordance with Section 01 32 10 - Progress Scheduling.
   1. The Contractor shall develop and submit a schedule identifying the commissioning process and provide commissioning scheduling information to the Engineer for review and planning activities.
   2. The Contractor shall incorporate the commissioning activities into the Project CPM schedule.

1.06 QUALITY ASSURANCE

A. The Contractor shall have a Commissioning Agent (CxA) on staff who shall be responsible for Commissioning issues compliance and coordination.
   1. The CxA shall be a Professional Engineer with 5-years of Commissioning experience on projects of similar complexity.
   2. The CxA shall be an ASHRAE Building Commissioning Professional (BCxP) or demonstrate equivalent ANSI-accredited certification appropriate for the level of Envision accreditation being sought.

1.07 SUBMITTALS

A. Commissioning Kick-off Meeting Minutes.

B. Commissioning Plan
   1. Submit within 90 consecutive calendar days of Notice to Proceed.

2. Update as necessary during the work to reflect the progress on the components and systems.

C. Commissioning Schedule

1. Submit concurrent with Commissioning Plan.

2. Update as necessary during the Work to reflect the progress on the components and systems.

D. Functional performance test procedures and forms: Submit minimum 30 calendar days prior to testing.

E. Deficiency Report and Resolution Record

1. Document items of non-compliance in materials, installation or operation. Document the results from start-up/pre-functional checklists, functional performance testing, and short-term diagnostic monitoring. Include details of the components or systems found to be non-compliant with the drawings and specifications. Identify adjustments and alterations required to correct the system operation and identify who is responsible for making the corrective changes.

2. Update as necessary during the work to reflect the progress on the components and systems.

F. Final Commissioning Report

1. Compile a Final Commissioning Report. Summarize all of the tasks, findings, conclusions, and recommendations of the commissioning process. Indicate the actual performance of the facility systems in reference to the DEP's Project requirements and Contract documents. Include completed pre-functional inspection checklists, functional performance testing records, diagnostic monitoring results, identified deficiencies, recommendations, and a summary of commissioning activities.

G. Operation and Maintenance (O&M) Manual Submittals

1. Contractor shall provide O&M manuals to DEP, in accordance with Section 01 78 25 – Operation and Maintenance Manuals.

H. Training

1. Contractor shall provide training in accordance with Section 01 79 05 – Equipment Start-up and Training.

I. Spare Parts

1. Contractor shall provide spare parts to DEP, in accordance with Section 01 78 24 – Spare Parts and Maintenance Materials.

J. Envision Documentation related to commissioning. Format as required by Institute for Sustainable Infrastructure for submittal under the referenced rating system.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Commissioning Process

1. The following provides an overview of the Commissioning tasks during Project construction and the general order in which they occur.

   a. Construction-phase Commissioning begins with a Commissioning Kickoff Meeting, conducted by the CxA in accordance with Section 01 31 15 – Project Coordination, where the Commissioning process is reviewed with all the Commissioning Team Members.

   b. Additional meetings may be required throughout construction, scheduled by the CxA in accordance with Section 01 31 15 – Project Coordination, with necessary parties attending to plan, scope, coordinate and schedule future activities and resolve open Issues.

   c. The Engineer will review the Contractor submittals and provide comments to the Contractor for inclusion in their review. The reviewed submittals will include all commissioned equipment

information, including detailed startup procedures, and coordination drawings that include commissioned equipment and systems, control drawings and sequences, and interfaces and interlocks between systems.

d. The CxA works with the CM and the Engineer in developing Pre-functional and Functional Test documentation formats.

e. Periodically throughout the construction process, the CxA will perform site visits to observe component and system installations.

f. The checkout and performance verification generally proceeds from component level to equipment to systems and intersystem levels. Pre-functional (Installation) Checklists are to be completed before Functional Performance Checklists.

g. The Contractor shall, with guidance from the CxA, execute and document the Pre-Functional (Installation) Checklists and perform startup and initial checkout of equipment and systems. The CxA documents that the checklists and startup are completed according to the approved plans. This will include the CxA witnessing selected assembly markups, portions of the startup of selected equipment, and spot checking the Pre-Functional (Installation) Checklists.

h. The CxA develops specific equipment and system Functional Checklists. The Contractor receives a copy of the procedure through the Commissioner. The CxA may request additional design narrative from the Commissioner and Controls Contractor, depending on the completeness of the Basis of Design and sequences provided within the design documents.

i. The Functional Checklists are executed by the Contractor and witnessed and documented by the CxA.

j. Items of non-compliance in material, installation startup, and operation are corrected and the equipment or system is rechecked. The CxA will maintain an Issues Log to track Issues and Issue resolution.

k. The CxA will review the Operation & Maintenance documentation for completeness.

l. Completion of Commissioning is required for Substantial Completion.

m. The Final Commissioning Report shall be submitted to the Engineer within 30 consecutive calendar days after substantial completion.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

Attachment A – Equipment and System Schedule

The following equipment and systems shall be commissioned in this Project.

TABLE 01 91 00-1 EQUIPMENT AND SYSTEM COMMISSIONING SCHEDULE FOR TI-010 DECHLORINATION FACILITY		
System	Equipment	Check
HVAC System		
	Packaged AC units	
	Unit heaters	
	Exhaust fans	
	Supply fans	
	Air handlers (HV Units)	
Lighting Controls	Sweep or scheduled lighting controls	
	Daylight dimming controls	
	Lighting occupancy sensors	
Domestic Hot Water		
	Backflow preventers	
	Hot water heaters	
Renewable Energy	Solar energy electrical power generation	

TABLE 01 91 00-2 EQUIPMENT AND SYSTEM COMMISSIONING SCHEDULE FOR TI-011 DISINFECTION FACILITY		
System	Equipment	Check
HVAC System		
	Packaged AC units	
	Unit heaters	
	Exhaust fans	
	Supply fans	
Lighting Controls	Sweep or scheduled lighting controls	
	Daylight dimming controls	
	Lighting occupancy sensors	
Domestic Hot Water		
	Backflow preventers	
	Hot water heaters	
Renewable Energy	Solar energy electrical power generation	

NO TEXT ON THIS PAGE

SECTION 02 24 20 – SOIL SAMPLING AND ANALYSIS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, tools, and equipment to perform all operations necessary to characterize, classify and determine the requirements for handling, reuse and disposal of all materials to be excavated.

B. Soil sampling results, from the Design Phase soil sampling investigation, are provided in Tables 7 through 10, 12 through 15 and 17 through 20, attached to Section 01 35 45 – Hazardous Materials Control, and in the following reports:

1. Soil and Groundwater Investigation Report for TI-010C Chlorination, June 2025, prepared by Bidwell Environmental, LLC;

2. Soil and Groundwater Investigation Report for TI-010D Dechlorination, June 2025, prepared by Bidwell Environmental, LLC; and

3. Soil and Groundwater Investigation Report for TI-011 Disinfection, June 2025, prepared by Bidwell Environmental, LLC.

C. Excess soils are classified for offsite reuse within New York State as per Tables 10, 15, and 20, attached to Section 01 35 45 – Hazardous Materials Control. Fill types are defined in 6 NYCRR Part 360.13(f), Table 2: Fill Beneficial Uses.

D. Soils are suitable for off-site beneficial use at out-of-state beneficial use facilities as they meet the New Jersey Non-Residential Soil Cleanup criteria and the Pennsylvania Clean and Regulated Fill Concentration Limits, as per Tables 7 and 8, included in their respective Soil and Groundwater Investigation reports, June 2025.

E. The soil classifications provided in the aforementioned tables attached to Section 01 35 45 – Hazardous Materials Control, and the classifications provided in the investigation report listed above are for estimates only and shall be verified by the Contractor as part of the characterization sampling requirements. The Contractor will be required to perform the necessary sampling of excavated soils not designated for on-site reuse to adequately characterize the soils in accordance with all applicable regulations and reuse/treatment/disposal facility requirements.

F. Soils shall be reused in the same excavation or elsewhere onsite without sampling. Sampling is anticipated for all excess soils that are generated and cannot be reused onsite; or when unanticipated conditions (e.g., hot spots) are encountered.

G. The primary method of characterizing soils shall be through in-situ sampling. No stockpiling of excavated material on-site or ex-situ sampling will be allowed without written approval from the Engineer.

H. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 35 27 – Environmental, Health and Safety Requirements

B. Section 01 35 45 – Hazardous Materials Control

C. Section 01 74 20 – Construction Waste Management

D. Section 31 23 19 – Dewatering

E. Section 31 23 16 – Excavation

F. Section 31 23 23 – Fill

G. Section 31 25 10 – Dust, Soil Erosion and Sediment Control

1.04 REFERENCES

A. Definitions

1. Analyte-free Water: Water containing less than the detection limits for volatile organics, pesticides, PCBs and inorganics. Compliance shall be verified either by the supplier or by an analytical laboratory.

2. Case-Specific Beneficial Use Determination (BUD): Under 6 NYCRR Part 360, Section 360.12(d), NYSDEC sets forth the requirements for petitioning NYSDEC to obtain a Case-Specific BUD, and the criteria for reviewing, granting, or denying of the BUD. For reuse of a solid waste to be determined a beneficial use, the petition must satisfy all criteria outlined under 6 NYCRR Part 360, Section 360.12(d).

3. Composite Sample: Composite sampling is comprised of grab samples which are initially collected from within a grid area and then combined into a single sample. This sample is representative of the entire grid area from which the grab samples were collected.

4. Excavated Material: All material regardless of its nature, except rock or boulders that have been excavated. Refer to Section 31 23 16 – Excavation.

5. Ex-situ Soil Sampling: Sampling of soil that has been excavated and stockpiled.

6. Fill: Soil and similar material excavated or brought to the Project Site for the purposes of construction. All fill material must meet the requirements of Section 31 23 23 – Fill. Fill from an off-site source shall be non-hazardous.

7. Grab/Discrete Sample: A single sample is collected at a particular time and place that represents the composition of the soil only at that time and place.

8. In-situ Soil Sampling: Sampling of soil prior to excavation and most representative of undisturbed conditions.

9. New York City Metropolitan Area Waste Impact Zone: The area encompassing the City of New York and the counties of Nassau, Suffolk, Putnam and Westchester, as per 6 NYCRR Part 360.2 Definitions.

10. Pre-Determined Beneficial Use for fill material: Under 6 NYCRR Part 360, Section 360.13(b) Waste cessation. "Excavated material ceases to be solid waste in accordance with the following:

    a. Fill Type 1 generated outside of the New York City Metropolitan Area Waste Impact Zone (NYCMAWIZ) – once a determination has been made that the material is Fill Type 1;

    b. Fill Type 1 generated within Nassau, Suffolk, Westchester and Putnam Counties – once the material is delivered to the site of reuse;

    c. Fill Type 1 cannot be generated within the City of New York;

    d. Fill Type 2 and Fill Type 3 generated outside of the NYCMAWIZ – once a determination has been made that the material is Fill Type 2 or Fill Type 3;

e. Fill Type 2 and Fill Type 3 generated within the NYCMAWIZ – once the material is delivered to the site of reuse;

f. Fill Type 4 and Fill Type 5 – Once the material is delivered to the site of reuse."

g. Under 6 NYCRR Part 360, Section 360.12(c)(1)(iv)(a), "Excavated material used to backfill the same excavation or as grade adjustment in areas of similar physical characteristics on the site of generation. If the material exhibits visual or historical evidence of contamination (including odors) and will be used in an area with public access, the material must be covered with pavement, foundation, or with a minimum of 12 inches of soil or fill that meets the criteria to be used as Fill Type 1 and Fill Type 2" as defined in Subdivision 360.13, Special requirements for pre-determined beneficial use of fill material.

11. Qualified Environmental Professional (QEP): "a person who possesses sufficient specific education, training, and experience necessary to exercise professional judgment to develop opinions and conclusions regarding the presence of releases or threatened releases to the surface or subsurface of a property or off-site areas, sufficient to meet the objectives and performance factors for the areas of practice identified" in 6 NYCRR Part 360.The QEP must:

a. Hold a current professional engineer's or a professional geologist's license or registration issued by the State or another state, and have the equivalent of three years of full-time relevant experience; or

b. Be a site remediation professional licensed or certified by the Federal government, a state or a recognized accrediting agency, to perform investigation or remediation tasks consistent with department guidance, and have the equivalent of three years of full-time relevant experience. Examples include:

i. Licensed Site Professional, by the State of Massachusetts;
ii. Licensed Environmental Professional, by the State of Connecticut;
iii. Licensed Site Remediation Professional, by the State of New Jersey;
iv. Qualified Environmental Professional by the Institute of Professional Environmental Practice (now the Board of Certified Safety Professionals); or
v. Certified Hazardous Materials Manager, by the Institute of Hazardous Materials Management.

An Environmental Professional (EP) as defined in Section 01 35 27 – Environmental, Health and Safety Requirements may meet the requirements of a QEP.

12. Treatment, Storage, Disposal Facilities (TSDF): Includes, but is not limited to, all permitted facilities that treat, store, or manage disposal of regulated waste.

13. Waste Classification:

    a. Regulated Solid Waste:

        1) Construction and Demolition (C&D) Debris: Waste resulting from the construction, remodeling, repair and demolition of structures, buildings and roads. Such waste includes fill material, demolition wastes, and construction wastes. Materials that are not C&D debris (even if generated from construction, remodeling, repair, and demolition activities) include municipal solid waste, friable asbestos-containing waste, corrugated container board, electrical fixtures containing hazardous liquids such as fluorescent light ballasts or transformers, fluorescent lights, furniture, appliances, tires, drums, fuel tanks, containers greater than 10 gallons in size, and any containers having more than one inch of residue remaining on the bottom.

        2) Hazardous Solid Waste: Material shall be considered a characteristic hazardous solid waste when it exhibits any of the following: ignitability, corrosivity, reactivity, or toxicity for Volatile Organic Compounds (VOCs), semi-VOCs (SVOCs), metals, pesticides, or herbicides, as defined in 6 NYCRR Part 371 or 40 CFR Section 261. Under New York State (NYS) regulations, a material that contains 50 ppm or greater of PCBs is considered a hazardous waste. The Environmental Protection Agency (EPA) considers a material that contains 50 ppm or greater of PCBs to be a Toxic Substances Control Act (TSCA)-regulated waste. All hazardous waste shall be considered unsuitable for reuse, and shall be disposed of at an approved permitted hazardous waste landfill.

        3) Non-Hazardous Contaminated Waste: Non-hazardous contaminated waste includes soil commingled with or containing other waste, petroleum and petroleum products, except those present solely as a result of normal use of vehicles on roadways or parking areas, and pesticides except those present solely as a result of the proper application in normal agricultural or horticultural practices. Physical evidence that soil is contaminated shall include visual identification of waste, chemical odors, vapor emission, and chemical staining.

4) Non-hazardous Petroleum-contaminated Waste: Exhibits a discernible petroleum-type odor, contains visible petroleum product, or may be associated with a reported spill.

b. Non-regulated Solid Waste: This applies to materials that, before being beneficially used (as determined by the NYSDEC or applicable out-of-state regulatory agency) were solid waste. Material used as described in 6 NYCRR Part 360, specifically Section 360.12(c) and Section 360.12(d) is no longer considered solid waste.

B. Reference Standards

1. EPA QA/G-4, Guidance on Systematic Planning Using the Data Quality Objectives Process, February 2006 or latest revision

2. USEPA Office of Solid Waste, Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods (SW-846), Third Edition, December 1996 with updates or latest revision

3. USEPA 40 CFR Chapter I, Subchapter R, - Toxic Substance Control Act (TSCA), Part 761 Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions

4. NYSDEC regulations, 6 NYCRR Part 360, Solid Waste Management Facilities General Requirements

5. NYSDEC regulations, 6 NYCRR Part 371, Identification and Listing of Hazardous Wastes (40 CFR Part 261)

6. NYSDEC regulations, 6 NYCRR Part 375, Environmental Remediation Programs

7. American Society for Testing and Materials (ASTM) Standards:

a. D422 - Method for Particle-Size Analysis of Soils.

b. D1556 - Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

c. D1557 - Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))

d. D6938 - Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.05 DESCRIPTION

A. Sampling Requirements

1. Fill Material:

a. Material to be excavated and proposed for reuse as fill under a Pre-Determined Beneficial Use meets the requirements of 6 NYCRR Part 360, Section 360.13(a), Applicability, Section 360.13(b), Waste Cessation, or Section 360.12(c)(1)(iv)(a).

b. If it is determined by the Contractor's QEP during construction that soils cannot be reused offsite in New York State, additional sampling shall be performed to meet the out-of-state beneficial use facility / TSDF requirements.

c. When sampling is necessary for offsite, in-state or out-of-state reuse or disposal, excess soils shall be sampled for RCRA characteristics, including ignitability, corrosivity, reactivity, PCBs, asbestos, and TCLP for metals, SVOCs, VOCs, and pesticides and herbicides, in addition to any other parameters required by the reuse/disposal facility. Frequency of sampling shall be as required by the out-of-state reuse/disposal facility.

2. When relocating soils on the same site, hazardous soils, non-soil wastes, or hot spots, as evidenced by visual observation, hand-held instruments or analytical results, must not be incorporated. All such material shall be removed for disposal off-site. Soil sample results greater than 5 ppm lead by Toxicity Characteristic Leaching Procedure (TCLP) shall be reported to the Engineer immediately.

B. Off-Site Beneficial Use Facility / TSDF

1. The Contractor shall submit the name(s) of the selected off-site soil beneficial use facilities / TSDFs and their location(s) to the Engineer for approval as part of the Soil Excavation, Treatment Reuse, and Disposal Plan specified in Section 31 23 16 – Excavation.

2. Reuse of excavation spoils off-site must be prioritized over disposal. TSDFs shall only be approved where reuse options are not available.

3. Note that some companies may have multiple beneficial use facilities or TSDFs, each possessing differing requirements regarding the types of materials accepted, the specific analytical testing parameters that must be performed for each material, and the frequency of sampling required for each material. It is the Contractor's responsibility to determine the types of materials accepted, specific waste acceptance criteria (analytical parameters) and frequency of testing requirements for each of its proposed facilities.

4. The Contractor shall confirm the location(s) and permit status, as well as check for outstanding violations and enforcement actions at each selected beneficial use facility / TSDF. The Engineer shall verify the information provided by the Contractor for each facility prior to approval.

5. If an approved facility is not available during construction, the Contractor shall be fully responsible for procuring alternate approved facilities at no additional cost to the City. Any additional sampling and analysis required and labor involved in selecting new facilities after the initial reuse or disposal facilities are accepted shall be the responsibility of the Contractor.

C. Project Conditions

1. Stockpiling: No stockpiling of excavated material on-site or ex-situ sampling of excavated soils will be allowed without written approval from the Engineer. Soils stockpiled for onsite reuse do not require sampling as they meet the conditions in Article 1.05.A.1.b.

    a. If stockpiling is considered necessary, and approved by the Engineer, sampling shall be conducted by collecting representative grab samples throughout the soil stockpile. Surface soil shall not be used as sampling material. Sampling frequency and analytical requirements will at a minimum conform to the sampling requirements specified herein. Multiple samples shall be classified based on biased worst case to be considered fully representative of the soils being sampled for reuse in New York State. The Contractor is also required to satisfy the specific sampling requirements of the beneficial use facility or TSDF.

    b. During stockpiling activities, the Engineer may identify quantities within each 300 cubic yard portion that differ in appearance from the bulk of the material as per 6 NYCRR Part 360, Section 360.13(e)(1) Table 1. In this case, the Engineer will direct the Contractor to segregate these variable materials for separate stockpiling on-site. The Contractor shall sample each stockpile that differs in appearance from the bulk of the material.

    c. All stockpiles of excavated materials shall be managed on site as required in Section 31 25 10 – Dust, Soil Erosion and Sedimentation Control.

2. Decontamination of Sampling Equipment: All sampling equipment shall be certified clean or precleaned, prior to collection of each sample, by the following method:

    a. Wash all sampling equipment, secondary containers (e.g., mixing bowls for composite sampling) and aluminum foil with non-phosphate laboratory grade detergent and distilled water.

    b. Triple rinse with distilled water.

    c. Rinse with isopropyl alcohol, or if samples are visibly contaminated with petroleum use a solvent, such as hexane or other alternate approved by the Engineer.

    d. Triple rinse with analyte-free water.

3. Disposal of Decontamination Solutions: Collect all decontamination solution and dispose of it through a licensed chemical waste disposal service if unsuitable for treatment on-site by incorporation into existing on-site treatment processes as defined in Section 31 23 19 – Dewatering.

1.06 QUALITY ASSURANCE

A. Laboratory Requirements:

1. The Contractor shall provide the services of a laboratory certified by the New York State Department of Health Environmental Laboratory Approval Program (NYSDOH-ELAP) to perform applicable testing and chemical analyses for the duration of the Work.

2. The laboratory shall also meet the certification requirements of the beneficial use facility / TSDF that will be utilized by the Contractor for the duration of the Work.

B. Permits and Regulations:

1. The Contractor shall obtain all necessary permits and perform all work in compliance with applicable requirements of OSHA, and other governing authorities having jurisdiction including all federal, state and local governing authorities.

C. Field QA/QC Samples:

1. Shall be collected and analyzed in accordance with the protocol for site samples.

2. The number of QA/QC samples required for a quantity of soil shall meet all beneficial use facility / TSDF requirements, and the approval of the Engineer.

D. Sample Turn-Around: The Contractor shall provide for prompt sampling and turn-around of analysis so as not to delay the project. If a turn-around time of less than ten (10) business days is required due to delays in construction scheduling or other constraints, Contractor shall provide for such at no additional cost to the City.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and other materials, including, but not limited to, those listed below for the approval of the Engineer. Where the Contractor's QEP determines that no sampling is required, at a minimum a Field Sampling Plan (FSP) per Article 1.07.A.2 shall be submitted describing a procedure for encountering potentially contaminated material during excavation as described in 1.05.A.2.

1. DEP Environmental, Health, and Safety (EHS) Drilling and Boring Checklist: The Contractor shall work with the Engineer and BEDC to complete all necessary portions of the EHS Drilling and Boring Checklist. This shall be completed and submitted to the Engineer a minimum of 60 days prior to the proposed commencement of the drilling/boring work. No drilling/boring work shall be performed at the Site without completion and written approval of the EHS Drilling and Boring Checklist from the Engineer. Updates to the checklist shall be completed and submitted whenever there is a change of the drilling subcontractor or scope of drilling/boring work; or new EHS hazards have to be considered in performing the work.

2. Field Sampling Plan (FSP): A FSP, prepared by the Contractor's QEP, shall be submitted to the Engineer for approval 30 days following notice to

proceed. The Engineer will approve the FSP only if it clearly provides a means to collect the information necessary to allow for classification of all material proposed for excavation and if it will ultimately generate data necessary to gain approval from the Contractor's chosen off-site beneficial use facility / TSDF. No sampling shall be conducted until the Engineer has reviewed and formally approved the FSP in writing. The FSP shall include the following at a minimum:

a. Locations and protocols for the collection and analysis of samples that represent all soils to be excavated. Collection methods and chosen locations shall be sufficient to pre-characterize the soil prior to excavation unless post-excavation sampling is approved by the DEP.

b. Each composite sample will be comprised of multiple (3-5) discrete samples that are representative of the horizontal and vertical extent of the excavation footprint.

    1) VOC analysis requires two (2) discrete (biased worst case) VOC samples to be collected for every one (1) composite sample.

    2) When soils are visibly heterogenous, composite and discrete (for VOCs), samples will be obtained to represent each visually different stratum or section of the excavation site, regardless of the overall excavation volume.

c. A detailed outline of the BUD or beneficial use facility / TSDF requirements for sampling, testing and analysis including specific number and types of samples per unit volume of soil to be excavated.

d. Parameters analyzed for soils to be reused or disposed, as defined in 6 NYCRR Part 360, Section 360.13 (e), in addition to any other parameters required by the beneficial use facility / TSDF.

e. A scaled site map showing:

    1) existing fixed landmarks;

    2) proposed excavation limits or area to be excavated divided into distinct vertical and horizontal grids, identifying the volume of soil or fill that each sample will represent;

    3) specific sampling locations that are representative of the entire depth of excavation and that will conform to the applicable sampling frequency requirement;

    4) identification numbers of the sample grids, relative depth, sampling intervals, and volumes reflective of the Contractor's excavation method.

        a) Sampling intervals shall account for existing subsurface data, historic sampling information,

including descriptions, depths, orientation, and location of material of potentially different classifications, and shall minimize undue mixing of excavated soils.

f. Proposed sampling, handling, preservation, and storage of equipment procedures, including transfer procedures, and sampling equipment decontamination procedures.

g. Proposed analytical methods, in accordance with SW-846, latest edition, for the analyses to be performed. Contractor shall confirm the analytical method and laboratory selected is accepted/certified by the receiving facility, including beneficial use facility/TSDF, meets the regulatory requirements, and can meet the required reporting limits for comparison to beneficial use facility/TSDF accepting criteria and other limits, as applicable.

h. Procedures for assessing precision, accuracy, degree of representation, comparability and completeness of samples and data, including performance audits and proposed protocols for corrective measures where problems are identified in accordance with Article 1.06 -- Quality Assurance.

i. Schedule of field inspections.

j. A statement that the sampling program is in accordance with the Contract requirements.

k. Manufacturer, catalog data and calibration records of all analytical equipment to be used on-site.

l. Name and address of analytical laboratory, copy of laboratory certification, and Quality Assurance Manual.

m. Description of field and laboratory QA/QC samples and any additional requirements of the reuse or disposal facilities.

n. The organizational structure of the Contractor's and all subcontractors' quality management (QM) personnel, including:

1) names, titles and contact information;

2) resumes;

3) responsibilities;

4) authorities; and

5) qualifications.

3. Field Sampling Summary Report (FSSR): A FSSR, prepared by the Contractor's QEP, shall be submitted to the Engineer for review in a timeframe, dependent on the extent of the data collection effort, determined by the Engineer at the time. Contractor shall be solely responsible for ensuring that the FSSR meets all requirements of Contractor's proposed

beneficial use facility/TSDF. The FSSR shall contain all laboratory analytical results obtained from the field sampling event and shall allow the Engineer to determine if the soil is acceptable for beneficial use or requires disposal at a permitted TSDF. At minimum, the FSSR shall include the following information:

a. A detailed account of any field procedures used which deviated from or were in addition to those established in the FSP.

b. A summary table listing the analytical results (with individual ID for each sample) with highlighted exceedances of 6 NYCRR Part 360, Section 360.13 (f), Table 2: Fill Material Beneficial Use, all Beneficial Use Facility/TSDF acceptance criteria, RCRA characteristics, and any other screening criteria identified and approved by the Engineer during the Project, as applicable.

c. Location of each sampling point (using individual ID from analytical results summary table) on the scaled site map created in the FSP.

d. A complete set of field notes collected and maintained by the Contractor during sampling. The field notes shall be made available to the Engineer during the sampling program.

e. Boring or probe logs from each sampling location containing a continuous stratigraphic description of all material encountered. Descriptions of material shall include, but not be limited to, color, odor, staining, field screening measurement, relative grain size distribution, material composition, moisture content, and cohesive properties.

f. Depth intervals for each sample, whether a grab or composite, and any special notes, which are included on the laboratory chain-of-custody forms.

g. Copies of all laboratory chain-of-custody forms for samples that are collected for analysis.

h. Analytical Results: The Contractor shall submit analytical results for sampled soil material to the Engineer within three (3) business days of receiving such data from the laboratory. Analytical results data shall be managed by utilizing a computer spreadsheet or database program compatible with NYSDEC requirements for EQuIS submittals as approved by the Engineer. Data shall be organized in such a way that all samples may be tracked from collection through analysis.

    1) The analytical results generated for a ten (10) business day turn-around time deliverable shall include a Form I (or equivalent) showing compounds analyzed for, and concentrations detected, and associated chain-of-custody reports to the Engineer.

2) The final data package generated by the laboratory shall include the following information:

a) A Form I showing pertinent physical data presented in concise, easy to follow formats (i.e., sample number, laboratory ID, client, date of sample preparation, date analyzed, percent moisture, dilution factor, sample matrix, units, undetected and detected compounds, etc.).

b) Reference to analytical methodology used.

c) General discussion including a description of sample types, tests performed, any problems encountered, and any general comments (case narrative).

d) Data from each discrete sample reported using cross-referencing between site samples and quality control samples and including all pertinent dates, information and reporting limits.

e) Associated quality control samples such as blanks, spikes and spike duplicates, laboratory duplicates, laboratory control samples, field duplicates and appropriate check standards.

f) Copies of chain-of-custody sheets.

3) The information must be delivered on CD or via electronic mail to the Engineer. All electronic data must be certified to be virus-free.

B. Monthly Submittals: Monthly soil generation/diversion (onsite and offsite reuse)/disposal data shall be tracked in accordance with Section 01 35 27 – Environmental Health and Safety Requirements, paragraph 1.07.C Monthly Contractor EHS Report, and 01 74 20 – Construction Waste Management.

C. Coordinate all submittals with the Soil Excavation, Reuse, Transport and Disposal Plan (SERTD Plan) required in Section 31 23 16 – Excavation.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Sample Identification:

1. All samples shall be identified with a sample label in addition to an entry on a chain-of-custody record. The label shall be identified upon receipt by the laboratory and cross-referenced to the chain-of-custody record.

2. Any inconsistencies shall be noted on the custody record. Laboratory personnel shall notify the Sampling and Analysis Manager immediately if any inconsistencies exist in the paper work associated with the samples, and Contractor shall collect new samples to replace those with inconsistencies which cannot be rectified.

B. Sample Labels: The field team shall complete the following information on a sample label for each sample bottle:

1. Site Name
2. Job Number
3. Sample Number
4. Sample Description
5. Company Name
6. Parameters to be analyzed
7. Date
8. Time
9. Preservation Technique Employed
10. Sample labels shall be attached to the sample bottles

C. Completion of Chain-of-Custody Record:

1. Maintain a chain-of-custody record on all samples. A chain-of-custody record is a printed multi-part form that accompanies a sample or group of samples as custody is transferred from person to person. A chain-of-custody record is a controlled document.
2. As soon as is practical after sample collection, preferably after decontamination, the following information shall be entered on the chain-of-custody form. All information shall be recorded in ink.
    a. Project number: Enter the alphanumeric designation assigned by the field team that uniquely identifies the project site.
    b. Project name: Enter the site name.
    c. Samplers: Sign the name(s) of the sampler(s).
    d. Station number: Enter the sample number for each sample in the shipment. This number appears on the sample identification label.
    e. Date: Enter a six-digit number indicating the year, month, and day of sample collection.
    f. Time: Enter a four-digit number indicating the time of collection in 24-hour time, for example, 13:54.
    g. Matrix/Type: Indicate the type of sample; composite or grab.
    h. Station location: Describe the location where the sample was collected.
    i. Number of containers: For each sample number, enter the number of sample bottles that are contained in the shipment.
    j. Remarks: Enter any appropriate remarks.

k. Sample Shipment:

3. Custody of samples shall be maintained throughout the shipment of samples to the selected laboratory (ies). All samples shall be packaged and shipped daily to ensure that no sample is held at the site more than 24 hours. Samples shall be delivered directly to the laboratory using the following procedures:

   a. Use waterproof high-strength plastic ice chests or coolers only.

   b. After filling out the pertinent information on the sample label and tag, put the sample in the bottle or vial and screw on the lid. For bottles other than VOC sample bottles, secure the lid with tape (tape on VOC bottles may cause contamination).

   c. Place inert cushioning material such as vermiculite or "bubble-wrap" in the bottom of the cooler.

   d. Enclose the bottles in clear plastic bags through which sample labels are visible, and seal the bag. Place bottles upright in the cooler in such a way that they do not touch and will not touch during shipment.

   e. Put in additional inert packing material to partially cover sample bottles (more than half-way). Place double-bagged crushed ice around, among, and on top of the sample bottles.

   f. Fill cooler with cushioning material.

   g. Put paperwork (chain-of-custody record) in a waterproof plastic bag and tape it with packing tape to the inside lid of the cooler.

   h. Tape the drain shut.

   i. Secure lid by taping. Wrap the cooler completely with strapping tape at a minimum of two locations. Do not cover any labels.

   j. Attach completed shipping label to top of the cooler.

   k. Put "This Side Up" labels on all four sides and "Fragile" labels on at least two sides of coolers containing glass containers.

   l. Ship the cooler overnight by commercial carrier (e.g., Federal Express, UPS), laboratory carrier or field personnel to the respective laboratory.

   m. Custody forms for the samples shall be signed by the Contractor's designated representative who is relinquishing custody. The custody form shall include the air bill number, method of shipment, and time and date of the transfer of custody.

4. Custody seals shall be applied to the front and back of the sample coolers. A shipping label with return address shall be applied as well as the air express bill and any Department of Transportation (DOT) required labels or markings.

D. Transferring Custody of Samples to Shipper, if applicable: Contractor shall transfer custody of samples to a shipper as follows:

1. Sign, date, and enter time on the chain-of-custody report under "Relinquished by."
2. Make certain that shipper signs the "Received by" entry.
3. Enter name of the carrier under next "Relinquished by" category. Receiving laboratory shall sign "Received for Laboratory by" on lower line and enter date and time.

E. Transferring Custody from Sampler or Shipper to Common Carrier:

1. The shipper or Contractor shall transfer custody of samples to a common carrier as follows:
   a. Sign, date, and enter time under "Relinquished by" entry.
   b. Enter name of carrier (e.g., UPS, Federal Express) under "Received by."
   c. Enter bill-of-lading or Federal Express airbill number under "Remarks."
   d. Place the original of the chain-of-custody form in the appropriate sample shipping package. Retain a copy with field records.
   e. Sign and date the custody seal. The custody seal is part of the chain-of-custody process and is used to prevent tampering with samples after they have been collected in the field.
   f. Wrap the seal across filament tape which has been wrapped around the hinges of the shipping package at least twice.
   g. Fold the custody seal over on itself so that it sticks together.
   h. Complete other carrier-required shipping papers.
   i. In instances when the Common Carrier will not accept responsibility for handling chain-of-custody forms, the Contractor shall ensure that the record is packed within the sample package.

F. Laboratory Custody Procedures: Once the samples arrive at the laboratory, the Contractor shall ensure that custody of the samples is maintained by laboratory personnel. The laboratory shall, at a minimum, document the chain of custody through each stage of analysis from receipt to final reporting.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Testing shall be in accordance with the sampling requirements of Article 1.05.A.

1. Parameters analyzed for soils to be reused or disposed off-site shall be the RCRA characteristics, including ignitability, corrosivity, reactivity, and Toxicity Characteristic Leaching Procedure (TCLP) for metals, SVOCs, VOCs, and pesticides and herbicides, in addition to any other parameters required by the beneficial use facility or TSDF.

2. If any soil sample results are greater than 5 ppm lead by TCLP the Contractor shall immediately notify the Engineer. (See Section 01 35 45 – Hazardous Materials Control for implementation of a Community Air Monitoring Program (CAMP) in the event that hazardous levels of lead are detected in soil.)

B. Field sampling shall be completed in ample time to prevent delay of the excavation work or the work of any other contractor.

3.02 IMPLEMENTATION

A. When relocating soils on the same Site, hazardous soils, non-soil wastes, or hot spots, as evidenced by visual observation, hand-held instruments or analytical results, must not be incorporated. All such material shall be removed off-site for proper disposal, treatment, and/or reuse as applicable.

3.03 FIELD TESTING / QUALITY CONTROL

A. Sampling frequencies shall be per Article 1.05.

B. Classification of soils for reuse or disposal shall be carried out by the Engineer.

C. Conduct testing in accordance with the approved FSP.

D. Calibrate all instruments in accordance with manufacturer recommendations.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 02 41 10 – DEMOLITION AND REMOVALS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to complete the demolition, removal, disposal and relocation Work.

B. Included, but not limited to, are demolition and removals of existing materials, structures, equipment, or work necessary to install the new Work, as shown and specified and to connect same with existing work in an approved manner. Demolition includes structural concrete, foundations, structural steel, metals, masonry, attachments, appurtenances, piping, electrical and mechanical equipment, paving, curbs, walks, fencing, and similar existing facilities.

C. Demolitions and removals which may be specified under other Sections shall conform to requirements of this Section.

D. The Contractor shall obtain all required permits from the City and other agencies having jurisdiction.

E. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 02 24 20 - Soil Sampling and Analysis

B. Section 31 23 16 - Excavation

C. Section 31 25 10 - Dust, Soil Erosion and Sediment Control

D. Section 33 01 10.60 - Disinfection of Piping, Tanks, Structures and Equipment

1.04 REFERENCES

A. 29 CFR 1926 - Safety and Health Regulations for Construction (Subpart T - Demolition)

B. 29 CFR 1910 - Occupational Safety and Health Standards

C. ANSI/ASSE A10 - Construction and Demolition Safety Standards

D. AWS D12.1 - Reinforcing Steel Welding Code

E. NYCDEP - Environmental Health and Safety Policies and Procedures – Vol. III. Control of Hazardous Energy Lock-Out/Tag-Out, or latest version

1.05 DESCRIPTION

A. Protection:

1. Demolition and removal Work shall be performed by competent workers experienced in the various types of demolition and removal Work required. The Work shall be carried through to completion with the prevention of damage to structures and the adjacent property and with due regard to the safety of City employees, work persons on the site, and the public. The Work will be performed so as not to interfere with the use of, and free and safe passage to and from, adjacent structures.

2. The Contractor shall provide, erect and maintain catch platforms, lights, barriers, weather protection, warning signs and other items as required for proper protection of the public, occupants of the building, work persons engaged in demolition operations, and adjacent construction.

3. The Contractor shall provide and maintain weather protection at exterior openings so as to fully protect the interior premises against damage from the elements until such openings are closed by new construction.

4. The Contractor shall provide and maintain temporary protection of the existing structure designated to remain where demolition, removal and construction work is being done, connections made, materials handled or equipment moved. The Contractor shall be responsible for any damage to

the existing structure or contents by reason of providing insufficient protection.

5. The Contractor shall take necessary precautions to control dust as required by Section 31 25 10 – Dust, Soil Erosion and Sediment Control. Dust shall be prevented from rising by wetting demolished masonry, concrete, plaster and similar debris. All portions of the existing buildings affected by the operations under this Section shall be protected by dustproof partitions and other adequate means.

6. The Contractor shall provide adequate fire protection in accordance with local Fire Department requirements.

7. The Contractor shall carry out all operations so as to avoid interference with operations and work in the existing facilities and the work under other contracts.

8. The Contractor shall be solely responsible for making all necessary arrangements and for performing all necessary work involving the discontinuance or interruption of all utilities or services.

9. Any equipment, piping and appurtenances removed without proper authorization, and that are necessary for the operations of the existing or expanded facilities, shall immediately be replaced to the satisfaction of the Engineer at no cost to the City.

10. Closing or obstructing of roadways, sidewalks, and passageways adjacent to the work by the placement or storage of materials will not be permitted, and all operations shall be conducted with minimum interference to traffic.

11. The Contractor shall repair damage caused by its operations to existing structures and equipment to remain, or to any property belonging to the City or its employees.

12. The Work shall comply with 29 CFR Part 1926 -- Safety and Health Regulations for Construction, applicable provisions and recommendations of ANSI/ASSE A10 -- Construction and Demolition Safety Standards, New York City Construction Code, New York City Electrical Code, all other governing codes and rules, and as specified herein or shown in the Contract Documents.

13. The Contractor shall make such investigations, explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal.

14. Demolition and removal of hazardous materials shall be in accordance with applicable federal, State and Local regulations.

B. Permits: The Contractor shall obtain all permits from all appropriate regulatory agencies required for closing or obstructing streets and sidewalks. Obtain all air permits as required for demolition of any building or structure located in New York City including a Demolition Permit from the Department of Buildings and a

DEP Registration for Demolition from the Department of Environmental Protection, Bureau of Environmental Compliance.

C. Condition of Buildings, Structures and Equipment:

1. The City does not assume responsibility for the actual condition of buildings, structures and equipment to be demolished and removed.

2. Conditions existing at the time of inspection for bidding purposes will be maintained by the City so far as practicable. However, there is no guarantee by the City that the number of fixtures, amount of equipment or any other material of value existing at bidding time in the buildings and structures to be demolished will be present in the structures when they are demolished. The Contractor shall have no claim against the City because of the absence of such fixtures and materials.

3. The conditions of existing structures and equipment shown on the Contract Documents is based on visual inspection and a walk-through survey only. Neither the Engineer nor the City will be responsible for interpretations or conclusions drawn therefrom by Contractor.

D. Scheduling: The Contractor shall carry out operations so as to avoid interference with City's operations and work in the existing facilities.

E. Notification: At least 48 hours prior to commencement of a demolition or removal, Contractor shall notify the Engineer in writing of his proposed schedule. City will inspect the existing equipment or facilities and review with the Contractor those items which are to remain the property of the City. No removals shall be started without the permission of the Engineer.

F. Coordination: The Contractor shall coordinate all electrical shutdowns with the Engineer and the Plant's Responsible Individual as defined in the DEP Policies and Procedures. The Contractor shall confirm all equipment is de-energized, and install required lock-out and tag-out devices on electrical equipment to prevent accidental re-energizing of the equipment.

G. Pre-Demolition Meeting:

1. The Contractor shall have a pre-demolition meeting with the Engineer and representatives of other related construction contracts, if any, in the presence of the Resident Engineer, to review all of the work areas that will be affected by the removal of materials from demolition.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to proposed methods, equipment and operating sequences to be used in performance of the demolition and removals work and handling of hazardous materials.

B. The Contractor shall demonstrate how coordination of operations and sequence for shut-off, capping, temporary services, continuation of utility services, and other applicable items will be provided to ensure no interruption of City's operations.

C. Sequence and Schedule: The Contractor shall submit a detailed schedule showing the sequence and duration of demolition activities.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. General:

1. The Work required shall be done with care, and shall include all necessary shoring, bracing, and support to prevent movement, settlement, or collapse of existing structures or facilities. The Contractor shall be responsible for any damage caused by demolition and removal Work to any part or parts of existing structures or equipment designated for reuse or to remain. The Contractor shall perform patching, restoration and new work in accor-

dance with applicable technical sections and details of the Contract Documents.

2. Surfaces of walls, floors, ceilings, or other areas which are exposed by any of the removals specified herein, and which will remain as architecturally finished surfaces, which have holes, scars, chipped or other damaged surfaces revealed by the removal, shall be repaired by the Contractor with the same or matching materials as the existing surface or as may be otherwise approved by the Engineer.

3. Pollution Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Comply with Section 31 25 10 – Dust, Soil Erosion and Sediment Control and all governing regulations pertaining to environmental protection.

   a. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

   b. Clean adjacent structures, facilities, and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to conditions existing prior to the start of the work.

   c. The use of calcium chloride for dust control will not be allowed.

4. All supports, pedestals and anchors shall be removed with the equipment and piping unless otherwise specified or required. Concrete bases, anchor bolts and other supports shall be removed to approximately one inch below the surrounding finished area, and the recesses shall be patched to match the adjacent areas. Superstructure wall and roof openings shall be closed, and damaged surfaces shall be patched to match the adjacent areas, as specified under applicable sections of the Specifications, as shown on the Contract Drawings, or as directed by the Engineer. Wall sleeves and castings shall be plugged or blanked off, all openings in concrete shall be closed in a manner meeting the requirements of the appropriate sections of the Specifications, as shown on the Contract Drawings and as directed and approved by the Engineer.

5. Any materials or items designated to remain the property of the City shall be removed with care and stored at locations designated by the City. This includes, but is not limited to:

   a. Existing sodium hypochlorite chemical feed pumps.

6. Where equipment is shown or specified to be removed and relocated, the Contractor shall not proceed with removal of this equipment without the prior approval of the Engineer. Upon approval, and prior to commencing removal operations, the equipment shall be operated in the presence of representatives of the Contractor, the City and the Engineer. Such items shall be removed with care, under the supervision of the trade responsible for reinstallation, and shall be protected and stored until required.

Material or equipment damaged during removal shall be replaced with similar new material or equipment. Any equipment that is removed without proper authorization and is required for plant operation shall be replaced at no cost to the City.

7. Wherever piping is to be removed for disposal, the Contractor shall drain the piping and adjacent pipe and headers that are to remain in service shall be blanked off or plugged and then anchored in an approved manner.

8. Where alterations occur, or new and old work join, the Contractor shall cut, remove, patch, repair or refinish the adjacent surfaces to the extent required by the construction conditions, so as to leave the altered work in as good a condition as existed prior to the start of the work. The materials and workmanship employed in the alterations shall be of the same quality as required for new work of the same type.

9. The Contractor shall confine cutting of existing roof areas designated to remain to the limits required for the proper installation of the Work. The Contractor shall cut and remove insulation and weather protection, and provide temporary weathertight protection as required until new roofing and flashings are installed.

10. The Contractor shall remove enclosures, signs, guards, and the like when no longer required or when directed by the Engineer at the completion of the Work.

11. The Contractor shall dispose of all demolition materials, equipment debris, and all other items not marked or specified by the City or the Engineer to remain as property of the City, off site and in conformance with the requirements of the Contract and all existing applicable laws and regulations.

12. The Contractor shall de-energize and disconnect electrical service to all structures and equipment prior to demolition or relocation. No demolition activity shall commence prior to electrical disconnection.

13. All construction and demolition debris that has come in contact with regulated solid waste shall be cleaned to the satisfaction of the Engineer before leaving the site.

14. The use of explosives is not permitted.

B. Structural Removals

1. The Contractor shall remove concrete, structures and sub-structures to the lines and grades shown unless otherwise directed by the Engineer. The removal of masonry beyond these limits shall be at the Contractor's expense and these excess removals shall be reconstructed to the satisfaction of the Engineer with no additional compensation to the Contractor.

2. The Contract Drawings show approximate available information on thickness of existing concrete to be removed and the extent of reinforcement. It is the Contractor's responsibility, before commencing the demolition work, to verify the thickness of existing concrete to be removed and the extent to which it is reinforced by suitable means as deemed necessary by the Contractor in the field. The City does not guarantee the accuracy of existing concrete thickness to be removed or the extent of reinforcement shown on the Contract Drawings, as actual concrete thickness or reinforcement may vary. No additional compensation will be made because of variations from the thickness of concrete or for variations in the extent of reinforcement shown on the Contract Drawings.

3. All concrete, stone, masonry, roofing materials, reinforcement, structural or miscellaneous metals, plaster, wire mesh and other items contained in or upon the structure shall be removed and taken from the site and disposed of at a permitted facility. Demolished items shall not be used in backfill.

4. After removal of parts or all of masonry walls, slabs and like work which tie into new work or existing work, the point of junction shall be neatly repaired so as to leave only finished edges and finished surfaces exposed.

5. When conducting demolition activities on masonry materials (i.e., brick and concrete), the Contractor shall perform work area and personal exposure monitoring in accordance with applicable regulations and standard industrial hygiene methods, until sufficient data is generated to demonstrate compliance with permissible exposure limits for crystalline silica, as calculated according to 29 CFR 1926.55 and 1926.57, employing exposure control methods specified in 29 CFR 1926.1153(c)(1). Compliance with permissible exposure levels must be demonstrated with a minimum of three (3) consecutive readings taken seven (7) days apart, for each new work task or change in equipment, process, or control measure.

C. Mechanical Removals

1. Mechanical removals shall consist of dismantling and removing existing pipes, pumps, motors and other facilities as specified, shown, or required for the completion of the work. It shall include cutting, capping, draining, and plugging as required, except that the cutting of existing piping for the purpose of making connections thereto will be included under Division 40 of the Specifications.

2. Existing process, water, chemical, and other piping shall be removed where shown on the Contract Drawings. All removed piping shall be removed to the nearest solid support, capped and left in place. Piping shall be purged and made safe by the Contractor prior to removal or capping. Disposal of any chemicals or other purged material in accordance with the requirements of Section 01 35 45 - Hazardous

Materials Control and other applicable environmental, health, and safety (EHS) requirements of the Contract shall be the responsibility of the Contractor. Where piping that is to be removed passes through existing walls, it shall be cut off and properly capped on each side of the wall.

3. When underground piping is to be altered or removed, the remaining piping shall be properly capped. Abandoned underground piping may be left in place unless it interferes with new work or is shown or specified to be removed.

4. Any required demolition or changes to potable water piping and other plumbing system work shall be made in conformance with all applicable codes. Portions of the potable water system that may have been altered or opened shall be pressure tested and disinfected in accordance with Section 33 01 10.60 – Disinfection of Piping, Tanks, Structures and Equipment and local codes. Other plumbing piping and heating piping shall be pressure tested only.

5. Provide all caps, plugs, blind flanges, shut-off valves and other work and materials required to remove from service existing piping and necessary to keep existing piping in service where shown or required.

D. Pavement, Curb and Sidewalk Removals:

1. Remove existing pavement, including base and surface courses, stabilized sub-bases, curbs, and gutters as required to construct new facilities or as shown. Before removing, saw a straight joint at least 1-1/2-inches deep between sidewalk and pavement designated for removal and that left in place. Curbs and gutters shall be removed to the nearest construction joint beyond the limit of demolition shown on the Contract Drawings.

2. Provide for satisfactory transition between replaced pavement and sidewalks and the portions remaining in place.

E. Electrical Removals:

1. Electrical removals shall consist of the removal of existing generators, transformers, distribution switchboards, control panels, motors, conduits and wires, and miscellaneous electrical equipment all as shown, specified, or required to perform the work.

2. All existing electrical equipment and fixtures to be removed shall be removed with such care as may be required to prevent unnecessary damage to keep existing systems in operation and maintain the integrity of the grounding systems.

3. Distribution switchboards shall be removed or modified as shown in the Contract Documents. Switchboards to be removed shall be disconnected and dismantled, and all components shall be disposed of off the site. Circuit breakers and other control equipment on modified switchboards that will no longer be used shall be removed unless otherwise shown or specified. All new openings cut into the modified switchboard panels

shall be cut square and dressed smooth to the dimensions required for the installation of the new equipment.

4. Motors shall be disconnected and removed where shown or specified. Motors not marked or designated by the City or the Engineer to be salvaged shall be removed from the site. Motors or other electrical gear designated for reuse shall be stored in enclosed, heated storage.

5. Conduits and wires shall be abandoned or removed where shown. All wires in abandoned conduits shall be removed, salvaged, turned over to the City and stored where directed by the Engineer. Abandoned conduits concealed in floor or ceiling slabs, or in walls, shall be cut flush with the slab or wall at the point of entrance. The conduits shall be suitably plugged and the area repaired in a flush, smooth, approved manner. Exposed conduits and their supports shall be disassembled and removed from the site. Repair all areas of work to prevent rust spots on exposed surfaces.

6. The Contractor shall coordinate all electrical shutdowns with the Engineer and the facility's Responsible Individual as defined in the DEP Policies and Procedures. The Contractor shall confirm all equipment is de-energized, and install required lock-out and tag-out devices on electrical equipment to prevent accidental re-energizing of the equipment.

F. Miscellaneous Removals:

1. Contractor shall remove miscellaneous items where shown on the Contract Documents or where necessary for the construction of new structures or modification of existing structures. Anchor bolts shall be cut back one inch below the concrete surface and the hole patched.

G. Modifications and Closures:

1. Modifications shall conform to all applicable requirements of the Contract Documents, and the directions and approvals of the Engineer.

2. Where alterations require cutting or drilling into existing floors, walls, and roofs, the holes shall be repaired in an approved manner. Contractor shall repair such openings with the same or matching materials as the existing floor, wall, or roof, or as otherwise approved by the Engineer. All repairs shall be smoothly finished unless otherwise approved by the Engineer.

3. Openings in existing concrete slabs, ceilings, roofs, masonry walls, floors and partitions which are not to be used in the new work shall be closed and sealed as shown or otherwise directed by the Engineer.

4. Where parts of existing structures are to remain in service, demolish the portions to be removed, repair damage, and leave the structure in proper condition for the intended use. Remove concrete and masonry to the lines designated by drilling, chipping, and other suitable methods. Leave the resulting surfaces true and even, with sharp straight corners that will result in neat joints with new construction or be satisfactory for the purpose

intended. Where existing reinforcing rods are to extend into new construction, remove the concrete so that the reinforcing is clean and undamaged. Cut off other reinforcing flush with the surface.

5. New work shall be keyed into the existing in an acceptable manner. New reinforcing steel shall be welded to the existing reinforcing. Welding shall conform to AWS D12.1, Reinforcing Steel Welding Code. In general, the same or matching materials as the existing adjacent surface shall be used. The finished closure shall be a smooth, tight, sealed, permanent closure with all exposed surfaces smooth finished and acceptable to the Engineer.

H. Maintenance and Clean Up:

1. Contractor shall maintain the buildings, structures, and other City properties free from accumulations of waste, debris, and rubbish caused by the demolition and removal operations.

2. Contractor shall provide on-site dump containers for collection of waste materials, debris and rubbish, and shall wet down dry materials to prevent blowing dust.

3. At reasonable intervals during the progress of the demolition and removal work or as directed by the Engineer, the Contractor shall clean the Site and properties and dispose of all waste materials in accordance with the applicable regulations and requirements of this Contract.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified and required to complete the protection, maintenance, and relocation of utilities located off-site and on-site.

B. The following index of this Section is presented for convenience:

C.

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1.02 PAYMENT

A. No separate payment will be made for performing any Work required under this Section. All costs, for Work required for this Section shall be included in the applicable lump sum, unit price(s), or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

B. Known Utilities in Public Right-Of-Way (Street Utilities)

1. Section U: Payment for Section U requires the Contractor to immediately commence negotiations with each Utility Company (or "the Companies," as defined in Section U) for an Interference Agreement under which each

Utility Company will compensate the Contractor for any interference work which the Utility Company does not elect to perform with its own forces or by specialty contractors retained by the Utility Company. Thus the Contractor is on notice that its Work under the Contract may be affected by interference work performed by (a) the Contractor pursuant to a separate Interference Agreement with the Utility Company, (b) the Utility Company, or (c) partly by each.

2.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Definitions

1. Utilities are defined as sewer lines, storm lines, water lines, gas lines, electric lines, lighting facilities, street lighting, water, electric, telephone and cable lines, storm sewer, catch basins, sanitary sewer, gas, oil and related underground structures owned by DEP or other companies.

B. Reference Standards

1. Subpart 753-3 of Rule 53 of the Industrial Code (New York State Department of Labor), latest edition.

2. Gas Facility Cost Allocation Act, an agreement entered into by the City of New York and gas companies Con Edison and National Grid (formerly Keyspan Energy Delivery).

1.05 DESCRIPTION

A. DEP Utilities

1. The Contractor shall furnish all labor, materials, and equipment required to protect-in-place, support, maintain and repair or relocate DEP utilities both on-site and off-site of the project location as directed by the Engineer during the Contract Work.

2. Unless otherwise shown or specified in the Contract Documents or specifically directed by the Engineer, the Contractor shall, during the entire construction period, maintain in continuous operation and service existing DEP utilities both on-site and off-site of the project location, except as otherwise approved by the Engineer for shutdown of any such facilities for specific periods of time to connect new facilities into existing facilities or to repair, relocate, support or shift the existing facilities.

3. All Work must be performed under the supervision of DEP Bureau of Water Supply and Operations and shall conform to the design standards of that Bureau.

4. For the relocation of DEP utilities including water and sewer lines as a result of the proposed Work under this Contract, the Contractor shall coordinate and get approval from the Engineer prior to the removal of any existing facility or to start any construction. The Contractor shall sequence shut down of water and sewer mains in coordination with the Engineer.

5. The Contractor shall execute the Work in such a way as to prevent damage or injury to existing DEP facilities both on-site and off-site of the project location, all adjacent private properties and occupants thereof, which might result from Work or other causes, and so as not to interfere with the use of, and free and safe passage to and from, DEP sites.

6. Restoration of hydrants and hydrant connections and all other City structures shall be in conformity with the requirements of the Contract Documents and the specifications of the Bureau of Water and Sewer Operations.

B. Unforeseen Utilities

1. The Contractor shall notify the Engineer of any unknown utility found during construction and shall, when directed by the Engineer, do all necessary Work to relocate, maintain in place, abandon, remove or replace these utilities.

2. Unforeseen Utilities are utilities not shown on the Contract Drawings that are found during the construction Work. Unforeseen utilities also include those utilities that cannot be protected in place as determined by the Utility Owner or extenuating circumstances as deemed by the Engineer.

C. Street Utilities

1. The Contractor shall furnish all labor, materials and equipment required to protect-in-place, support, maintain and repair, or relocate utilities encountered or disturbed during the Contract Work.

2. All existing utilities that interfere with the Work shall be removed, relocated, maintained and protected in place or by other means taken care of as required by the Department or utility company having jurisdiction.

3. During the progress of the Work, the Contractor shall cooperate with the public utility companies to safeguard from injuring existing surface, subsurface or overhead structures in the vicinity of Work. The Contractor shall give the public utility companies ample notice before commencing Work at locations where existing surface, subsurface or overhead structures owned by utility companies interfere with the Contract Work.

D. Coordination with Street Utilities Companies

1. Marking of Underground Utilities

a. On receiving the Commissioner's written Notice to Commence Work (Notice to Proceed), the Contractor shall call 811 to make arrangements for the complete identifications and marking of all underground utilities in the Project area. The Contractor shall protect and maintain these markings as Work proceeds.

2. Notice to Utility Companies to Remove Structures

a. The Contractor shall, except as otherwise directed by the Engineer, give notice in writing to all utility and other companies or individuals owning or controlling any pipes, conduits, tunnels tracks or other structure which shall be found, upon excavating, to occupy the place of the Work to be built as required under this Contract so that said companies or individuals may remove their structures at their expense and shall not cause any hindrance to or interfere with such companies or individuals in removing their structures. But if said utility, railroad, or other companies or individuals within, five days after receipt of such notice shall fail to remove their structures, the Contractor shall, upon the approval of the Engineer, remove the same, it being expressively understood that the cost thereof shall not be charged against the City, but shall be a matter for adjustment between the Contractor and the company or companies or individuals concerned.

3. Notice to Utility Companies to Support, Protect, Temporarily Remove and Replace Structures within the Limits of Work

a. The Contractor shall, except as otherwise directed by the Engineer, hereof, give notice in writing to all utility and other companies or individuals owning or controlling any pipes, conduits, tunnels, tracks or other structures which are found within the limits of ordered excavation so that said companies or individuals may protect, support or temporarily remove and replace their structures, and it shall not cause any hindrance to, or interference with any such utility company or companies or individuals in protection, supporting or temporarily removing and replacing main and service pipes, conduits, tunnels, lampposts, lamps, tracks or other structures but the Contractor shall allow the said company or companies or individuals to take all such measures as are necessary to accomplish their requirements.

b. The Contractor shall comply with the provisions of subpart 753-3 of Rule 53 of the Industrial Code (New York State Department of Labor) latest edition, copies of which may be obtained at the Department of Labor.

4. Requirement for Separate Interference Agreement with Utility Companies

a. The Contractor shall be responsible for compliance with all the provisions of the following Sections and Schedules, which are hereby made a part of the original Contract documents:

b. "Section U: Additional Contract Requirements Applying to Work Performed in the Presence of Privately Owned Utility Facilities" (Refer to **Attachment A** – Page 02997 – 10).

1) Schedule U-1 listing of companies named for this Contract (Attachment A – Page 02997-22)

2) Schedules U-2 listing scope of utility interferences is no longer included in City contract. Such information will be part of Interference Agreement between Utility Operator and Contractor.

3) Section U-3 (as per the Private Utilities reference document for SECTION U called "CET SPECIFICATIONS AND SKETCHES", dated November 2010). Electronic copy available upon request to the Engineer.

4) Each facility operator shall provide inspectors at the Work site to inspect methods of interference work, verify quantities and items of Utility Work, and coordinate all phases of the facility operator operations.

5) In addition, the following statements are made to provide clarification of various paragraphs under Section U:

a) Section U, ¶3, requires the Contractor to immediately commence negotiations with each Company for an Interference Agreement under which the Company will compensate the Contractor for any Interference Work, which the Company does not elect to perform with its own forces or by specialty contractors retained by the Company. Thus the Contractor is on notice that its Work under the Contract may be affected by Interference Work performed by (a) the Contractor pursuant to a separate Interference Agreement with the Company, (b) the Company, or (c) partly by each.

b) The City has no contract with any of the Companies for Work on or adjacent to the site of work under this Contract, and the Companies are not "Other Contractors" as defined for the purposes of this Contract. The Contractor is reminded, however, that pursuant to Section U, ¶3, the City will not compensate the Contractor for any direct and/or

indirect costs related to Interference Work, regardless of whether such Interference Work is covered by an Interference Agreement between the Contractor and the Company or is performed by the Company using its own forces or by specialty contractors retained by the Company.

c) Section U, ¶13, provides that the provisions of Section U are material provisions of the Contract and that the Contractor's failure to comply with the procedures set forth in Section U are sufficient for the Commissioner to declare the Contractor in default pursuant to Article 48 of the Contract.

6) Pursuant to these provisions, the Contractor is informed that the Performance Bond required of the Contractor pursuant to the Contract is not deemed to guarantee performance of any of the Interference Work.

7) 7) For work adjacent to existing gas and electric utilities, contractor is instructed that Consolidated Edison (ConEd) will require inspectors and a representative from its Corrosion Control Group present on site during work. ConEd will require notification to its Gas Control Group and GERC Group prior to excavation and will have contingency valves staffed by the GDS Group, along with a gas transmission engineer, on-site during construction. Contractor is responsible for coordination with ConEd. Contractor is instructed to follow ConEd's procedures included herein under Attachment B – ConEd Specification G-11863-13, and Attachment C – ConEd Corporate Instruction for Gas Facilities.

E. Maintenance of Existing Facilities Operational

1. Unless otherwise shown or specified in the Contract Documents or specifically directed by the Engineer, the Contractor shall, during the entire construction period, maintain in continuous operation and service existing utilities, except as otherwise approved by the Engineer for shutdown of any such facilities for specific periods of time to connect new facilities into existing facilities or to repair, relocated, support or shift the existing facilities.

F. Utilities Operated by Franchised Operators

1. The City shall not be liable for any costs incurred by the Contractor as a result of the compliance, non-compliance, or improper compliance by the

franchised operators of underground facilities, with subpart 753-3 of Rule 53 of the Industrial Code.

2. The City shall not be liable for any costs incurred by the Contractor for the support, protection and maintenance of underground facilities owned by franchised operators of such facilities

G. Restoration of Pavements

1. Restoration of pavements shall be made in conformity with the requirements of the NYC Department of Transportation Standard Highway Specifications, latest edition. These specifications may be examined at the Office of the Department of Transportation, Bureau of Highway Operations, 55 Water Street, New York, New York. The Bidder shall acquaint himself with such requirements before submitting the bid. The Contractor shall give the Department of Highways four weeks written advance notice before proceeding with final restoration of pavements, walks and curbs.

H. Existing Sewer Structures

1. All existing sanitary or storm sewer, catch basins and basin connections, including those that are owned by or not by the Department, shall be temporarily supported or permanently supported as needed.

1.06 QUALITY ASSURANCE

A. Standards

1. The Contractor shall comply with standards specified herein and in accordance with Article 5 of the General Conditions.

B. Requirements of Regulatory Agencies

1. The Contractor shall comply with NYS Industrial Code Rule 753.

2. The City shall not be liable for any costs incurred by the Contractor as a result of the compliance, non-compliance, or improper compliance of any regulations.

3. The City shall not be liable for any costs incurred by the Contractors for the support, protection and maintenance of underground facilities owned by franchised operators of such facilities.

1.07 SUBMITTALS

A. For any existing utility that is to be relocated or restored, the Contractor shall submit for approval to the Engineer a relocation layout including plan, profile and section as applicable with information related to the existing and final condition of the utility to be relocated or restored. The relocation layout must include fittings, appurtenances, thrush blocks and restraints, pipe or structure supports, trenching and bedding, anticipated dewatering operations, support of excavation,

and corresponding calculations showing conformance with all applicable building codes and design standards. The relocation layout and calculations shall be signed and sealed by a Professional Engineer licensed and registered in the State of New York.

B. During the progress of Work, the Contractor shall keep an up-to-date set of the Relocation Drawings showing field and working drawings modifications. Immediately upon completion of Work, the Contractor shall provide As-built Drawings showing the actual Work performed under this Section as specified in the Contract Documents. Relocation Drawings shall include all necessary plans, sections and details, with all reference dimensions and elevations required for complete Record Drawings of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Field Verification

1. The Contractor shall field verify that dimensions are as indicated on approved Shop Drawings and as indicated by the Department or Utility Company having jurisdiction

2. The Contractor shall notify the owners of the utilities or structures concerned before starting any work. The Contractor further assumes all liability and responsibility for the underground utility pipes, conduits or structures shown or not shown on the Contract Documents.

3. Determination of Location and Depth:

   a. The Contractor shall determine the true location and depth of all utilities and service connections; including the type, material, and condition of any utility which may be affected by or affect the work.

   b. The Contractor shall coordinate with all Companies and field locate all underground lines before starting any construction or ordering any materials for fabrication.

4. Exposure in Advance of Trenching:

   a. Expose all utility mains ("test-pit") that must be crossed or closely paralleled in accordance with the Contract Documents.

   b. The Contractor shall provide the location and depth of the "test-pit" utilities to the Engineer after field location.

   c. Expose all service connections before excavation in the area.

   d. All cost incurred in exposing utilities shall be borne by the Contractor.

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

ATTACHMENTS

A. Section U: Additional Contract Requirements Applicable To Work Performed In The Presence Of Privately Owned Utility Facilities
B. Attachment B – Con Edison Specification G-11863-13
C. Attachment C – Con Edison Corporate Instruction for Gas Facilities

NO TEXT ON THIS PAGE

ATTACHMENT A

SECTION U: ADDITIONAL CONTRACT REQUIREMENTS APPLICABLE TO WORK PERFORMED IN THE PRESENCE OF PRIVATELY OWNED UTILITY FACILITIES

SECTION U:
ADDITIONAL CONTRACT REQUIREMENTS APPLICABLE TO WORK PERFORMED IN THE PRESENCE OF PRIVATELY OWNED UTILITY FACILITIES

The Contractor is hereby notified that pursuant to the law and franchise agreements issued by the City, certain private utility and public service companies named in Schedule U-1 ("the Companies") own and/or operate surface and/or subsurface facilities within the limits of this contract. The existence of these facilities impacts the productivity of the City work called for in the contract. In order to improve coordination of the City construction with the private utility facilities owned and/or operated by the Companies named in Schedule U-1, Article 1.06.30 of the Standard Highway Specifications of the New York City Department of Transportation, Dated November 1, 2010; and/or Articles 10.15 through 10.18 of the Standard Sewer and Water Main Specifications of the New York City Department of Environmental Protection, Dated July 1, 2014; as applicable, are amended and will be implemented as follows:

1. Means and Methods For City Work:

a) The Contractor is hereby notified that the utility interferences may impact the performance of, and/or interferes with, City work. The contractor will be required to perform such utility work as directed by the Resident Engineer in order to clear all utility interferences from the project site as required for satisfactory completion of City work within specified contract schedule.
b) In areas serviced by overhead electric system, the contractor understands and by bidding for this contract agrees that he/she will be required to perform the public work in the presence of energized electrical overhead lines and appurtenances located in areas adjacent and/or within the project area. As a consequence he/she will select means and method of construction appropriate to maintain the safety clearances required or as permitted by electric operators in order to avoid damaging the insulation or shielding of these lines and also to prevent knocking them down.

2. Field Inspection Prior to Construction:

Prior to the start of any contract work in areas serviced by overhead electric lines, and after the award to the apparent low bidder for this contract, the contractor must request a field walk of the project area along with the operator of the overhead electrical facilities and the Resident Engineer. At that time the facility operator will confirm the type and condition of the overhead electrical lines and the sufficiency of their insulating properties with respect to the means and methods proposed by the contractor. The contractor must be prepared to describe in enough details his/her proposed means and methods of construction operations in order to anticipate the likelihood that electric lines insulation would be cut or otherwise compromised. Also such details will allow the facility operator to anticipate the need for added insulation and/or shielding of non-insulated lines.

3. Compensation for Interference Work:

Compensation for Interference Work is a matter of adjustment between the Contractor and each private utility company located within the limits of the project area and whose utility facilities are affected by City contract work. In particular, the City will not compensate the Contractor for any direct and/or indirect costs related to Interference Work, including, but not limited to, lost profit, increased overhead, or any other impact costs. Upon receipt of a Notice of Award from the City, the Contractor shall immediately commence negotiations with each of the Companies concerning the manner in which and the price for which the Contractor, through its own forces or by others hired by it, will perform and be paid by the Company for all necessary Interference Work as defined above, and at known locations of City contract work, that the Company(ies) choose(s) not to perform with its(their) own forces or by specialty Contractors hired by it (them) (as per "Interference Agreement"). (Specialty contractors' work is limited to (i) insulation installation and removal, (ii) live gas and steam work, (iii) cleanup and disposal of hazardous materials, (iv) splicing live electrical and telecommunications facilities, and (v) work not traditionally performed by general construction contractors.

4. Interference Agreement:

1. Although the parties may negotiate an Interference Agreement in any format or manner they deem fit, the Contractor is hereby advised that the Companies have indicated to the City that they will agree to compensate the Contractor on a unit price basis according to the Quantity and Types of Interferences expected to be encountered on this Contract In accordance to the Private Utilities reference document for SECTION U called "CET SPECIFICATIONS AND SKETCHES", dated November 2010, copy of which is available on demand.
2. The Contractor shall notify the City upon concluding an Interference Agreement with each of the Companies.

5. City Contract Work to Continue Without Interference Agreement :

If, prior to the start of construction, as directed by the City's Order to Work / Notice To Proceed (OTW/ NTP) date any of the Companies and the Contractor have not concluded an Interference Agreement as described above, then the City shall issue a written "48 Hours Notice to Public Corporation" as prescribed by the City of New York Administrative Code", commonly referred to as "Order-Outs" and City construction will proceed as ordered and the Contractor will be directed by the Resident Engineer to perform the City work on Time, Material and Equipment basis (T&M) as specified in standard City contract agreement Article 26.2. T&M records will include identification of types of utility facilities interfering with City work, utility facility owners, specifying the nature and quantity of any materials, plant and equipment furnished or used in connection with the performance of such work and crew size, such as: name and number of each worker employed on such work. T&M records will also indicate the hours of active time, standby time and idle time. The Company (ies) and the Contractor will maintain separate records of the actual quantity and cost of labor, materials, and equipment expended, and will provide copies of this information to the other party on a daily basis for reconciliation. These T&M records along with cost evaluations will be

submitted daily to the Resident Engineer for review and approval. The total cost of City work will be based on quantity of work performed multiplied by unit price contract bid items. The total interference cost will be calculated as the difference between the total T&M cost and total cost for City work. The Resident Engineer will conduct a monthly reconciliation session of the daily T&M records with the affected Company (ies) and contractor. If the contractor and affected utility companies cannot reconcile their T&M records, by the last day of each month, then the Resident Engineer will submit the approved City's T&M records along with total cost evaluations to the DEP Construction Manager who will review these records and recommend approval and validity certification by the DEP Deputy Commissioner.

1. Copies of the DEP approved and certified T&M records will then be transmitted by DEP to the contractor and the utility companies. These certified records may be used by the contractor for compensation claims against the responsible private facility owners, or may be used by any party as supporting documentation in dispute regarding compensation for performing Interference Work. The contractor will be required to perform City work while invoices are submitted by the contractor to the Utility companies for payment within 30 days, or while compensation disputes between contractor and affected company (ies) are submitted to Binding Arbitration process described in **Paragraph 9.**
2. All issues related to utility work and/ or delays due to compensation disputes or claims against utility companies are not allowable as justification for granting contract time extensions or delay claims against the City. The City may assess liquidated damages specified in the contract for net overall delays suffered by City contract work as a result of utility issues, disputes and claims.
3. The standard City contract dispute resolution process specified in Article 27 "Presentation of disputes to Commissioner", of the standard City contract agreement is not applicable to any disputes related to utility work and/ or compensation for such work or claim against utility companies. Utility work issues, disputes and claims may only be submitted to Binding Arbitration process described in **Paragraph 9.**
4. The contractor will notify the Resident Engineer when utility work that require the intervention of company utility specialty crews causes excessive contractor's labor and equipment standby or idleness and, thereby jeopardizing the City project schedule. The Resident Engineer will submit the facts to the DEP Construction Manager who will recommend to the DEP Deputy Commissioner or authorized representative regarding the issuance of a "48 Hours Notice" to the concerned utility company as authorized by the New York City administrative Code Section 19-143 and/ or Section 24-521 as applicable.
5. Utility delays caused by utility and/ or by unavailability of utility specialty crews cannot be discounted for earning any contractual bonus when such bonus clause is included in a contract. However, if such specified bonus is not earned or disallowed by the City or if the City assesses specified liquidated damages as a result of such excessive delays, the

contractor may seek damages from the responsible utility company (ies).

6. Extra Utility Work with Utility Agreement:

If during construction the Contractor encounters utility facilities interferences or utility scope of work that it believes is not covered by the Interference Agreement as described above, then the Contractor shall immediately notify the Company in writing, with a copy to the City, describing the nature and location of the extra work in question. The Company then has five (5) business days to investigate the conditions and then:

1. Advise the Contractor and the City in writing that no interference with its facilities exists at the location in question, and hence that the Contractor may proceed with City work without providing for any impact from Company facilities;
2. Advise the Contractor and the City in writing that the Interference Agreement negotiated pursuant to **Paragraph 4**, above, provides for the scope of work encountered, specifying the exact unit items and/or terms of the agreement that cover the work;
3. Advise the Contractor and the City in writing that it intends to perform the necessary utility Work with company forces or with its own contractor including, but not limited to, relocating its facility out of the way of the proposed City work. In this case, the Company shall provide a written schedule for the performance of the utility work it proposes to perform, which shall be subject to approval by the City based on its impact to the Contractor's currently approved progress schedule. Upon approval of the Company's schedule by the City, the Contractor shall provide access to the worksite to the Company and/or any contractors hired by it to perform this utility work. If necessary, the City may grant a contract time extension for delays caused by the performance of such utility work by the company.
4. Reasonably specify in writing the scope of work to be performed by the Contractor on behalf of the Company that is not covered under the Interference Agreement negotiated pursuant to **Paragraph 4**, including, but not limited to, relocating, supporting, and/or protecting the Company's facilities, and/or shifting the City facility if approved by the Resident Engineer, and/or otherwise changing its operations to work in the presence of the Company's facilities. Should the Company elect this option, it must adequately define and provide an initial price offer for the work required to be performed.

7. Means and Methods for utility work:

Upon receipt of the Company's determination pursuant to **Paragraphs 6.2**, or **6.4**, above, the Contractor shall determine reasonable means and methods of performing the work defined by the Company. These means and methods are subject to approval of the Company, which shall not be unreasonably withheld. If, however, the Company objects to the Contractor's proposed means and methods then it shall define an alternate method of construction. Upon receipt of the Company's approval or its proposed alternate method of construction, the Contractor shall commence performance of the work defined by the Company as soon as possible, and

shall perform the work in a good, workmanlike, and efficient manner, using the means and methods approved by the Company, in order to permit the City work to proceed in the most expeditious manner possible, but without imposing unreasonable and/or unnecessary costs on the Company. It is expressly understood by all parties that the City's rights pursuant to Article 4 of the Contract apply to Utility Work performed pursuant to this section.

8. Disputed utility work covered by a utility agreement:

The City Work will continue as described in **Paragraph 5** above. In the event of any dispute between the Company (ies) and the Contractor regarding any issue related to the performance of, or payment for, utility work, including, but not limited to, any indirect or impact costs incurred by the Contractor due to the Utility Work and/or to the existence of facilities owned or operated by the Company (ies) on the line of the work. The Company (ies) and the Contractor hereby agree to submit to each other a "Final Offer," in writing, by certified mail. Each party shall then have three business days to consider each other's Final Offer. In the event that neither party accepts the other's Final Offer within those three days, the Company (ies) and the Contractor agree to immediately submit the dispute to binding arbitration as described in **Paragraph 9.** During the pendency of any arbitration, the Company (ies) and the Contractor shall maintain separate records of the actual quantity and cost of labor, materials, and equipment expended, and to provide copies of this information to the other party on a daily basis for reconciliation. Any and all disagreement with the records maintained and provided by the other, must be documented in writing to all parties. However, these records are solely for the benefit of presentation to the arbitrator, whose decision may not necessarily be based on these records and in any event is final. Both parties should be aware that the City will not confirm or deny the accuracy of any records maintained by either party for Utility work performed pursuant to a Utility Agreement. While the arbitration is pending, the Company shall pay the Contractor on a monthly basis, based on the price offered by the Company to the Contractor for the performance of the work.

9. Arbitration of utility work:

The arbitration of the issues described above shall be conducted pursuant to the Construction Industry Arbitration Rules of the American Arbitration Association (hereinafter "the Rules" and "AAA") in effect on the date the arbitration is initiated except as set forth herein. The arbitration award shall be final and binding upon the parties to the arbitration and judgment upon the award may be entered in a court having jurisdiction.
(a) Once an arbitrator(s) has been appointed by the AAA, the arbitration shall be scheduled as promptly as possible given the arbitrator(s) and the parties' schedules.
(b) No later than seven days prior to the first arbitration hearing, Company and Contractor shall submit to the arbitrator(s), and to each other, a summary of each party's respective position and such other information as is deemed appropriate, along with a copy of each party's Final Offer as specified in **Paragraph 8.**
(c) The arbitration shall be conducted and concluded in two days.

(d) On the morning of the first day of the arbitration, Contractor and/or representatives shall have 3 ½ hrs to make a presentation of its claim to the arbitrator. During its presentation, Contractor shall not be permitted to produce any documents or cost records which have not already been provided to the Company. Contractor shall be permitted to produce any analysis or description of its claim which has been prepared for the purpose of its presentation.

(e) After lunch, Company and/or its representatives shall have two hours to ask Contractor questions about its claim and its presentation. Thereafter the arbitrator(s) shall have two hours to ask Contractor questions about its claim and its presentation.

(f) On the morning of the second day of the arbitration, Company and/or its representatives shall have 3 ½ hours to make a presentation of its claim to the arbitrator. During its presentation, the Company shall not be permitted to produce any documents or cost records which have not already been provided to the Contractor. The Company shall be permitted to produce any analysis or description of its claim which has been prepared for the purpose of its presentation.

(g) After lunch, Contractor and/or its representatives shall have two hours to ask Company questions about its claim and its presentation. Thereafter the arbitrator(s) shall have two hours to ask Company questions about its claim and its presentation.

(h) Subject to the above time limitations, the arbitrator(s) may conduct the arbitration in such manner as the arbitrator(s) deems reasonable.

(i) The arbitrator(s) shall then have one week to select in writing, as the arbitrator ('s) award, that party's Final Offer which appears to be more reasonable, based on the presentations at the arbitration hearings.

(j) The arbitrator shall have no discretion to grant an award other than one of the two Final Offers submitted by the parties.

(k) Any award for work that has already been performed shall be paid on the 7th day after receipt of the arbitrator's decision, or on the 30th day after completion of the work, whichever is later. Payment for work not yet completed at the time of the arbitrator's decision shall be paid within 30 days of completion of work. Interest shall accrue from the date payment is due at the rate of 9% per annum. Either party may cause judgment to
be entered in accordance with the arbitrator(s) decision in a court in the State of New York, County of New York.

(l) The arbitrator's fees and any other costs of the arbitration shall be initially shared equally by Company and Contractor. The non-prevailing party shall then pay all arbitrator's fees and costs of the arbitration and shall reimburse the prevailing party for its share of such fees and costs theretofore paid.

(m) The parties may, at any time, settle any matter submitted to arbitration.

10. Order-out waiver:

The Contractor and all subcontractors hired by it, if an Interference Agreement is executed as specified between the concerned parties, agree to waive any rights they may have, if any, under law, contract or otherwise to compel the City to assert any right the City may have, including the issuance of any directives required under the New York City Administrative

Code, Section 19-143 and Section 24-521, to require any or all of the Companies to maintain, repair, replace, protect, support, shift, alter, relocate, and/or remove utility facilities in connection with the work to be performed under this contract. However, nothing in this section shall preclude the City from exercising its rights under the Law to issue such a directive to the Company.

11. Cost of insurance:

Each of the named Companies, at their option and if an Interference Agreement is executed as specified between the concerned parties, may be named as an additional insured on all insurance policies required to be maintained under this contract. In the event that a Company opts to be so named as an additional insured, the actual incremental cost, if any, to the Contractor of providing such insurance coverage shall be borne by that Company. The Contractor shall provide a written statement from its insurance provider documenting the actual cost of this added coverage to the Company. Under no circumstances shall the cost of insurance coverage on behalf of any Company be borne by the City. Nothing in this paragraph shall be interpreted to imply the City's acceptance of any additional responsibility or liability for any matter related to the performance of Utility Work. In particular, the Company and the Contractor bear joint and full responsibility to ensure that any Utility Work performed by the Contractor is in compliance with all applicable government and Company regulations.

12. Cost of utility interference work:

The Companies, by virtue of a prior agreement with the City, have agreed to perform their obligations described in this section. It is expressly understood that the cost of Utility Work or any delays cost cause by such utility work shall not be a charge against the City, but shall be a matter for adjustment between the Contractor and the Company or Companies concerned. The City and the Contractor agree that the Companies are third party beneficiaries of this section of the contract, if a Utility Agreement is executed between the contractor and utility company (ies). The provisions of this section shall govern in all cases where Company property interferes with or is about to be disturbed by the City work, notwithstanding any other provision of the Contract, except for Natural Gas transmission/distribution facilities covered subject to the Gas Facility Cost Allocation Act (GFCAA) and covered separately in this contract.

13. Default declaration:

The Contractor agrees that the provisions of this section are material provisions of the contract, and that the Contractor's failure to comply with the procedures set forth above are sufficient for the Commissioner to declare the Contractor in default pursuant to Article 48 of the Contract.

14. NYS Labor Law:

The Contractor is hereby advised that New York State Labor Law applies to public work. The work described in this Section U of the contract

performed by utility company (ies) with their own forces or vendors hired by such company (ies) is not public work.

15. Facility operators:

The insurance requirements in **Paragraph 11** of this Section U apply to: (i) additional Companies, if any, who were not named in Schedule "A" but which have executed a Utility Agreement with the contractor for utility work; and (ii) additional coverage, if any, paid for by Utility Companies whose utility facilities are located within the project limits, that they may require for the utility work pursuant to an utility agreement between the contractor and such utility companies.

[End]

SCHEDULE U-1

CSO-FC-DF

CONSTRUCTION OF FLUSHING CREEK CSO DISINFECTION FACILITIES

SCHEDULE U-1
LISTING OF COMPANIESNAMED FOR THIS CONTRACT

COMPANY NAME	CONTACT NAME	CONTACT TELEPHONE
Consolidated Edison	Calmore Alman	929-237-8227

SECTION U-3

(As per the Private Utilities reference document for SECTION U called "CET SPECIFICATIONS AND SKETCHES", dated November 2010)

ATTACHMENT B

Con Edison Specification G-11863-13

ATTACHMENT C

Con Edison Corporate Instruction for Gas Facilities

EP7 (1.0) - PAGES GAS COST SHARING (EP-7) STANDARD SPECIFICATIONS

NOTICE

THE PAGES CONTAINED IN THIS SECTION REPRESENT THE GAS COST SHARING WORK THAT SHALL APPLY TO AND BECOME A PART OF THE CONTRACT.

(NO TEXT ON THIS PAGE)

TABLE OF CONTENT

I - NOTICE TO ALL BIDDERS; GAS COST SHARING WORK

II - GENERAL PROVISIONS; GAS COST SHARING WORK

1. General
2. Gas Interferences And Accommodations
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I - NOTICE TO ALL BIDDERS; GAS COST SHARING WORK

All prospective bidders are hereby advised that, pursuant to the "Gas Facility Cost Allocation Act", ("the Act"), the City of New York has entered into an agreement ("the Agreement") with the gas companies (Con Edison or National Grid (formerly KeySpan Energy Delivery)) operating in their respective areas of the City to "share" the cost of facility relocation and/or support and protection of facilities disturbed by proposed water and/or sewer and related City work specified in this contract. Therefore, bid items, specifications and estimated quantities for the incremental costs of support and protection of certain gas facilities have been included in this contract. The low bid for this contract shall be determined by examining each bid for all work to be performed under this contract including any work of support and protection of gas facilities to be performed. The Contractor shall not seek additional compensation from gas companies except as specifically set forth in its contract.

II - GENERAL PROVISIONS; GAS COST SHARING WORK

1. General:

The Contractor shall perform City work with interferences from existing live and abandoned gas facilities. This shall be defined as utility work. Therefore, this contract includes bid items, specifications and estimated quantities designed to fully compensate him/her for the incremental costs of supporting, protecting, providing accommodations and, avoiding disturbing gas facilities located in the streets shown on the contract drawings. In the event that any other provisions of this contract related to gas facilities (or private utilities) conflict with these provisions, these provisions shall supersede and govern all work related to gas facilities owned by the companies operating in the project area. All utility work, as defined in these specifications, including changes and additions thereto shall be paid solely by the City except when specified otherwise in this contract. Contractor hereby agrees that the facility operator shall not be liable to pay him/her for any work performed including extra utility work. Contractor agrees that its bid prices include all compensation for loss of productivity and efficiency, idle time, delays (including any delays occasioned by negot iation of a contract change), change in operations, mobilization, demobilization, remobilization, added cost or expense, lost of profit, other damages or impact costs that may be suffered by or because of utility work, or the presence of gas facilities in the proximity of City work and that it will not seek additional compensation for these items. All disputes shall be resolved as specified in the contract.

Pursuant to the Act, Agreement, and the New York City Administrative Code, the gas company(ies) has been directed by the Commissioner and is required to perform all maintenance, repairs, replacement, shifting, alteration, relocation, and/or removal work that are not part of this contract. By having bid on this contract, the Contractor understands and agrees that the Commissioner has preasserted any right the City has to require, including the issuance of any directives or so called "order outs" under the New York City Administrative Code, any or all gas companies to maintain, repair, replace, protect, support, shift, alter, relocate, and/or remove all gas facilities that are about to be disturbed by the City contract work. The issuance of additional such directives during the performance of the contract work, where necessary in the sole judgment of the Commissioner, shall be initiated by such Commissioner as set forth in the relevant sections of the Act and Agreement. Contractor further agrees to insert such requirements as set forth herein above into any contracts with its approved subcontractors so that its subcontractors also understand and agree to such contract requirements.

2. Gas Interferences And Accommodations:

During the performance of sewer and water main work funded by the New York City Department of Environmental Protection (NYCDEP), as instructed by the Engineer, the use of any applicable contract bid item is allowed in order to resolve and accommodate all gas facilities interferences with such City work, including the removal of contaminated soil in associated trench excavation. This is in addition to the specified EP-7 bid items in the contract. Payment for such accommodation shall be funded by EP-7 bid item “UTL-GCS-2WS - GAS INTERFERENCES AND ACCOMMODATIONS” (F.S. Fixed Sum). The value of such accommodation shall be computed by multiplying the appropriate unit prices bid to the quantity of work performed, as determined by the Engineer, and applying the total amount thus to be paid

to EP-7 bid item "UTL-GCS-2WS - GAS INTERFERENCES AND ACCOMMODATIONS". When EP-7 bid item "UTL-GCS-2WS - GAS INTERFERENCES AND ACCOMMODATIONS" does not exist, such additional accommodation work shall be at no cost to the City but shall be a matter of adjustment between gas facility operator and Contractor. Private facilities, other than gas, that become in interference due to gas interferences accommodations shall also be accommodated, if so directed by the Resident Engineer, at no additional cost to the City and, provided that its owner agrees to be responsible for all additional costs to Contractor, otherwise, such facility shall be ordered by the City to be maintained, shifted, relocated or replaced by its owner at his/her expenses.

2a. Water Main Accommodations:

When water main construction is to be performed in this contract, Contractor shall be required, if warranted by field conditions, and at locations designated by the Resident or Borough Engineer, to change the vertical or horizontal alignment of water mains including but not limited to all additional labor, material, work method accommodations, furnishing, delivering and laying offset fittings and pipes, etc., necessary in order to complete water main installation and, avoid gas interferences in the project area, including street intersections. Typical work method accommodations shall include, but not be limited to, pier and plate, installation of filter fabric and select fill, etc. Such work shall be performed as directed by the Engineer and in accordance with contract specifications and latest edition of water mains standards and specifications.

2b.Sewer Accommodations:

When sewer construction is to be performed in this contract, Contractor shall be required, if warranted by field conditions, and at locations designated by the Resident or Borough Engineer, to change the horizontal alignment of sewer facilities (if possible) including but not limited to all additional labor, material, work method accommodations, furnishing, delivering and construction of additional manholes or modification of manholes/catch basins, extending chute connections, house connections, using alternate materials and methods, poured-in-place structures, etc., necessary in order to complete sewer installation, and avoid gas interferences in the project area, including street intersections. The term sewer facility shall include, but not be limited to, all sewer pipe and appurtenances, manholes, catch basins, catch basin chutes, etc. Such work shall be performed as directed by the Engineer and in accordance with contract specifications and latest edition of sewer standards and specifications.

3. Quantity Overruns, EP-7 Funded Bid Items:

No quantity overrun, in excess of one hundred twenty five (125) percent, shall be permitted for EP-7 funded bid items (gas) included in this contract, except when Resident Engineer determines that such overruns are caused by field modifications to planned City work, or approved construction methods, or contract scope changes. The Engineer will notify the gas facility operator in writing of overruns. The Contractor must invoice the gas facility operator for payment of all overruns, which will be paid by the gas facility operator at the contract bid price. Gas facility operator will be entitled to reimbursement by NYCDEP under established cost sharing procedures.

4. Changes And Extra Work:

This section is not applicable to work defined under "Emergency Reconstruction Contracts" or so-called "Where and When Contracts" since these projects, by definition, inherently encounter unanticipated gas facilities and cannot be pre-engineered. In all other cases, any contract changes proposed for City work shall also cover and include all associated changes to support and protection of gas facilities affected by such changes to City work. In all other cases where the Contractor finds that City work cannot be performed as planned and specified and/or, as approved because of a need to support, protect and/or alleviate interferences from gas facilities that were not listed and/or shown, or incorrectly shown in contract plans and specifications, he shall immediately notify the Resident Engineer and the facility operators' representative of his findings. Resident Engineer shall promptly examine such claims and determine whether or not such work is covered by contract bid items and /or specifications (contract bid items and specifications shall include city contract items as well as EP-7 items). The Resident Engineer shall also

examine the claim to determine if the application of EP-7 bid item "UTL-GCS-2WS - GAS INTERFERENCES AND ACCOMMODATIONS" is appropriate to resolve the claim. If upon examination, the Engineer determines that such field conditions were unanticipated (not shown and/or listed, or incorrectly shown in contract documents) and are not covered by bid items and contract specifications, he shall then direct the Contractor and the affected facility operator to negotiate the cost of supporting and protecting, and/or alleviating the impact on City work caused by such unanticipated gas facilities with each other with the understanding that the performance of City work shall continue during negotiations. If a cost agreement is reached, the Contractor and facility operator shall adjust such costs between themselves at no additional costs to the City contract. If the Contractor and affected facility operator do not reach an agreement concerning the price to be paid for the extra work within five (5) business days of the Engineer's directive to engage into such negotiations and, after considering: public safety and inconvenience, requirements of laws and regulations applicable to private utilities, integrity of all utility systems, including but not limited to sewer and water, gas, electric, telephone and, cable TV facilities, sound engineering practices, cost (long and short term) to all affected parties, and potential City work delays, then the Resident Engineer, depending on nature and severity of interferences with City work, shall either, direct the facility operator to relocate or replace its facilities at its own discretion and cost, reimbursable by NYCDEP under established gas cost sharing procedu res or, direct the Contractor to perform the utility work on actual time, material and equipment costs basis pursuant to relevant contract requirements and amendments. Contract bid prices for any applicable items of work involved shall be applied, or converted to an allowance for time and material charges. Changes shall be for affected portions of utility work and, shall be processed with EP-7 funds.

5. Excavation:

All excavators shall notify the NYC/LI One Call Center at 1-800-272-4480 at least two (2) working days, not including the day of the call, but not more than ten (10) working days in advance of the start of any excavation work. The gas company(ies) will mark out its facilities within the project limits and provide Construction Inspector(s) during all excavation work in close proximity (within twelve (12) inches) to gas facilities. The Contractor shall exercise extreme caution when excavating in the vicinity of any gas facilities. Hand excavation shall be performed within twelve (12) inches of gas facilities. The Contractor prior to excavating underneath these facilities shall adequately support all gas facilities. Standard support details for gas facilities have been included in the specifications. Any damage to gas facilities shall be reported immediately to the gas company(ies). The Contractor shall be responsible for all cost associated with repairs made necessary by damages caused by his operations.

6. Backfilling And Street Restoration:

Backfilling operations and street restorations shall be in accordance with contract requirements.

7. Non-Responsive Bids:

Every gas (EP-7) bid item has a suggested "Not less than" value per unit indicated on contract bid sheet. Bids resulting in cost of less than suggested for EP-7 items are hereby prohibited and if submitted shall be considered NON-RESPONSIVE.

8. Minimum Clearances:

Clearance requirements for City work shall govern and supersede any clearance requirement of gas facility operator. Therefore, a minimum of twelve (12) inches clearance between private utilities and City water mains, sewers or related structures to be installed in this contract shall be maintained. When this clearance is not attainable, the Resident Engineer may allow a minimum of four (4) inches clearance. With less than twelve (12) inches clearance a neoprene/polyethylene shield (to be provided by facility operator) shall be installed as part of all work item specifications. However, if Resident Engineer determines that City work cannot be performed within allowable clearance and no reasonable City accommodation (no-cost change to City work) is possible, the City shall direct the facility operator to remove, relocate, shift, or alter their facility(ies) pursuant to the New York City Administrative Code.

9. Work By Facility Operator:

The facility operator may find it necessary to perform the following types of work during performance of City work: accommodating a contractor's request for gas facilities modifications (in order to facilitate City contractor's proposed construction method) or, remedial and emergency work on gas facilities proper with their own resources and materials if an approved method of construction for City work causes unanticipated disturbances to gas facilities or, replacing defective gas facilities when they are exposed by the Contractor and their actual conditions are observable by the facility operator. Also included in the above category of defective gas facilities are: the presence of environmental contaminants attributable to the gas facility in or around gas facilities. If such work is deemed required by the facility operator or if facility operator is directed by the City to address such deficiencies at any time during the course of construction, the Contractor shall modify the construction schedule at no cost to the City and allow the facility operator five (5) business days to perform such work without interferences. Additional costs to the facility operator (in cases of accommodations) or, Contractor (in cases of defective gas facilities) due to such gas work, if any, shall be the responsibility of the parties involved and not of the City. Such costs shall be a matter of adjustment between the Contractor and the facility operator.

10. Materials Furnished By Facility Operator:

It shall be the Contractor's responsibility to inspect material to be installed by him immediately upon delivery and advise the facility operator through its authorized representative, of all damaged materials. The Contractor at no additional costs to the City or the facility operator shall replace any material that is damaged or lost after the Contractor's inspection.

11. Liability And Insurance:

Notwithstanding the provisions of this contract, the existing division of liabilities to third parties shall remain the same as between the City and the company. Therefore, it is specifically agreed by the City, company and Contractor (by bidding on this contract) that for the purpose of any liabilities to third parties, that the City contractor performing work directly and physically relating to gas company facilities in this project, shall be deemed an agent of the company and not an agent of the City, the New York City Municipal Water Finance Authority, or the New York City Water Board. Contractor shall include the company as an additional insured on all insurance policies maintained to comply with the City's insurance requirements.

12. Width And Depth Of Excavation:

Contractor shall not be authorized to deliberately change trench or excavation widths and/or depth specified without Engineer's approval. Enlargement of any side of excavation up to eighteen (18) inches beyond pay limits (or inside face of sheeting) requested by the Contractor for the installation of certain types of sheeting may be granted. However, such enlargements or those greater than allowable shall not be approved when, in the sole judgment of the City, field conditions allow the water mains and sewer work to be performed within the limits specified and, the sole purpose of such enlargement request is to impact adjacent utilities (public or private) whose support and protection are part of this contract. Any approval shall be given at no additional cost to the City contract, including EP-7 funding, and all costs associated with unauthorized enlargements shall be the sole responsibility of the Contractor.

13. Depth And Crossing Angles Of Gas Facilities:

Where gas facilities are shown (or specified as) crossing proposed alignment of sewers, water mains, catch basins and chute connections or any other proposed excavations at specific angles (as measured off plans or sketches or specified in contract), it shall be understood that actual field measurements may deviate (plus or minus) forty-five (45) degrees from those shown or specified. The cover, or depth from street surface to top of facilities, shall be as shown or specified in contract documents, no deviation is to be assumed. Where gas facilities are not shown on contract documents, but their support and protection are otherwise included in this contract then, all references to facilities crossing at "various angles and depth" in the gas sections shall mean that such facilities are crossing sewer, water, catch basin and, catch basin chute, and other excavations at a ninety (90) degree angle to the proposed sheeting line or side of

excavation (for unsheeted trenches) with an allowable deviation of forty-five (45) degrees in any direction, except for catch basin chute excavation where the allowable deviation shall be sixty (60) degrees. Where the cover is not noted or specified, the bottom face of such facilities shall be assumed to be crossing catch basin chutes at a depth of three (3) foot eight (8) inches or less from the street surface. Paragraph No. 2 above shall apply in cases of distribution water main construction. Appropriate bid items and specifications are provided for cases where angle and depth are greater than stated above. This section also applies to work defined in "Emergency Reconstruction Contracts" or so-called "Where and When Contracts". These contracts are not pre-engineered and consequently have no drawings, sketches or determined locations and so, gas facilities encountered will be crossing existing and proposed sewer, water, catch basin/catch basin chutes and all appurtenances at various angles and depths.

14. Maintenance Of Traffic For Gas Work:

All work pertaining to gas bid items and specifications shall be performed within the contract maintenance of traffic plan as specified in the contract document. The bid price for the Maintenance and Protection of Traffic shall cover all work pertaining to gas items. The City shall make compensation for additional maintenance and protection of traffic items in connection with gas item of work only when such additional work is deemed reasonable and necessary by the Resident Engineer and is approved by him prior to its performance.

15. Relocated Gas And Temporary Systems Installation:

In cases where the Contractor is allowed to select the location for temporary construction such as, installation of dewatering headers, wells, well points, etc., he shall not disturb any gas facilities shown on sketches provided in this section. The only exception shall be, if the affected gas company agrees to such relocation and provided that the cost of such relocation is a matter of adjustment between the company and Contractor, and at no cost to the City.

16. Role Of Company Inspector:

In any case in which the City elects to perform some or all support and protection work with its own employees, personnel or contractors, the facility operator shall provide onsite inspectors to approve and certify such support and protection work (exclusive of City accommodations) performed by the City's own employees, personnel, and contractors. Facility operator's inspectors are not authorized to direct City contractor during the performance of contract work. They shall act through the City Resident Engineer and provide him/her required approvals and certifications, prior to preparing partial payments of EP-7 items, in a format and frequency to be prescribed by the appropriate City Head of Construction.

17. Coordination With Gas Company:

The Contractor shall be required to notify the gas company(ies), in writing, at least two (2) weeks prior to the start of final paving in order to allow companies to complete any unfinished gas work located within the area to be paved. Every effort shall be made to maintain gas service with minimum inconvenience to the public.

III - TECHNICAL SECTION

SECTION 6.01 - Trench Crossings; Support And Protection Of Gas Facilities And Services.

1. Description:

Under this section, the Contractor shall provide all labor, materials, equipment, and incidentals required to support and/or protect the integrity of gas mains, services and appurtenances of any sizes, configurations, and operating pressures crossing trench excavations above subgrade for planned construction of sewers

and water mains facilities. A gas service shall be defined as a gas pipe of three (3) inches in diameter or less branching from the main to a customer pick up point or property valve box. A gas main may be any size pipe that is part of a distribution or transmission network other than services described above. Crossings shall be defined as gas facilities spanning the width of excavation (one side to the other side). These crossings may be at various angles and depth as shown on “Gas Cost Sharing Work Standard Sketches Nos. 1 and 1A”, and as specified in “General Provisions; Gas Cost Sharing Work Paragraph No. 13” and, at the locations shown or listed in contract documents. The gas company operating in the area, (facility operator), owns these facilities. The work shall be performed in accordance with contract specifications, plans, and at the directions of the Resident Engineer in consultation with the authorized representatives of the facility operator.

2. Method Of Construction:

A. Protection: In general, the gas facilities shall be protected as required by New York State Industrial Code 753. In particular, the Contractor shall use hand excavation methods (pick and shovel or hand held power tools) directly below the pavement base to expose the gas facilities (marked out by facility operators) and to ascertain the clearances and cover of the facilities with respect to the proposed excavation. Upon exposing the affected facilities sufficiently, at the discretion of the Resident Engineer, to ascertain the foregoing, Contractor shall be permitted to proceed with a combination of hand and machine excavation, as appropriate, outside a zone of protection whose limit shall be defined as a perimeter located twelve (12) inches from the outside face of each gas facility crossings (See “Gas Cost Sharing Work Standard Sketch No. 2”). If the facilities are in direct interference with City work, meaning that “Minimum Clearances” described in “General Provisions; Gas Cost Sharing Work Paragraph No. 8” cannot be maintained, and excavation has to be temporarily or permanently abandoned then this particular location shall become a test pit and dealt with as specified in Section 6.07, and “General Provisions; Gas Cost Sharing Work Paragraphs Nos. 2 and 8”.

B. Support: Gas mains or services crossing excavations equal or less than four (4) feet wide are generally self supporting, unless field conditions as determined by the Resident Engineer require otherwise. The support requirements for gas mains and services crossing excavations greater than four (4) feet wide shall be as shown on the attached “Gas Cost Sharing Work Standard Sketch No. 1” and Contractor shall use sheeting methods that permit the maintenance of gas facilities in their existing locations and configurations. Alternate methods equivalent to those shown on the sketch or accommodations by the facility operator proposed by the Contractor in order to facilitate the execution of the specified work shall be allowable, provided that prior approval is obtained by the Contractor from the Engineer and the facility operator. The support and protection of gas facilities crossings shown on plans, drawings, listings or otherwise identified in this contract shall not be circumvented with the issuance of so called "order outs".

3. Method Of Measurement:

The Contractor shall be paid for supporting and/or protecting gas facilities crossing trench excavations under the appropriate bid items covered by this section. The Contractor shall be directly responsible to the facility operator for the total cost of using any alternate method requiring the use of resources owned by the facility operator. Regardless of the method used, the City shall pay the bid price for the appropriate support and/or protect item of work. The average rate charged by the facility operator for alternate support and protection work such as, disconnecting and reconnecting gas services is listed in attached “Schedule GCS-A”.

4. Payment Restrictions:

These items shall not be paid for: gas services crossing unsheeted water main trench excavation; abandoned gas main/services identified by facility operator; gas mains/services crossing trench excavations for fire hydrant branch connections pipes, catch basins and/or chutes (sewer drain pipe), house sewer and/or water services; gas facilities encroaching any face of excavation for sewer and/or water construction, all of which are covered under other contract sections. Also this item shall not be paid for new gas mains and services crossing water trenches when trenching for such new facilities has been

performed by the Contractor in common with trench excavation for City work (overlapping trench limits). The cost of supporting and protecting such gas facilities crossings shall be deemed included in the cost of trench excavation for the new gas facilities. This payment restriction shall apply even if such common trench gas excavation is not part of the contract. The prices bid for items covered by this section represent full compensation to Contractor to completely perform the work described. No other bid items shall be combined with these items in order to pay for gas main and/or services crossing excavations specified herein.

5. Method Of Payment:

Each (Ea.) gas facility crossing trench excavation as described in these specifications shall be counted for payment.

6. Price To Cover:

The cost of timber/steel supports installed for gas facilities shall be included in the bid price. The bid price for each crossing shall also cover all additional supervision, labor, material (except those provided by the facility operator), equipment and insurance necessary to completely maintain the gas facilities without disruption of service to the customers and in accordance with contract plans, specifications and facility operator standards. The price shall also include: changes of method of operations; sheeting modifications where necessary to accommodate the gas facilities crossings; installation and removal of water pipe under gas facilities (so called "snaking"); extra care during excavation (including hand excavation under existing single and multiple gas facilities); extra backfilling and compaction around, over and under gas facilities; installation and removal of sheeting around gas facilities; associated maintenance and protection of traffic; barricades; and traffic plates that may be required to temporarily close and/or complete the work.

SECTION 6.02 - Extra Excavation For The Installation Of Catch Basin Sewer Drain Pipes With Gas Interferences.

1. Description:

Under this item, the Contractor shall provide all labor, materials, equipment, insurance, and incidentals for the extra excavation associated with the installation of catch basin sewer drain pipes (chute) under gas facilities of various sizes crossing the trench excavation at various angles and depth at the locations shown in the contract documents and also, for the support and protection of these facilities during associated excavation and backfill operations. The gas company operating in the area, (facility operator), owns these facilities.

2. Method Of Measurement:

The bid price shall be per location (Each) where extra excavation is required when catch basin sewer drain pipes are installed at an upstream invert depth lower than four (4) feet (up to a maximum of six (6) feet) from the proposed pavement grade because the bottom faces of interfering gas mains and appurtenances are located at a depth greater than three (3) foot eight (8) inches from proposed pavement surface (See “Gas Cost Sharing Work Standard Sketch No. 4”).

3. Method Of Construction:

Incremental cost responsibility for chute excavation is determined by the first private facility encountered starting from catch basin structure proper and that prevents the installation of the chute connection at an upstream cover less than or equal to three (3) feet or any other minimum cover required to avoid City facilities (e.g. water, sewer, etc.) as directed by the Resident Engineer.

4. Payment Restrictions:

This item shall not apply and related bid item shall not be paid in cases where:

A. Upstream invert chute is more than six (6) feet deep because of gas facilities.

B. Chute cannot be installed above existing gas facilities because of interferences with other private facilities that are not otherwise covered under this contract, regardless of upstream invert depth.

The above cases shall be at no cost to the City, but shall be a matter of adjustment between the Contractor and the facility operator(s).

5. Price To Cover:

The bid price shall cover the additional cost of all additional supervision, labor, materials, equipment and insurance, to complete the installation of catch basins and associated sewer connections in accordance with the contract plans and specifications. The price shall include: excavation by hand around and under single and multiple gas facilities; locating, supporting and protecting gas facilities; backfilling and all other items necessary to perform all work incidental thereto including: installation and removal of drain pipe under gas facilities ("snaking"); widening of trenches to facilitate the above work; subsequent additional backfill and pavement restoration; modifying precast catch basin window to accommodate connection; changing sheeting method and configuration to accommodate gas facility crossings; maintenance and protection of traffic; barricades; and installation of traffic plates that may be required to temporarily close and/or complete the work. The price shall not include removal of ledge rock and/or excavation of boulders in open cut.

SECTION 6.02.1 - Extra Excavation For The Installation Of Catch Basin Sewer Drain Pipes With Upstream Inverts Greater Than Six (6) Feet.

1. Description:

Under this item, the Contractor shall provide all labor, materials, equipment, insurance and incidentals for the extra excavation of catch basin chutes where the upstream invert is greater than six (6) feet under gas facilities of various sizes crossing the trench excavation at various angles and depth at the locations shown in the contract documents or as determined by field conditions and also, for the support and protection of these facilities during the associated excavation, sheeting and backfilling operations.

2. Method Of Measurement:

The bid price shall be per location (Each) where extra excavation and sheeting is required when the catch basin chute installed at an upstream invert depth lower than six (6) feet from the proposed pavement grade because the bottom faces of the interfering gas mains and appurtenances are located at a greater depth than three foot eight inches from the proposed pavement surface only.

3. Method Of Construction:

Incremental cost responsibility for chute excavation is determined by the first private facility encountered during such excavation when initiated from catch basin structure and that prevents the installation of the chute at an upstream cover less than or equal to three (3) feet or any other cover required to avoid City facilities as directed by the Resident Engineer.

4. Payment Restriction:

This item shall not apply and related bid item shall not be paid in cases where:
Upstream invert chute is less than or equal to six (6) feet deep because of gas facilities. Section 6.02 shall be paid.

5. Price To Cover:

The bid price shall cover the additional cost of all supervision, labor, materials, equipment and insurance to complete the installation of catch basin and associated sewer connections in accordance with the contract plans and specifications. The price shall include: excavation by hand around and under single and multiple gas facilities; locating, supporting and protecting gas facilities incidental thereto; widening of trenches to facilitate the above work; subsequent additional backfilling and pavement restoration; modifying pre-cast basin window to accommodate connection; the installation of catch basin with deeper sumps as specified; additional sheeting and changes in sheeting method and configuration to accommodate gas facility crossings; maintenance and protection of traffic; barricades; and installation of traffic plates that may be required to temporarily close and/or complete the work.

SECTION 6.03 - Removal Of Abandoned Gas Facilities. All Sizes.

1. Description:

Under this section the Contractor shall provide all labor, materials, equipment, insurance and, incidentals required for the removal of abandoned gas mains, services, or appurtenances thereof, located within the street shown on the contract plans, owned by gas company operating in the project area (facility operator), used or to be used for or in connection with or to facilitate the conveying, transportation, distribution or furnishing of gas (natural or manufactured or mixture of both) for light, heat, or power, but does not include property used solely for or in connection with business of selling, distribut ing or furnishing of gas in closed containers. Such removal shall include only abandoned gas facilities that interfere with (i.e. cause additional work) City work.

2. Determination Of Operating Status Of Gas Facilities:

The Contractor shall notify facility operator, as required by New York State Industrial Code 753. Gas facilities shall not be removed without the approval of the facility operator whose authorized representative shall certify in writing (specific facility or area wide facilities certification) and in a timely manner acceptable to the Resident Engineer that abandoned facilities are free of combustible gas and any other environmental contaminants prior to removal. The Resident Engineer shall rely on facility operator's certification. The facility operator may request the excavation of test pits (See Section 6.07) for this determination ahead of City work and, Contractor shall provide safe access, facilitate and permit facility operator to enter test pit excavations for the purpose of testing gas facilities to be removed by the Contractor. However, facility operator may prefer to make this test during performance of City work, in order to issue the above certification. This shall be permitted provided that it is agreed that additional costs, if any resulting from this choice shall be a matter of adjustment between the Contractor and facility operator only, and at no cost to the City.

3. Restrictions:

The facility operator shall be solely responsible for its contaminated gas facilities, surrounding contaminated soil and their disposal and abatement procedures, unless contract bid items are applicable and provided for such work. In such cases, the quantity removed shall be charged to EP-7 bid item "UTL- GCS-2WS - GAS INTERFERENCES AND ACCOMMODATIONS" at the City bid prices.

4. Method Of Measurement:

Abandoned gas pipeline removal shall be measured for payment per linear foot of pipe and appurtenances removed.

5. Price To Cover:

The price shall cover all additional cost of supervision, labor, materials, equipment, and insurance necessary to complete this work in accordance with the contract plans and specifications, including

excavation by hand around and under other City and facility operator owned properties and, where necessary, support and protection of such properties. The price shall also cover breaking, cutting, and/or burning of abandoned gas pipes and their disposal from the site; sealing open ends remaining in the excavation with concrete or caps (caps to be provided by the facility operator) and backfilling of the area where the pipeline has been removed with clean backfill. The price shall also include any required dump charges. This item does not include any type of extra excavation, backfilling, compaction, pavement removal and restoration associated with abandoned gas facilities removal, all of which are covered under Section 6.06.

SECTION 6.03.1 - Removal Of Abandoned Gas Facilities With Possible Coal Tar Wrap. All Sizes. (For National Grid Work Only)

1. Description:

Under this section the Contractor shall provide all labor, materials, equipment, insurance and, incidentals required for the removal of abandoned gas mains, services or appurtenances thereof, located within the street shown on the contract plans, owned by the gas company operating in the project area (facility operator), used or to be used for or in connection with or to facilitate the conveying, transportation, distribution or furnishing of gas (natural or manufactured or mixture of both) for light, heat, or power, but does not include property used solely for or in connection with business of selling, distributing or furnishing of gas in enclosed containers. Such removal shall include only abandoned gas facilities that interfere with (i.e. cause additional work) City work. These gas facilities may be coated with Coal Tar Wrap and so, may require special handling and disposal methods as specified in National Grid Standard Operating Procedure 12-2, Coal Tar Wrap Handling and 12NYCRR56.

2. Determination Of Operating Status Of Gas Facilities:

The Contractor shall notify facility operator, as required by New York State Industrial Code 753. Gas facilities shall not be removed without the approval of the facility operator whose authorized representative shall certify in writing (specific facility or area wide facilities certification) and in a timely manner acceptable to the Resident Engineer that abandoned facilities are free of combustible gas and any other environmental contaminants prior to removal. The Resident Engineer shall rely on the facility operator's certification. The facility operator may request the excavation of test pits (See Section 6.07) for this determination ahead of City work and, the Contractor shall provide safe access, facilitate and permit facility operator to enter test pit excavations for the purpose of testing gas facilities to be removed by the Contractor. However, the facility operator may prefer to make this test during performance of City work, in order to issue the above certification. This shall be permitted provided that it is agreed that additional costs, if any, resulting from this choice shall be a matter of adjustment between the Contractor and the facility operator only, and at no cost to the City contract. Should such investigation result in the determination that the abandoned gas facilities do not contain Coal Tar Wrap then the removal of said facilities shall be covered under separate item (See Section 6.03).

3. Requirements:

The City Contractor shall excavate abandoned gas facility sufficiently, either in its entirety, or at locations determined by Contractor to allow the removal of Coal Tar Wrap (if present on the abandoned gas facility) and to facilitate the safe extraction of manageable lengths of abandoned pipe without damage to adjacent facilities, utilities or City structures either parallel to or crossing above or below abandoned gas facility. The Contractor is to allow access to the designated cutting points within the Contractor's trench by authorized National Grid personnel who will remove the Coal Tar Wrap as per National Grid procedures. This work by National Grid personnel shall be performed in a timely fashion and shall not unduly impede the Contractor's progress and/or productivity. Upon completion of the coating removal, the Contractor shall be allowed to cut, burn or grind the gas facility and remove the section of abandoned pipe. The Contractor at a site designated by the Contractor shall stockpile the removed pipe. The facility operator will be responsible to provide trucking and disposal services with its own personnel and shall remove the stockpiled pipes during off hours or during such time as agreed to by the Contractor. Since the pipe

removed will remain the property of the facility operator and is to be disposed of by the facility operator, the facility operator shall be responsible for any required notifications, filings, dump charges and incidentals associated with the disposal of abandoned gas facilities found to contain Coal Tar Wrap.

4. Method Of Measurement:

Abandoned gas pipeline removal shall be measured for payment per linear foot of pipe and appurtenances removed.

5. Price To Cover:

The price shall cover all additional cost of supervision, labor, materials, equipment and insurance necessary to complete this work in accordance with the contract plans and specifications, including excavation by hand around and under other City and facility operator owned properties and, where necessary, the support and protection of such properties. The cost shall also include hand excavation in the area(s) of proposed abandoned pipe cut(s), cutting and/or burning of abandoned gas pipes and stockpile of removed sections of abandoned pipe and associated maintenance and protection of traffic, blocking and temporary fencing if required. The unit price shall also cover sealing open ends remaining in the excavation with concrete or end caps (end caps to be provided by the facility operator) and backfilling of the area where the abandoned pipeline has been removed with clean backfill material. This item does not include any type of extra excavation, backfilling, compaction, pavement removal and/or restoration (temporary and permanent) associated with abandoned pipe removal ("lost trench"), all of which are covered under separate Section 6.06. The price shall also include allowance for any loss of productivity by the Contractor due to required facility operator work to remove pipe coating and prepare pipe for cutting as well as any change in Contractor's excavation method, additional trucking and/or stockpiling costs.

SECTION 6.03.1a - Removal Of Abandoned Gas Facilities With Possible Coal Tar Wrap. All Sizes. (For Con Edison Work Only)

1. Description:

Under this section the Contractor shall provide all labor, material, equipment, insurance and, incidentals required to prepare abandoned gas mains, services and appurtenances thereof located within the street shown on contract plans, owned by the gas company operating in the project area (facility operator), for removal due to interference with proposed City work. These abandoned gas facilities were, at one time, used for or in connection with or to facilitate the conveying, transportation, distribution or furnishing of gas (natural, manufactured or a combination of both) for light, heat, or power, but does not include property used solely for or in connection with business of selling, distribution or furnishing of gas in enclosed containers. Such preparation for removal shall include only abandoned gas facilities that interfere with (i.e. cause additional work) City work. These gas facilities may be coated with Coal Tar Wrap which may contain asbestos or PCB's and so, may require special handling and disposal methods as specified in Con Edison - ASBESTOS MANAGEMENT MANUAL, CHAPTER 6 - ASBESTOS WORK PROCEDURES, SECTION 06.04 - COAL TAR WRAP REMOVAL. For under 25' (feet) in length and an approved NYC-DEP variance for over 25' (feet).

2. Determination Of Operating Status Of Gas Facilities:

The Contractor shall notify facility operator, as required by New York State Industrial Code 753. Gas Facilities shall not be removed without the approval of the facility operator whose authorized representative shall certify in writing (specific facility or area wide facilities certification) and in a timely manner acceptable to the Resident Engineer that abandoned facilities are free of combustible gas and any other environmental contaminants prior to removal. The Resident Engineer shall rely on the facility operator's certification. The facility operator may request the excavation of test pits (See Section 6.07) for this determination ahead of City work and Contractor shall provide safe access, facilitate and permit facility operator to enter test pit excavations for the purpose of testing gas facilities. However, the facility

operator may prefer to make this test during performance of City work in order to issue the above certification. This shall be permitted provided that it is agreed that additional costs, if any, resulting from this choice shall be a matter of adjustment between the Contractor and the facility operator only, and at no cost the City contract. Should such investigation result in the determination that the abandoned gas facilities do not contain Coal Tar Warp then the removal of said facilities shall be covered under separate item (See Section 6.03).

3. Requirements:

The Contractor shall excavate abandoned gas facility sufficiently, either in it's entirety, or at locations determined by Contractor to allow the removal of Coal Tar Wrap (if present on the abandoned gas facility) and to facilitate the safe extraction of manageable lengths of abandoned pipe without damage to adjacent facilities, utilities or city structures either parallel to or crossing above or below abandoned gas facility. The Contractor is to allow access to the designated cutting points within the Contractors trench by authorized Con Edison personnel who will remove the Coal Tar Wrap as per Con Edison and/or NYC-DEP approved procedures. This access shall conform to all applicable codes, rules & regulations. This work by Con Edison personnel shall be performed in a timely fashion and shall not unduly impede the Contractors progress and/or productivity. Upon completion of the coating removal, the Contractor shall be allowed to cut, burn or grind the gas facility and remove the section of abandoned pipe. Contractor shall designate a specific site to stockpile those removed pipes. The facility operator will be responsible to provide trucking and disposal services with its own personnel and shall remove the stockpiled pipes during off hours or during such time as agreed to by the Contractor. Since the pipe removed will remain the property of the facility operator and is to be disposed of by the facility operator, the facility operator shall be responsible for any required notifications, filings, dump charges and incidentals associated with the disposal of abandoned gas facilities found to contain Coal Tar Wrap.

4. Method Of Measurement:

Abandoned gas facility removal shall be measured for payment per linear foot of pipe and appurtenances removed.

5. Price To Cover:

The price shall cover all additional cost of supervision, labor, materials, equipment and insurance necessary to complete this work in accordance with the plans and specifications, including, but not limited to, excavation by hand around and under other City and facility operator owned properties and, where necessary, the support and protection of such properties. The cost shall also include hand excavation in the area(s) of proposed abandoned pipe cut(s), cutting and/or burning of abandoned gas pipes and stockpile of removed sections of abandoned pipe and associated maintenance of traffic, blocking and temporary fencing if required. The unit price shall also cover sealing open ends remaining in the excavation with concrete or end caps (end caps to be supplied by facility operator) and backfilling of the area where the abandoned pipeline has been removed with clean backfill material. This item does not include any type of extra excavation, backfilling, compaction, pavement removal and/or restoration (temporary and permanent) associated with abandoned pipe removal ("lost trench"), all of which are covered under separate Section 6.06. The price shall also include allowance for any loss of productivity by the Contractor due to required facility operator work to remove pipe coating and prepare pipe for cutting as well as any change in Contractor excavation method, additional trucking and/or stockpiling costs.

SECTION 6.04 - Adjust Hardware To Grade Using Spacer Rings/Adaptors. (Street Repaving.)

1. Description:

Under this section, the Contractor shall provide all labor, supervision, materials, equipment, insurance and incidentals required to adjust to final grade gas street surface hardware located within the contract area

boundaries shown on the plans. The gas company operating in the area, (facility operator), owns these facilities. The work shall be performed in accordance with the contract plans, specifications and at the directions of the Resident Engineer in concurrence with authorized representative of the facility operator.

2. Materials:

The facility operator shall furnish and deliver all prefabricated hardware parts required. These include adaptors for the grade adjustment proper and new street hardware if existing ones are found to be defective, all in accordance with the facility operator standards and City rules and regulations. The Contractor shall notify the facility operator of the installation schedule at least three (3) business days before materials are required on the site. Should the facility operator fail to deliver the necessary material according to any schedule mutually agreed upon by the Contractor and facility operator, the City shall not be responsible for any delays attributable thereto, nor for the failure of delivery of such materials. On project where material storage is not permitted on site, the facility operator shall deliver the required material to the Contractor's yard and it shall be the Contractor's responsibility to transport the material to the work site when needed for installation. It shall also be the Contractor's responsibility to inspect the materials to be installed by him immediately upon delivery and advise the facility operator through its authorized representative, of all damaged materials. The Contractor at no additional expense to the City or the facility operator shall replace any material that is damaged or lost after the Contractor's inspection.

3. Method Of Measurement:

The Contractor shall be paid for each six (6) inch round box and/or nine (9) inch square box adjusted to grade regardless of adjustment height requirements.

4. Price To Cover:

The unit price bid for this item shall include all additional labor, supervision, insurance, equipment and, material (except those to be provided by the facility operator), required to adjust each box to grade as required in the contract plans and specifications. The bid price shall also include the removal of existing frames and covers from existing facilities to be salvaged and returned to the facility operator and, all material transportation from the Contractor's material storage yard to the work site. In addition the bid price shall include "chipping" around existing box using appropriate means and methods where grinding is required.

SECTION 6.05 - Adjust Hardware To Grade By Resetting. (Road Reconstruction.)

1. Description:

Under this item, the Contractor shall provide all labor, supervision, materials, equipment, insurance and incidentals required to adjust to the proposed grade gas street surface hardware located within the contract area boundaries shown on the plans. The gas company operating in the area, (facility operator), owns these facilities. The work shall consist of either building up or lowering or resetting the casting by removing the existing frame and cover building up or decreasing the existing installation, replacing the frame and/or cover if damaged or worn out, as determined by the Resident Engineer, with a new frame and/or cover furnished by the owner, and setting the frame and cover to new elevation. The work shall be performed in accordance with the contract plans, specifications and at the directions of the Resident Engineer.

2. Materials:

The facility operator shall furnish and deliver all new hardware parts required. The Contractor shall furnish materials such as mortar, bricks and concrete in compliance with contract requirements. At locations where high-early strength concrete is required under this contract to be placed adjacent to gas facilities, then the requirement for concrete shall be high-early strength complying with the current New York State Department of Transportation, Standard Specifications for Class F concrete. Existing castings may be replaced as required and deemed necessary by the Engineer and by City rules and regulations. The

Contractor shall install the new castings of various sizes furnished by the facility operator. The Contractor shall notify the facility operator of the installation schedule at least three (3) business days before materials are required on the site and, shall provide off-loading services to the facility operator. Should the facility operator fail to deliver the necessary material according to any schedule mutually agreed upon by the Contractor and facility operator, the City shall not be responsible for any delays attributable thereto, nor for the failure of delivery of such materials. Such delays shall be a matter of adjustment between the Contractor and the facility operator. On project where material storage is not permitted on site, the facility operator shall deliver the required material to the Contractor's yard and it shall be the Contractor's responsibility to transport the material to the work site when needed for installation. It shall also be the Contractor's responsibility to inspect the materials to be installed by him, immediately upon delivery and advise the facility operator through its authorized representative, of all damaged materials. The Contractor at no additional expense to the City or the facility operator shall replace any material that is damaged or lost after the Contractor's inspection.

3. Methods Of Construction:

The Contractor shall remove and reinstall existing castings or install new castings to the proposed grade. Setting and resetting the castings shall be done with mortar and brick according to the standards of the facility operator. Work shall be performed in a workmanlike manner. Castings that are deemed unacceptable for resetting shall remain the property of the facility operator and he shall be responsible for their removal and proper disposal from site. No traffic shall be allowed on adjusted street hardware until permitted by the Engineer.

4. Method Of Measurement:

The Contractor shall be paid for each gas hardware adjusted to grade regardless of size or adjustment height requirements (up or down).

5. Price To Cover:

The unit price bid for this item shall include all additional labor, supervision, insurance, equipment and, material (except those to be provided by the facility operator), required to adjust each gas hardware to grade as required in the contract plans and specifications. The bid price shall also include the removal of existing frames and covers from existing facilities; building up the existing installations with bricks and mortar, or lowering the existing installation by removing bricks and mortar; replacing damaged frames and/or covers with new frames and/or covers furnished by the facility operator; setting the frames and covers to the new elevations; protect existing installations; repair minor structural damages to existing installations prior to resetting frames; unloading of furnished castings at the Contractor's yard and transporting castings from the Contractor's yard to the job site as required; completing the work in accordance with the contract plans, specifications and, at the directions of the Engineer. In addition the bid price shall include "chipping" around existing gas facilities using appropriate means and methods where grinding is required.

SECTION 6.06 - Special Care Excavation And Backfilling.

1. Description:

Under this section, the Contractor shall provide all labor, materials, equipment, insurance and incidentals required to support and protect the integrity of live gas facilities including mains, services, related structures and appurtenances during excavations. The gas company operating in the area, (facility operator), owns these facilities. The work shall be performed in accordance with the contract plans, specifications and at the directions of the Resident Engineer in consultation with authorized representatives of the facility operator.

2. Applicability Of Section:

This section shall apply to live gas facilities of various sizes located within two (2) feet of any face of unsheeted excavation, (unsheeted excavation refers to any excavation performed for city work and includes excavations performed that are to be subsequently sheeted using approved methods) and paralleling or,

encroaching any face of excavation. Also, for crossings greater than forty-five (45) degrees and/or located at a cover depth greater than five (5) feet from existing street surface. Parallel facilities are not exposed at any time during excavation (See "Gas Cost Sharing Work Standard Sketch No. 5"). Encroaching facilities are partially exposed inside the limit of excavation (See "Gas Cost Sharing Work Standard Sketch No. 5"). This section shall also apply to gas facilities crossing catch basins excavation, and catch basins sewer connections (chutes) trench excavation only when extra depth (covered in other section), is not required for chutes installations because of such utilities interferences (See "Gas Cost Sharing Work Standard Sketch No. 3"). This section shall also apply to gas services (if shown or otherwise listed in contract documents) crossing unsheeted excavations for water mains, gas facilities crossing fire hydrant branch connections, house sewer and/or water service connections excavations. This section shall also apply for so called "loss trench", as described further, and for additional excavation (pavement and/or soil), backfilling, compaction, roadway base and pavement restoration due to abandoned gas facilities, only if removed by Contractor. If operating status of gas facilities cannot be determined prior to excavation then such facilities shall be considered live and this section shall fully apply. The excavation around fully exposed live gas facilities along and within limits of excavation (not crossings) shall be covered by this section also (not shown on "Gas Cost Sharing Work Standard Sketch No. 5"), however the support requirement, if any is required, of such facilities is beyond the scope of these specifications and therefore shall be the responsibility of facility operator to determine and prescribe, at no cost to the City contract, but shall be a matter of adjustment between the Contractor and facility operator.

3. Payment Restriction:

No special care excavation shall be paid for abandoned gas facilities paralleling and/or encroaching excavation and therefore are not in direct interference with City work. Except as allowed in this section, the bid item specified under this section shall not be used in combination with items covered under other sections for work done due to a particular gas facility. This item shall not be paid for new gas facilities when trenching for such new facilities has been performed by the Contractor of record in common with trench excavation for City Work (overlapping trench limits). The cost of excavating with care as defined in this section shall be deemed included in the cost of trench excavation for the new gas facilities. This restriction shall apply even if such gas common trench excavation is not part of the contract. If facilities are in direct interference with City work, meaning that "Minimum Clearances" described in "General Provisions; Gas Cost Sharing Work Paragraph No. 8" cannot be maintained and excavation has to be temporarily or permanently abandoned then this particular location shall become a test pit and dealt with as specified in Section 6.07 and "General Provisions; Gas Cost Sharing Work Paragraphs Nos. 2 and 8".

4. Method Of Construction:

All excavation in the vicinity of gas facilities shall be as required by NYS Industrial Code 753. Where these facilities are paralleling and located two (2) feet or less from the limits of the proposed excavation, the Contractor shall use hand excavation methods (pick and shovel or hand held power tools) to ascertain the clearances of these facilities with respect to the proposed excavation. Once the location of these facilities with respect to the proposed excavation is verified to the satisfaction of the Resident Engineer, the Contractor shall then proceed with a combination of hand and machine excavation as required preserving the integrity of the facilities. The installation of timber supports or underpinning, when soil foundation cannot fully support partially exposed pipes, may be required to prevent pipe movement as directed by the Resident Engineer.

5. Method Of Payment:

The unit price for this work item shall be based on cubic yard (CY) of average excavation with care and, is to be considered as an incremental cost for performing City work with gas facilities interferences.

6. Method Of Measurement:

A. For Paralleling Facilities: Volume calculated as: Depth as measured from existing street surface to the bottom of unsheeted trench excavation allowable by OSHA regulations, multiplied by, the width measured as one (1) foot from the face of excavation toward the center of excavation, multiplied by

the length of parallel facility, divided by twenty-seven (27) cubic feet per cubic yard (See “Gas Cost Sharing Work Standard Sketch No. 5”). The gas facility is no longer considered to be in interference once sheeting has been installed, therefore no further compensation for paralleling facilities as described above will be made.

B. For Encroaching Facilities: Volume calculated as: Depth of trench as allowable by OSHA, maximum up to five (5) feet multiplied by, the width of partially exposed pipe plus one (1) foot, multiplied by the length of facility encroachment, divided by twenty-seven (27) cubic feet per cubic yard (See “Gas Cost Sharing Work Standard Sketch No. 5”).

C. Fully Exposed Gas Facilities: (Not shown on “Gas Cost Sharing Work Standard Sketch No. 5”) along and inside trench and/or crossing trench at an angle greater than forty-five (45) degrees and/or a cover depth greater than five (5) feet from the existing street surface. The volume shall be measured as the depth of trench excavation multiplied by the distance measured along the sheeting line between two (2) points of intersections of the gas facilities and the sides of trench excavation, multiplied by the width of trench excavation.

D. For Additional Excavation And Restoration Due To So Called "Loss Trench", When The Integrity Of Pavement And Soil Above And Around Existing Live Gas Facilities Cannot Be Maintained Due To Its Lack Of Cohesiveness: Volume shall be calculated as: Depth of unsheeted trench excavation multiplied by width measured as distance of facility from closest edge of unsheeted excavation plus, width of facility proper plus, one (1) foot or a maximum width of three (3) feet multiplied by length of facility fully exposed divided by, twenty-seven (27) cubic feet per cubic yard (not shown on “Gas Cost Sharing Work Standard Sketch No. 5”).

E. For Facilities Crossing Excavation For Catch Basins, Or Chutes Installations (When NYCDEP Funded) Or Fire Hydrant Branch Connections, Or Unsheeted Water Main Trench, Or House Sewer And/Or Water Services: Volume calculated as: Depth as measured from existing street surface to the bottom of the trench excavation multiplied by, the width taken as the outside diameter of pipe or the width of structure plus one (1) foot on either side (two (2) feet), multiplied by, the length of exposed facility crossing the trench, divided by twenty-seven (27) cubic feet per cubic yard (not shown on “Gas Cost Sharing Work Standard Sketch No. 5”).

Overlapping volume dimensions measured as described above may occur when multiple facilities are paralleling excavations, encroaching excavations or crossing catch basins and catch basin chute installations. In such cases, all such facilities shall be counted as one limited by the extreme pipes, faces (See “Gas Cost Sharing Work Standard Sketch No. 2”). The volume shall then be calculated as described above.

7. Price To Cover:

The bid price shall also cover all additional supervision, labor, material, equipment and insurance necessary to excavate while protecting and maintaining (excluding supports for fully exposed live gas) gas facilities without disruption of service to the public and in accordance with contract specifications. The price shall also include, changes of sheeting method and excavation width configuration where necessary to accommodate gas facilities in their existing locations; difficulties during the installation of catch basins, chute connections, hydrant branch, and house sewer and water connections under or over gas facilities; loss of productivity due to slower rate of excavation (special care) during excavation, including the use of such methods as: hand excavation around existing single and multiple facilities, extra excavation and backfilling due to lost trench because of existing and adjacent gas facilities, compaction, removal of sheeting from the facilities, extra roadway base restoration and temporary pavement, associated maintenance and protection of traffic, barricades, and traffic plates that may be required to temporarily close and/or complete the work.

SECTION 6.06A - Special Care Excavation and Backfilling for Transmission Mains. (Transmission Main is described as any gas main with a MAOP greater than 124 psig)

1. Description:

Under this section, the contractor shall provide all labor, materials (except for sand to be utilized for backfill of a one-foot envelope around the facility to be furnished by the facility operator), equipment, and incidentals required to support and protect the integrity of Gas Transmission Main during excavations. This facility is owned by the gas company operating in the area, hereafter referred to as facility operator. The work shall be performed in accordance with the contract plans, specifications and at the directions of the Resident Engineer in consultation with authorized representatives of the facility operator.

2. Applicability of Section:

This section shall apply to Transmission Main of various sizes located within any excavation sheeted or unsheeted (excavation refers to any excavation performed for city work and includes excavations performed that are to be subsequently unsheeted/sheeted using approved shoring methods and paralleling, encroaching, and crossing any excavation. Parallel facilities are not exposed at any time during excavation (within 2' of edge of excavation)). Encroaching facilities are partially/fully exposed inside the limit of excavation. This section shall also apply to gas facility crossing catch basins excavation and catch basins sewer connections (chutes), water mains, fire hydrant branch connections, sanitary sewer, storm sewer, combination sewer, house sewer and/or water service connections excavations. The excavation around fully exposed live gas facilities along and within limits of excavation shall be covered by this section also, however the support requirement, if any is required, of such facilities is beyond the scope of these specifications and therefore shall be the responsibility of facility operator to determine and prescribe, at no cost to the City contract, but shall be a matter of adjustment between the contractor and facility operator.

3. Payment Restriction:

The bid item specified under this section shall not be used in combination with items covered under other sections for work done due to a particular gas facility. This item shall not be paid for new gas facilities when trenching for such new facilities has been performed by the contractor of record in common with trench excavation for City Work (overlapping trench limits). The cost of excavating with care as defined in this section shall be deemed included in the cost of trench excavation for the new gas facilities. This restriction shall apply even if such gas common trench excavation is not part of the contract. If facilities are in direct interference with City work, meaning that "minimum clearances" described in the General Provisions for Gas Cost Sharing (Para. No.8) cannot be maintained, the excavation shall be abandoned and the contractor shall be compensated as per the provisions specified in Paragraphs Nos. 5 and 6 of this item (6.06A).

4. Method of Construction:

All excavations in the vicinity of gas facilities shall be as required by NYS Industrial Code 753. No saw cutting of pavement or masonry for gas mains having less than 2 feet of cover to break asphalt/concrete as determined by the facility operator. The contractor shall use power excavation for the removal of pavement or masonry but only to the depth of such pavement or masonry **(breaking of pavement or masonry shall be done by means of hand held pneumatic breaking equipment).** Upon removal of pavement or masonry the contractor shall use hand excavation methods only **(pick and shovel; no power tools)** to ascertain the clearances of these facilities with respect to the proposed excavation. Once the location of these facilities with respect to the proposed excavation is verified to the satisfaction of the Resident Engineer and the facility operator the contractor shall then proceed with hand only within the zone of protection described as 2 feet from the face of the facility in all directions of the facility as required to preserve the integrity of the facility. Once outside of the zone of protection as described above the contractor may use a combination of hand and machine to complete the excavation.

5. Method of Payment:

The unit price for this work item shall be based on cubic yard (CY) of average excavation with special care and, is to be considered as an incremental cost for performing City work with gas facilities interferences.

6. Method of Measurement:

A. For Paralleling Facilities:

Volume calculated as: Depth as measured from existing street surface to the bottom of facility, multiplied by, the width measured as two (2) feet from the face of excavation toward the center of excavation, multiplied by the length of parallel facility, divided by twenty-seven (27) cubic feet per cubic yard Only hand excavation shall be utilized within the zone of protection identified as 2 feet from face of facility, beyond 2 feet from the face of facility the contractor can use a combination of hand and machine.

B. For Encroaching Facilities:

Volume calculated as: Depth as measured from existing street surface to the bottom of facility, multiplied by, the width measured as two (2) feet plus the exposed facility toward the center of excavation, multiplied by the length of the encroached facility, divided by twenty-seven (27) cubic feet per cubic yard. Only hand excavation shall be utilized within the zone of protection identified as 2 feet from face of facility, beyond 2 feet from the face of facility the contractor can use a combination of hand and machine.

C. Fully Exposed Gas Facilities:

Volume calculated as: Depth as measured from existing street surface to the bottom of facility, multiplied by, the width measured as two (2) feet from the face of the facility on either side plus

the facility, multiplied by the length of the facility, divided by 27 cubic feet per cubic yard. Only hand excavation shall be utilized within the zone of protection identified as 2 feet from face of facility in all directions, beyond 2 feet from the face of facility in all directions the contractor can use a combination of hand and machine.

D. For Additional Excavation And Restoration Due To So Called "Loss Trench", When The Integrity Of Pavement And Soil Above And Around Existing Live Gas Facilities Cannot Be maintained Due To Its Lack of Cohesiveness:
Volume shall be calculated as: Depth of unsheeted trench excavation multiplied by width measured as distance of facility from closest edge of unsheeted excavation plus, width of facility proper plus, one (1) foot or a maximum width of three (3) feet multiplied by length of facility fully exposed divided by, twenty-seven (27) cubic feet per cubic yard (not shown on "Gas Cost Sharing Work Standard Sketch No. 5").

E. For Facilities Crossing Excavation For Catch Basins, Or Chutes Installations (When NYCDEP Funded) Or Fire Hydrant Branch Connections, Or Unsheeted Water Main Trench, Or House Sewer And/Or Water Services:
Volume calculated as: Depth as defined above multiplied by, the width taken as the outside diameter of pipe or the width of structure plus one (1) foot on either side (two (2) feet), multiplied by, the length of exposed facility crossing the trench, divided by twenty-seven (27) cubic feet per cubic yard (not shown on "Gas Cost Sharing Work Standard Sketch No. 5").

7. Price to Cover:

The bid price shall also cover all additional supervision, labor, material, equipment and insurance necessary to excavate while protecting and maintaining (excluding supports for fully exposed live gas) gas facilities without disruption of service to the public and in accordance with contract specifications. The price shall also include, changes of sheeting method and excavation width configuration where necessary to accommodate gas facilities in their existing locations; difficulties during the installation of catch basins, chute connections, hydrant branch, and house sewer, sanitary sewer, storm sewer, combination sewer and water connections under or over gas facilities; loss of productivity due to slower rate of excavation (special care) during excavation, compaction, removal of sheeting from the facilities, extra roadway base restoration and temporary pavement, associated maintenance of traffic, barricades, and traffic plates that may be required to temporarily close and/or complete the work. Breaking shall be done by means of hand held pneumatic breaking equipment. Inspection of exposed mains shall be performed by facility operator in a timely fashion and shall not unduly impede contractor's progress or productivity.

SECTION 6.07 - Test Pits For Gas Facilities.

1. Description:

Under this section, the Contractor shall furnish all labor, materials, insurance, equipment and appliances necessary to excavate, sheet and, maintain test pits at locations approved by the Resident Engineer in consultation with the facility operator. Test pits shall be dug in order to ascertain exact locations, cover and invert elevations, clearances, alignment and operating status (live or dead) of existing gas facilities. The Contractor shall inspect jointly with the Resident Engineer and facility operator, gas facilities and other structures uncovered, take all relevant measurements and elevations as directed by the Resident Engineer. Tests to determine operating status of gas facilities shall be performed by facility operator. The pits shall be covered with steel plates during daytime nonworking hours, and uncovered, as required, until the inspection work is completed. Testing of gas facilities may require a maximum of four (4) hours. Then, the pits shall be backfilled with clean fill, and resurfaced with temporary pavement. All traffic shall be maintained and all safety measures as stipulated shall be complied with.

2. Methods Of Construction:

A. Excavation: Existing pavement to be removed shall be neatly cut along lines of removal with a saw or other approved equipment which leaves a neat straight joint line along the juncture with subsequently replaced pavement. Excavation in the vicinity of utilities and other structures shall be performed using hand tools. Use of hand operated pneumatic and electric jackhammers will be permitted only for breaking pavement and removal of masonry, concrete and boulders, or as otherwise directed by the Resident Engineer. The Contractor shall properly dispose of all materials excavated from test pits away from site. Test pits shall be excavated at locations shown on the contract drawings or as directed by the Resident Engineer. Additional test pits may be required and shall be excavated where required, as ordered by the Resident Engineer. All test pits shall be excavated to a depth and size necessary to locate the existing facilities. Sheeting shall be used when depth of excavation exceeds five (5) feet. The sheeting required shall be furnished and installed in full compliance with the State of New York and Federal Safety Codes requirements and as specified in contract, whichever is more stringent. Care shall be taken that no existing gas facilities or other structures are broken or damaged. All broken or damaged facilities shall be reported immediately to facility operator who shall decide whether such facilities shall be repaired or replaced by company forces or by City contractor and in conformance with “General Provisions; Gas Cost Sharing Work Paragraph No. 9”. Contractor shall excavate all material encountered, including large masses of concrete, cemented masonry and boulders, as directed by the Resident Engineer. Any type of excavation protection used, shall satisfy the following:

   (a) Industrial Code Rule 753.
   (b) Prevent injury to workers and the public, and avoid damage to existing water, sewer, and gas pipes or other structures, and to pavements and their foundations, through caving or sliding of the banks of the excavation.

   Should it become necessary, as determined by the Resident Engineer, to enlarge any test pit in any dimension after sheeting has been placed, the Contractor shall remove portions of the sheeting, as necessary, enlarge the test pits as directed, and replace the sheeting without additional compensation for this work other than for the additional volume of material excavated.

B. Maintenance Of Test Pits: Excavated test pits shall be maintained free of debris and kept dry by the Contractor in order to permit the inspection and measurements and to determine the locations of facilities. In order to accomplish this, Contractor shall, upon completion of excavation and placement of sheeting (if depth greater than five (5) feet), furnish and install adequate steel plates and posting over the excavated pits and shall temporarily remove all equipment debris and workers, and relocate barricades in order to open the full width of street to traffic during nonworking hours. The Contractor shall then, at no additional cost, relocate such barricades, barrels, cones and other warning devices and remove steel plates, as and when directed by the Resident Engineer to facilitate the inspection of

exposed facilities. When work is being performed and the pits are not covered with steel plates, the Contractor shall provide complete and safe access to the test pits as may be required, and he shall provide construction barricades and maintain traffic at all times as shown or as directed by the Resident Engineer. Upon completion of test pit inspection by the Resident Engineer, the pit shall be backfilled by the Contractor as specified in contract, except that backfill material shall conform to contract specifications for such purpose.

C. Pavement And Sidewalk Restoration: After backfilling is completed, the Contractor shall construct a temporary pavement consisting of a minimum of four (4) inches thick asphaltic concrete mixture in roadway areas or a two (2) inches thick asphaltic concrete mixture in sidewalk areas in order to maintain existing pedestrian and vehicular traffic. This temporary pavement shall be maintained until permanent pavement and sidewalk replacement is constructed as specified in contract.

3. Measurements:

The quantity to be measured for payment shall be the number of cubic yards of material removed from within the limits of the pit dimensions as directed by the Resident Engineer. The volume occupied by existing pipes or other structures remaining within the maximum payment lines will not be deducted from the total volume measured except, where the cross sectional area of these facilities exceeds four (4) square feet. As determined by the Resident Engineer, the quantity measured for payment may be proportionate to a fair and reasonable estimate of gas responsibility in the total volume excavated.

4. Price To Cover:

The contract price bid per cubic yard for test pits shall cover all additional costs of labor, material, insurance, equipment, appliances and incidentals required to excavate test pits, including removal and disposal of excavated materials, sheeting, steel plating, backfill, compaction and temporary pavement and sidewalk restoration all in accordance with the specifications and as directed by the Resident Engineer. The price shall also include the cost of providing safe access to the excavation by facility operator for the performance of certain test to determine operating status of gas facilities prior to City work. The price shall also include support and protection of all gas facilities crossing excavation, paralleling and/or encroaching any face of excavation.

SECTION 6.08 - “NO TEXT”

SECTION 6.09 - Trench Excavation and Backfill for New Gas Mains and Services (For National Grid Work Only)

1. Description:

Under this section, the contractor shall furnish all labor, materials, equipment, insurance, permits and incidentals required to break/remove roadway and sidewalk pavement, excavate, backfill and restore gas trenches. The trench to be excavated shall be determined by the size of the gas facility to be installed. The work shall be performed in accordance with applicable specifications, and/or at the direction of the Resident Engineer in consultation with the facility operator.

2. Materials:

All materials used to excavate and prepare trenches shall be supplied by the Contractor and be approved by the facility operator in consultation with the Resident Engineer.

3. Method of Construction:

Excavation – The Contractor shall saw cut and/or break and remove existing roadway which may include

but is not limited to, asphalt, concrete and cobblestone, utilizing approved equipment that leaves a neat straight joint line along the juncture with subsequently replaced pavement. Prior to starting the trenching operation, the contractor shall excavate the appropriate gas main tie-in pits at the extremities of the gas main sections to be replaced. Test pits shall be excavated to determine exact location of all tie-in pits and at appropriate intervals along proposed trench excavation to verify lane and clearances as shown on the contract plans. The tie-in pits shall be adequately protected by the contractor using wood fencing or steel traffic plates until such time when the facility operator has completed the tie-in work. The Contractor shall be permitted to excavate utilizing a combination of machine and hand excavation, as field conditions warrant, and as directed by the facility operator. The trench shall be adjusted so as to provide for a nominal cover on the new gas facilities or as required based on field conditions, applicable specifications, or as directed by the facility operator in consultation with the Resident Engineer. The width of the trench shall be as directed by the facility operator in consultation of the Resident Engineer. The bottom of the trench shall be graded smooth with a minimum cushion of 3 inches of clean sand and in conformance with applicable specification and be compacted, to minimize initial settlement and to avoid "point" support of new gas facilities. All stones projecting into the trench bottom shall be removed, and the voids backfilled before the new gas facilities are installed. Where streets are not to final grade, the cover shall be measured from the final grade, or the existing grade, whichever provides the deeper trench. Excavation in the vicinity of utilities and other structures shall be performed using hand tools. The contractor shall properly dispose of all materials excavated away from site. Size and location of excavation shall be as directed by the facility operator in consultation with the Resident Engineer. Trenches shall be excavated to a depth and size necessary to facilitate the installation of the new gas facility and in conformance with the applicable specification. All existing facilities that are encountered during trench excavating shall be protected in a manner suitable to the facility operator in consultation with the Resident Engineer. Tight sheeting shall be used, as required, based on field conditions and/or when the depth of excavation is equal to or greater than five feet. Skeleton type sheeting will not be permitted. The sheeting required shall be furnished and installed in full compliance with the State of New York and Federal Safety Code requirements and in compliance with applicable specifications and/or as directed by the facility operator in consultation with the Resident Engineer. Care shall be taken that no existing gas facilities or other structures are broken or damaged. Contractor shall excavate all material encountered necessary to facilitate the installation of the new gas facilities, and as directed by the facility operator. Care should be taken to avoid damage to existing utility facilities and structures, and to pavements and their foundations, and to avoid caving or sliding banks within the excavation.

Maintenance of Trench Excavation - Excavated trenches shall be maintained free of debris and kept dry by the contractor. In order to accomplish this, contractor shall, upon completion of excavation and placement of sheeting (as required and/or if depth is equal to or greater than five feet), furnish and install adequate steel plates, as directed by the facility operator in consultation with the Resident Engineer, and posting over the excavated trenches and shall temporarily remove all equipment debris and workers, and relocate barricades in order to open the full width of street to traffic during non-working hours, as required based on DOT requirements. National Grid forces will perform all live gas main connections, dead gas main cut-outs, and/or service work associated with disconnecting and reconnecting from old to new gas main The Contractor shall then, at no additional cost, relocate such barricades barrels, cones and other warning devices and remove steel plates, as and when directed by the facility operator in consultation with the Resident Engineer to facilitate the installation of the new gas facilities. When work is being performed and the excavations are not covered with steel plates, the Contractor shall provide complete and safe access to the trench as may be required, and shall provide construction barricades and maintain traffic at all times as shown or as directed by the facility operator in consultation with the Resident Engineer. The contractor has the responsibility to maintain and set to grade all National Grid hardware during backfill and pavement restoration. Upon completion of installation of the new gas facility, the trench excavation shall be backfilled by the contractor in accordance with Contract requirements and all backfill material shall conform to contract specifications for such purpose.

Pavement and Sidewalk Restoration - After backfilling is completed, the contractor shall install temporary pavement consisting of six inches (6”) thick asphaltic concrete mixture in roadway areas or a two inches (2”) thick asphaltic concrete mixture in sidewalk areas in order to maintain existing pedestrian and vehicular traffic. This temporary pavement shall be maintained until permanent replacement as specified in contract. Permanent pavement restoration shall be as required by the appropriate contract specifications and as

directed by the Resident Engineer.

4. Method of Measurement:

The quantity to be measured for payment shall be the number of cubic yards (C.Y.) of trench actually excavated, including roadway pavement, base and/or sidewalk concrete removed within the limits of the trench as directed by the Resident Engineer in consultation with the facility operator. The volume occupied by existing pipes or other structures will be deducted from the total volume measured as shown on contract drawing(s) Title: EP-7 SECT. 6.09 GAS SPECIALTY CONTRACTOR WORK, or as encountered based on existing field conditions.

5. Price to Cover:

The unit price bid per cubic yard for excavation shall include the cost of all supervision, labor, material, equipment, insurance and incidentals necessary to complete excavation trenches, including backfill, compaction testing and restoration of trenches and tie-ins pits as specified or shown on the contract, plans. The bid price shall also include the cost of coordinating the sewer and water main work to be performed by the contractor with the gas installation work to be performed by others. The price shall also include, associated maintenance of traffic, and traffic plates and openings and closings of plates as may be required in order to provide access to the facility operator during the new gas facility installation, and installing, removing and maintaining tight sheeting that may be required, cut, break and remove various thickness of surface and base pavement, excavate by hand, furnish, place and compact, in compliance with DOT requirements, clean sand backfill following installation of the gas facility. Any required removing, trucking, storing, and disposing of material shall be deemed included in the unit price. The price shall also include the cost of providing temporary pavement restoration. Permanent pavement restoration shall be deemed included in this item, as required and as directed by the Resident Engineer.

SECTION 6.09a Trench Excavation and Backfill for New Gas Mains and Services (For Con Edison Work Only)

1. Description:

Under this section, the contractor shall furnish all labor, materials, equipment, insurance, permits and incidentals required to break/remove roadway and sidewalk pavement, excavate, backfill and restore gas trenches. The trench to be excavated shall be determined by the size of the gas facility to be installed. The work shall be performed in accordance with applicable specifications, and/or at the direction of the Resident Engineer in consultation with the facility operator.

2. Materials:

All materials used to excavate and prepare trenches shall be supplied by the Contractor and be approved by the facility operator in consultation with the Resident Engineer. Clean sand backfill material shall be used and shall conform to Con Edison specification EO-1181-rev.6, General Specification for Backfilling of Trench and Small Openings.

3. Method of Construction:

Excavation – The Contractor shall saw cut and/or break and remove existing roadway which may include but is not limited to, asphalt, concrete and cobblestone, utilizing approved equipment that leaves a neat straight joint line along the juncture with subsequently replaced pavement. Prior to starting the trenching operation, the contractor shall excavate the appropriate gas main tie-in pits at the extremities of the gas main sections to be replaced. Test pits shall be excavated to determine exact location of all tie-in pits and at appropriate intervals along proposed trench excavation to verify lane and clearances as shown on the contract plans. The tie-in pits shall be adequately protected by the contractor using wood fencing or steel traffic plates until such time when the facility operator has completed the tie-in work. The Contractor shall be permitted to excavate utilizing a combination of machine and hand excavation, as field conditions warrant, and as directed by the facility operator. The trench shall be adjusted so as to provide for a nominal

cover on the new gas facilities or as required based on field conditions, applicable specifications, or as directed by the facility operator in consultation with the Resident Engineer. The width of the trench shall be as directed by the facility operator in consultation of the Resident Engineer. The width and depth of the trench shall conform to Con Edison Gas Operations drawing 309495 rev. 4, Trench Excavation for Gas Mains Up to 350 PSIG, or as directed by the facility operator in consultation of the Resident Engineer. The bottom of the trench shall be graded smooth with a minimum cushion of 3 inches of clean sand and in conformance with applicable specification and be compacted, to minimize initial settlement and to avoid "point" support of new gas facilities. All stones projecting into the trench bottom shall be removed, and the voids backfilled before the new gas facilities are installed. Where streets are not to final grade, the cover shall be measured from the final grade, or the existing grade, whichever provides the deeper trench. Excavation in the vicinity of utilities and other structures shall be performed using hand tools. The contractor shall properly dispose of all materials excavated away from site. Size and location of excavation shall be as directed by the facility operator in consultation with the Resident Engineer. Trenches shall be excavated to a depth and size necessary to facilitate the installation of the new gas facility and in conformance with the applicable specification. All existing facilities that are encountered during trench excavating shall be protected in a manner suitable to the facility operator in consultation with the Resident Engineer. Tight sheeting shall be used, as required, based on field conditions and/or when the depth of excavation is equal to or greater than five feet. Skeleton type sheeting will not be permitted. The sheeting required shall be furnished and installed in full compliance with the State of New York and Federal Safety Code requirements and in compliance with applicable specifications and/or as directed by the facility operator in consultation with the Resident Engineer. Care shall be taken that no existing gas facilities or other structures are broken or damaged. Contractor shall excavate all material encountered necessary to facilitate the installation of the new gas facilities, and as directed by the facility operator. Care should be taken to avoid damage to existing utility facilities and structures, and to pavements and their foundations, and to avoid caving or sliding banks within the excavation.

Maintenance of Trench Excavation - Excavated trenches shall be maintained free of debris and kept dry by the contractor. In order to accomplish this, contractor shall, upon completion of excavation and placement of sheeting (as required and/or if depth is equal to or greater than five feet), furnish and install adequate steel plates, as directed by the facility operator in consultation with the Resident Engineer, and posting over the excavated trenches and shall temporarily remove all equipment debris and workers, and relocate barricades in order to open the full width of street to traffic during non-working hours, as required based on DOT requirements. Con Edison forces will perform all live gas main connections, dead gas main cut-outs, and/or service work associated with disconnecting and reconnecting from old to new gas main The Contractor shall then, at no additional cost, relocate such barricades barrels, cones and other warning devices and remove steel plates, as and when directed by the facility operator in consultation with the Resident Engineer to facilitate the installation of the new gas facilities. When work is being performed and the excavations are not covered with steel plates, the Contractor shall provide complete and safe access to the trench as may be required, and shall provide construction barricades and maintain traffic at all times as shown or as directed by the facility operator in consultation with the Resident Engineer. The contractor has the responsibility to maintain and set to grade all Con Edison hardware during backfill and pavement restoration. Upon completion of installation of the new gas facility, the trench excavation shall be backfilled by the contractor in accordance with Contract requirements and all backfill material shall conform to contract specifications for such purpose.

Pavement and Sidewalk Restoration - After backfilling is completed, the contractor shall install temporary pavement consisting of six inches (6”) thick asphaltic concrete mixture in roadway areas or a two inches (2”) thick asphaltic concrete mixture in sidewalk areas in order to maintain existing pedestrian and vehicular traffic. This temporary pavement shall be maintained until permanent replacement as specified in contract. Permanent pavement restoration shall be as required by the appropriate contract specifications and as directed by the Resident Engineer.

4. Method of Measurement:

The quantity to be measured for payment shall be the number of cubic yards (C.Y.) of trench actually excavated, including roadway pavement, base and/or sidewalk concrete removed within the limits of the trench as directed by the Resident Engineer in consultation with the facility operator. The volume occupied

by existing pipes or other structures will be deducted from the total volume measured as shown on contract drawing(s) Title: EP-7 SECT. 6.09 GAS SPECIALTY CONTRACTOR WORK, or as encountered based on existing field conditions.

5. Price to Cover:

The unit price bid per cubic yard for excavation shall include the cost of all supervision, labor, material, equipment, insurance and incidentals necessary to complete excavation trenches, including backfill, compaction testing and restoration of trenches and tie-ins pits as specified or shown on the contract, plans. The bid price shall also include the cost of coordinating the sewer and water main work to be performed by the contractor with the gas installation work to be performed by others. The price shall also include, associated maintenance of traffic, and traffic plates and openings and closings of plates as may be required in order to provide access to the facility operator during the new gas facility installation, and installing, removing and maintaining tight sheeting that may be required, cut, break and remove various thickness of surface and base pavement, excavate by hand, furnish, place and compact, in compliance with DOT requirements, clean sand backfill following installation of the gas facility. Any required removing, trucking, storing, and disposing of material shall be deemed included in the unit price. The price shall also include the cost of providing temporary pavement restoration. Permanent pavement restoration shall be deemed included in this item, as required and as directed by the Resident Engineer.

GAS COST SHARING STANDARD SPECIFICATIONS
SCHEDULE GCS-A

Average rate charged by utility companies to Disconnect and Reconnect Gas Services:

1. National Grid - $2700.00 per Service/and Visit

IV - STANDARD SKETCHES; GAS COST SHARING WORK

Hereinafter attached are the following Standard Sketches for Gas Cost Sharing Work:

Sketch No. 1 - Support Requirements For Gas Mains And Services Crossing Excavation Greater Than 4' - 0" Wide At Any Angle

Sketch No. 1A - Support Requirements For Gas Mains Over 16" Diameter Up To And Including 48" Diameter Crossing Excavation At Any Angle

Sketch No. 2 - Typical Methods Of Measurement For Gas Crossings

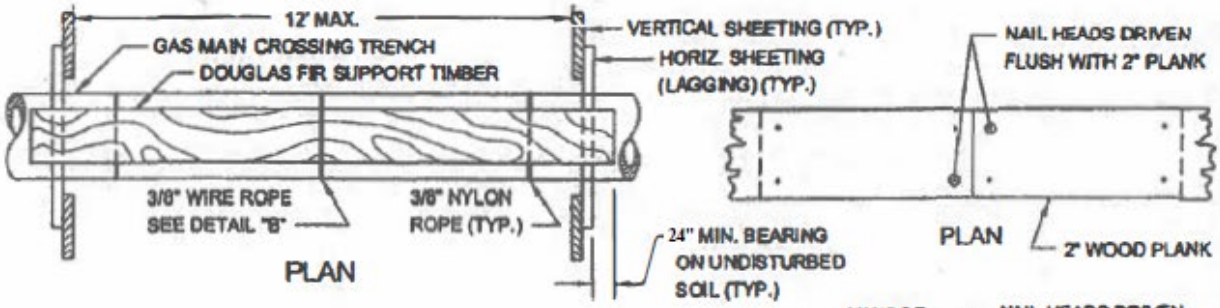
Sketch No. 3 - Utility Crossings During Catch Basin Chute Connection Pipe Installation

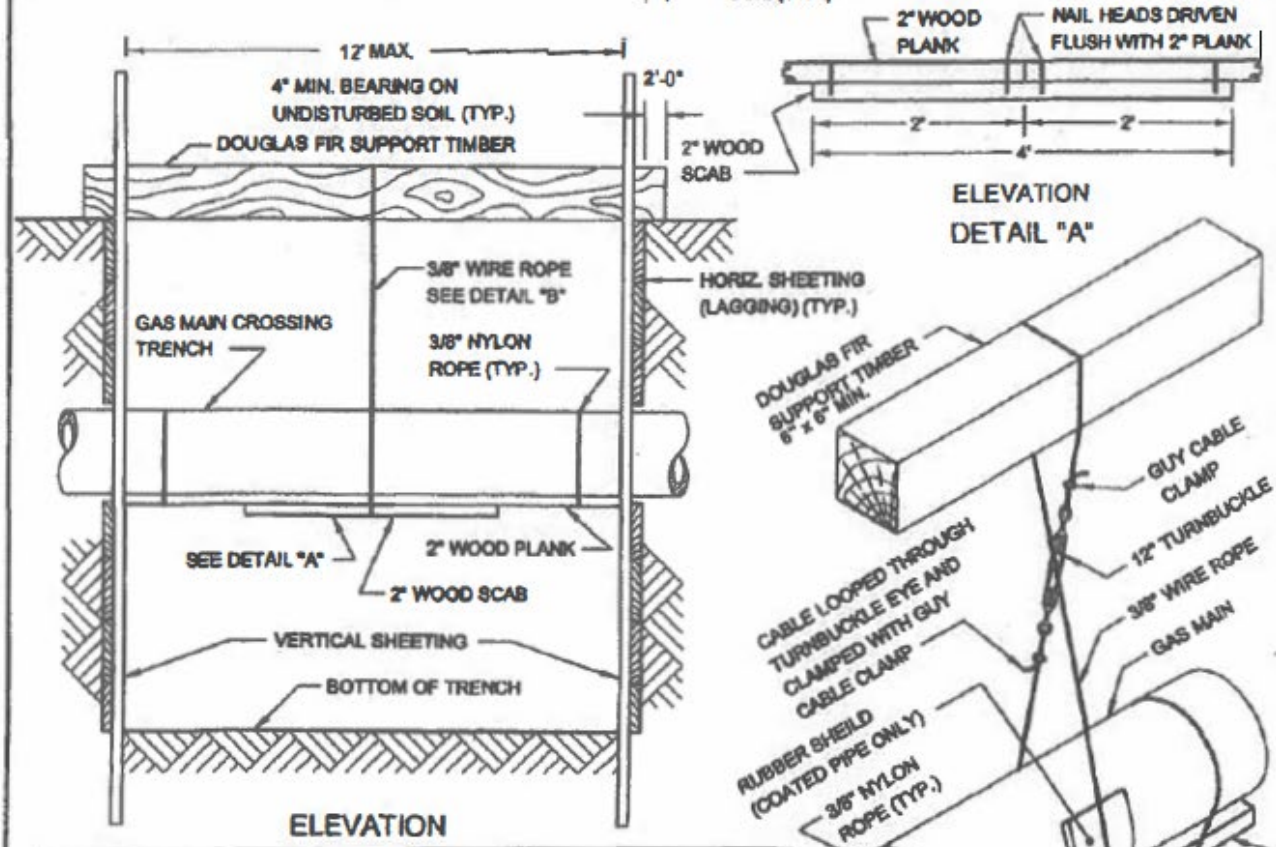
Sketch No. 4 - Utility Crossings During Catch Basin Chute Connection Pipe Installation (Extra Depth)

Sketch No. 5 - Gas Main Encroachment On And/Or Parallel To Excavation Of Unsheeted Trench

GAS COST SHARING WORK (SKETCH NO. 1)

SUPPORT REQUIREMENTS FOR GAS MAINS SUSPENDED IN EXCAVATIONS UP TO 12'-0" WIDE AT ANY ANGLE





CABLE SUPPORT SPACING

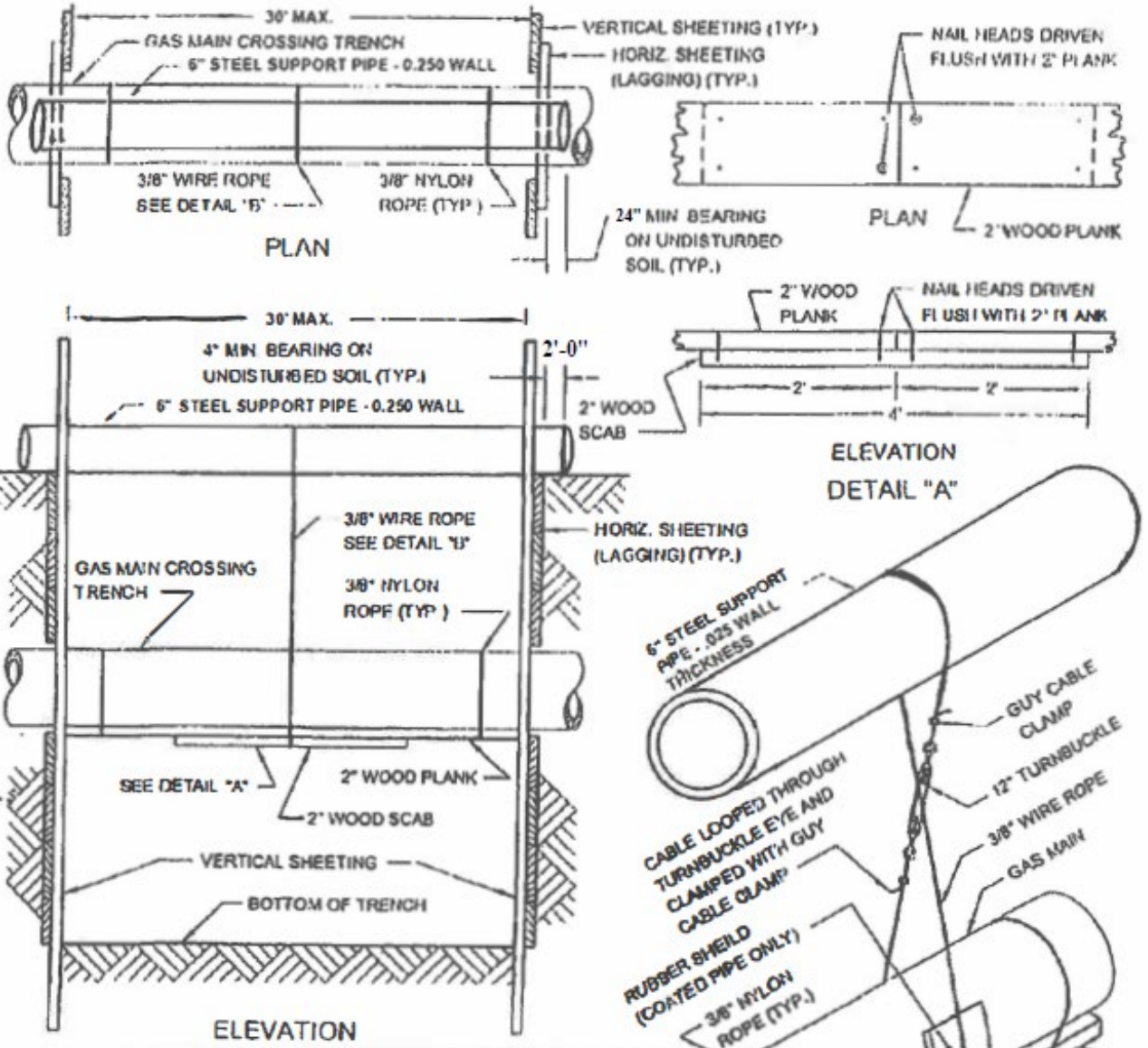
PIPE SIZE	CAST IRON	STEEL	PLASTIC
UP TO 2"	-	10'-0"	3'-0"
3" TO 4"	4'-0"	15'-0"	6'-0"
6" TO 10"	4'-0"	15'-0"	6'-0"
12" OR LARGER	6'-0"	15'-0"	6'-0"

NOTE: SUPPORTS FOR GAS TRANSMISSION FACILITIES SHALL BE REVIEWED WITH GAS ENGINEERING PRIOR TO INSTALLATION.

REVISED DEC. 2019 - LTYP

GAS COST SHARING WORK (SKETCH NO. 1A)

SUPPORT REQUIREMENTS FOR GAS MAINS SUSPENDED IN EXCAVATIONS BETWEEN 12'-0" AND 30'-0" WIDE AT ANY ANGLE

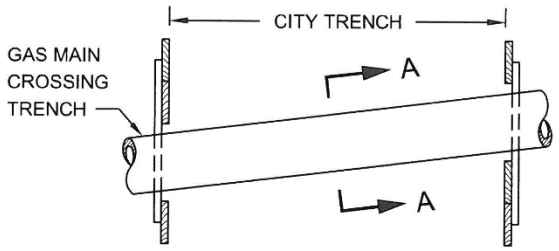


CABLE SUPPORT SPACING			
PIPE SIZE	CAST IRON	STEEL	PLASTIC
UP TO 2"	-	10'-0"	3'-0"
3" TO 4"	4'-0"	15'-0"	6'-0"
6" TO 10"	4'-0"	15'-0"	6'-0"
12" OR LARGER	6'-0"	15'-0"	6'-0"

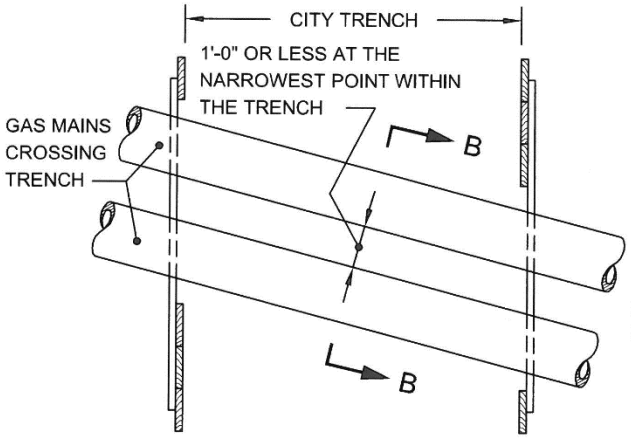
NOTE: SUPPORTS FOR GAS TRANSMISSION FACILITIES SHALL BE REVIEWED WITH GAS ENGINEERING PRIOR TO INSTALLATION.

GAS COST SHARING WORK (SKETCH NO. 2)

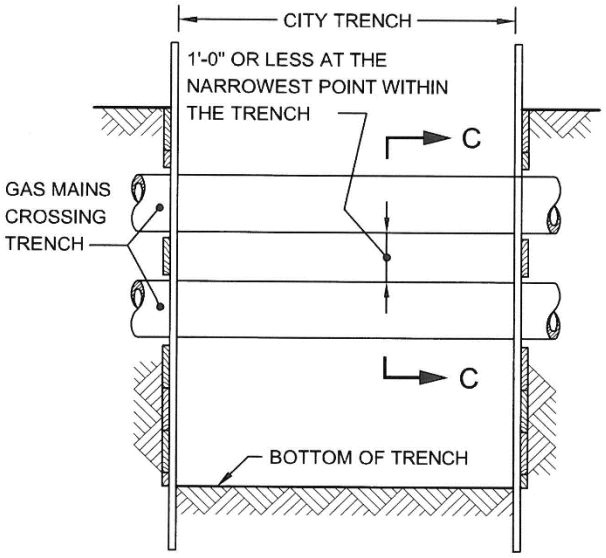
TYPICAL METHODS OF MEASUREMENT FOR GAS CROSSINGS



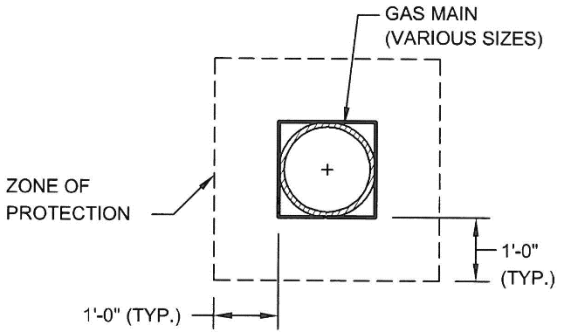
SINGLE FACILITY CROSSING



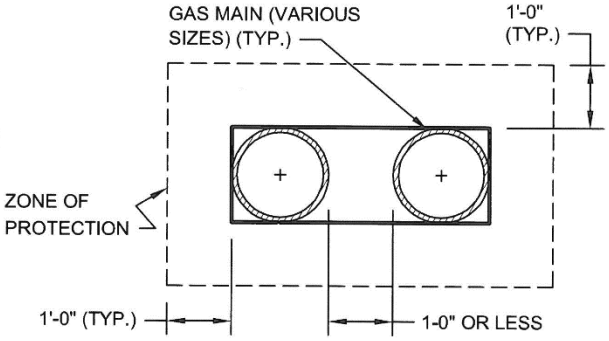
MULTIPLE FACILITIES
(GAS MAINS AT SAME ELEVATION)



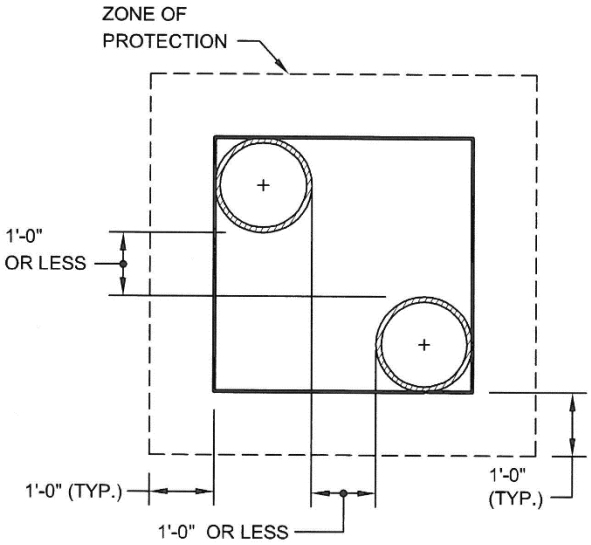
MULTIPLE FACILITIES
(ONE CROSSING AT DIFFERENT ELEVATIONS)



SECTION A-A



SECTION B-B



SECTION C-C

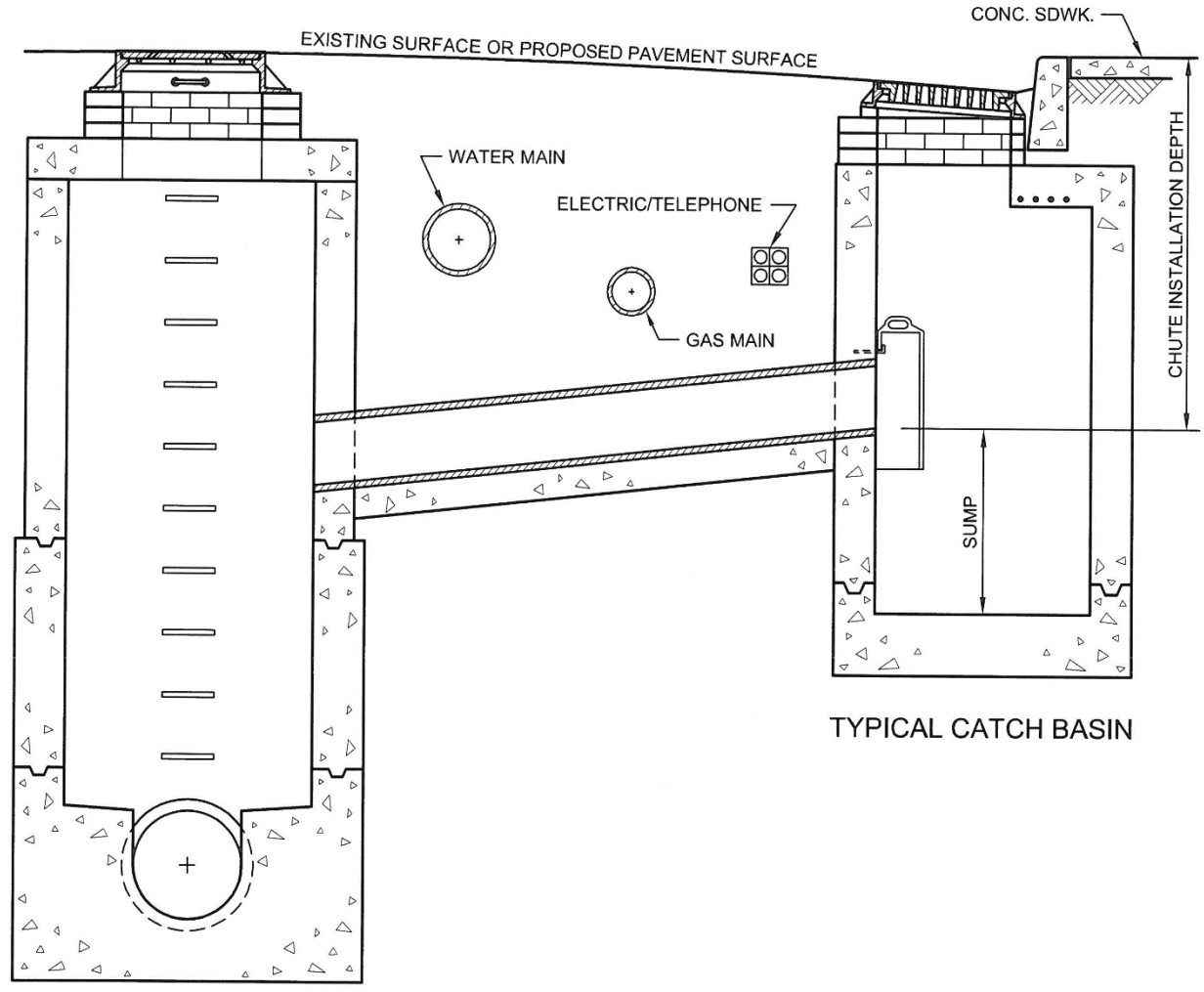
NOTE:

GAS MAINS MAY OR MAY NOT BE PARALLEL
TO EACH OTHER.

REVISED SEPT. 2004 - L. ADRIEN
REVISED SEPT. 2004 - J. WONG/W. PATALANO/P. MOY

GAS COST SHARING WORK (SKETCH NO. 3)

UTILITY CROSSINGS DURING CATCH BASIN CHUTE CONNECTION PIPE INSTALLATION



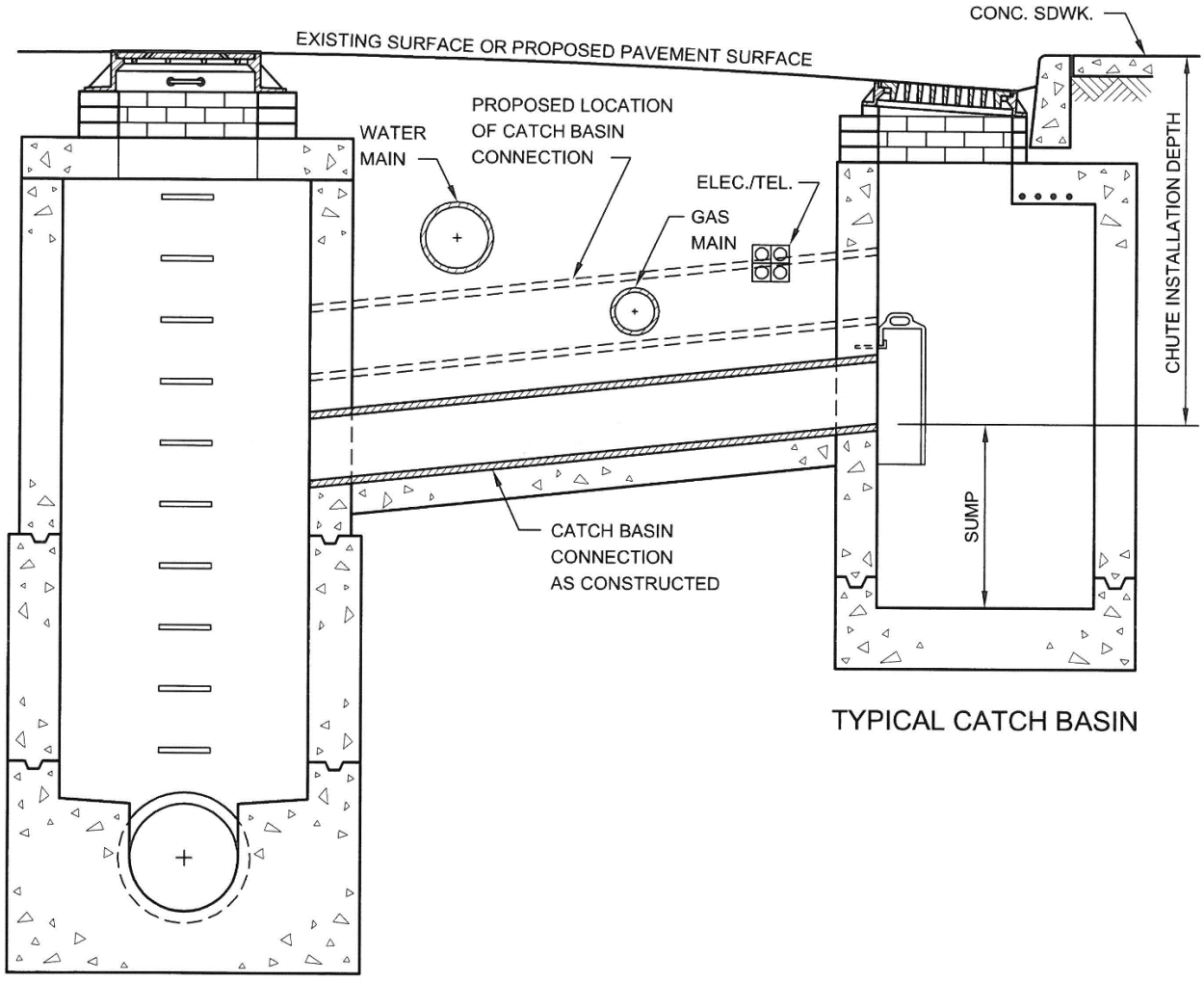
TYPICAL CATCH BASIN

TYPICAL SEWER MANHOLE

REVISED OCT. 2004 - L. ADRIEN
REVISED OCT. 1998 - J. WONG/W. PATALANO/P. MOY

GAS COST SHARING WORK (SKETCH NO. 4)

UTILITY CROSSINGS DURING CATCH BASIN CHUTE CONNECTION PIPE INSTALLATION (EXTRA DEPTH)



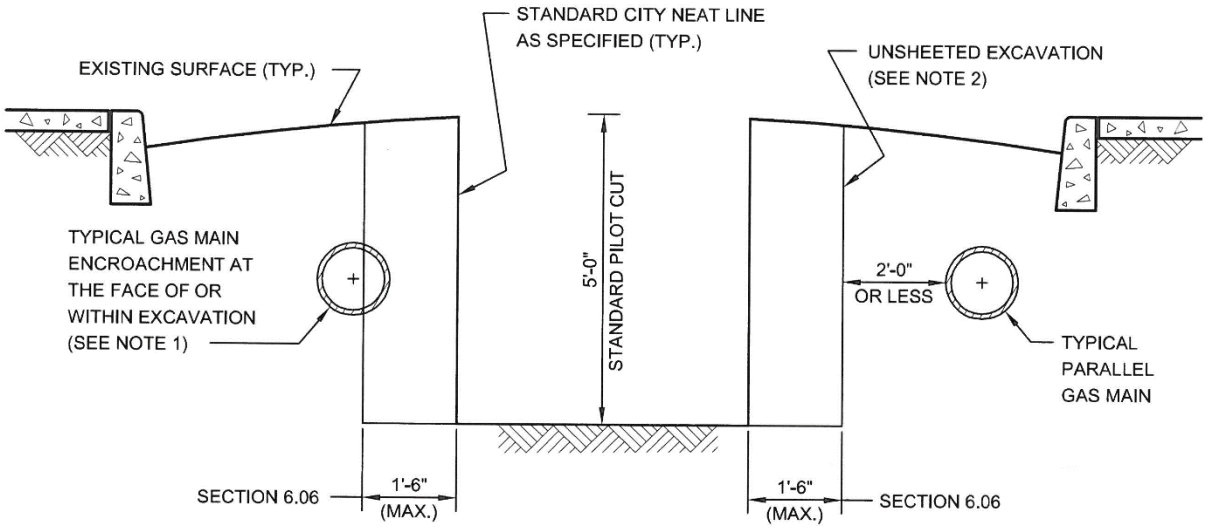
TYPICAL CATCH BASIN

TYPICAL SEWER MANHOLE

REVISED OCT. 2004 - L. ADRIEN
REVISED OCT. 1998 - J. WONG/W. PATALANO/P. MOY

GAS COST SHARING WORK (SKETCH NO. 5)

GAS MAIN ENCROACHMENT ON AND/OR PARALLEL TO EXCAVATION OF UNSHEETED TRENCH



NOTES:

(1) GAS MAIN LOCATED AS SHOWN MAY HAVE TO BE REMOVED BY THE FACILITY OPERATOR PRIOR TO THE START OF CITY EXCAVATION, OTHERWISE, THE CONTRACTOR WILL BE PAID UNDER SECTION 6.06 FOR THE SAID WORK. IF GAS MAIN IS ABANDONED THEN SECTION 6.03 SHALL APPLY.

(2) EIGHTEEN (18) INCHES FROM STANDARD NEAT LINE IS THE MAXIMUM ALLOWABLE WIDTH OF AREA THAT MAY BE DISTURBED OR EXCAVATED DURING INSTALLATION OF CERTAIN TYPES OF SHEETING SYSTEMS THAT MEET THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS OF THE DEPARTMENT OF DESIGN AND CONSTRUCTION OF THE CITY OF NEW YORK.

REVISED OCT. 2004 - I. ADRIEN
REVISED OCT. 1998 - J. WONG/W. PATALANO/P. MOY

V - PRELIMINARY GAS WORK TO BE PERFORMED BY FACILITY OPERATOR.

APPLICABLE TO ALL GAS DRAWINGS:

- ALL RELOCATION WORK SHOWN IN THIS SECTION IS TO BE PERFORMED BY FACILITY OPERATOR.
- ALL SUPPORT AND PROTECTION WORK TO BE PERFORMED BY CITY CONTRACTOR
- IF ADDITIONAL INFORMATION IS NEEDED REGARDING THE FACILITY OPERATOR'S RELOCATION WORK, THE CONTRACTOR IS ADVISED TO CONTACT THE GAS COMPANY REPRESENTATIVE:

Neville Jacobs Jr.
NationalGrid Energy Delivery
287 Maspeth Avenue
Brooklyn, NY 11211
718-963-5612
Neville.Jacobs@nationalgrid.com

(NO TEXT IN THIS AREA, TURN PAGE)

conEdison	LAST REVIEW DATE: 6/27/2024	REVIEW CYCLE:
	EFFECTIVE DATE: 8/29/2024	5 Years

SPECIFICATION: **G-11863-13**

★ **TITLE:** **INSPECTION AND ASSESSMENT REQUIREMENTS ASSOCIATED WITH EXCAVATION ACTIVITIES NEAR GAS PIPELINES AND OTHER HAZARDOUS CONDITIONS, FOR PIPELINES OPERATING AT 125 PSIG AND ABOVE (ENERGIZED & UNENERGIZED)**

VOLUME: **1 and 10**

★ **COURSE ID:** **GAS0413**

★ **REQUIRED TRAINING GROUPS:** **Gas Construction, Gas Distribution Services, Construction Management, Gas Control, The Welding Center of Excellence, Project Management and Customer Programs, Transmission Integrity Management, Transmission Maintenance, Major Projects, LNG, Corrosion Control, Gas Emergency Response Center, Tunnel Maintenance, Field Engineering and System Reliability, Gas Compliance, System Programs, Quality Control, Scheduling and Sequencing, Contractors and Per Diem Contractors**

★ Each group listed is responsible for its own training which may be specific to a title/individual and not to the group in its entirety. Please check with your local training coordinator/department.

SUBSTANTIVE REVISIONS: (See ★)

1) Cover Page - Replaced “Core Groups” and “Target Audience” with “Required Training Groups”. Identified the Required Training Groups. Included terminology for training responsibility. Updated the title of this specification.

2) Section 1.0 - This section was revised to provide clarified on the types of pipelines this specification is applicable too.

SUBSTANTIVE REVISIONS: (Continued)

3)	Section 2.0	-	Reformatted the legal section to match current format. Added in code section 49 CFR 192, Section 615 & 16 NYCRR Part 255, Section 615.
4)	Section 4.0	-	This section was added with this revision. All subsequent sections were renumbered.
5)	Section 5.0	-	This section is new with this revision. All subsequent sections have been renumbered.
6)	Section 6.1	-	Provided details as to what a gas pipeline is. Placed the Note in a text box.
7)	Section 6.2	-	Placed the Note in a text box.
8)	Section 6.6	-	Added in what the acronym GERC stands for.
9)	Section 7.1	-	Added in that the OQ Job Function Matrix can be found on the Gas Hub.
10)	Section 7.5 A)	-	Labelled image “Figure 1”.
11)	Section 7.5 B)	-	Added in that the OQ Job Function Matrix can be found on the Gas Hub. Placed the Note in a text box.
12)	Section 7.7	-	Labelled image “Figure 2”. Added in Figure 3 and the Special Precautions section discussing drip pots. Placed the Note in a text box.
13)	Section 8.2	-	Added in the title of the referenced specification G-11810.
14)	Section 8.3	-	Added in the specification associated for the referenced DOJT GAS0576.
15)	Section 8.5	-	Added in the title of the referenced specification G-11868. Updated the referenced section 8.0 to section 10.0 cause the section has changed.
16)	Section 10.1	-	Placed the Note in a text box.
17)	Section 10.5	-	Added in the title of the referenced specification G-8209.
18)	Section 10.6	-	Updated the referenced section 8.7 to section 10.7 cause the section has changed.
19)	Section 10.7	-	Added in the title of the referenced specification G-11870.

SUBSTANTIVE REVISIONS: (Continued)

20)	Section 10.9	-	Removed the referenced specification title for G-11870 as it is stated in one of the sections above.
21)	Section 10.10	-	Added in the title for the referenced drawing EO-6799-C.
22)	Section 11.0	-	This section was added with this revision. All subsequent sections were renumbered.
23)	Section 13.0	-	Added in referenced specifications G-11884, G-8153 and IP-42. Updated the titles for specifications G-11870, G-8005, G-8209, G-11854, G-11810, G-11814, and EO-6799-C.
24)	Attachment B	-	The title of this attachment was revised.
25)	Attachment D	-	The title of this attachment was revised. All of the flow charts were updated to reflect the current process.
26)	Throughout this specification and accompanying attachments the names of the groups involved were updated to clearly reflect the current process and to ensure each group was referred to correctly. The term “transmission main or TM” was replaced with “Pipeline” throughout since the definition of transmission main is being updated.		

Gas Operations Standards

★ **TITLE:** **INSPECTION AND ASSESSMENT REQUIREMENTS ASSOCIATED WITH EXCAVATION ACTIVITIES NEAR GAS PIPELINES AND OTHER HAZARDOUS CONDITIONS, FOR PIPELINES OPERATING AT 125 PSIG AND ABOVE (ENERGIZED & UNENERGIZED)**

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★ TITLE: INSPECTION AND ASSESSMENT REQUIREMENTS ASSOCIATED WITH EXCAVATION ACTIVITIES NEAR GAS PIPELINES AND OTHER HAZARDOUS CONDITIONS, FOR PIPELINES OPERATING AT 125 PSIG AND ABOVE (ENERGIZED & UNENERGIZED)

★ 1.0 SCOPE

This specification covers the inspection and assessment procedures that Con Edison will perform associated with any excavation activity, manmade condition or natural condition that could potentially impact pipeline integrity within 25 feet of the following gas pipeline types (*referred to as "**Pipeline**" throughout this specification*):

- All energized gas pipelines (including mains, services, regulator laterals, stubs and appurtenances) operating at 125psig and above.
- All mapped unenergized gas pipelines (including mains, services, regulator laterals, stubs and appurtenances) that will be energized and operate at 125psig and above at a future date.

> **Note:** Exceptions for unenergized gas pipelines are noted within the body of this specification.

Inspection activities will also include visual inspection of the pipeline for leakage and condition of pipeline markings.

★ 2.0 LEGAL REQUIREMENTS

Federal: 49 CFR 192, Section 459, 614, 615, 705 and 935
49 CFR 196, All sections

State: 16 NYCRR Part 255, Section 459, 614, 615, 705 and 935.
16 NYCRR Part 753, All sections

3.0 ORGANIZATIONS APPLICABLE

All Con Edison departments (including Gas Operations, Electric Operations and Central Operations) that perform excavation work or have contractors that excavate for them in Manhattan, Queens, the Bronx and Westchester. This

includes all departments that oversee and monitor municipal contractors, Company contractors, third party contractors and Code Rule 753 mark-out vendors (Construction).

Also included are Gas Control; Gas Engineering – Major Projects, Gas Engineering – Transmission Maintenance; Gas Transmission Integrity Management, and Corrosion Control.

★ 4.0 OPERATOR QUALIFICATION

Span of Control means the ratio of nonqualified to qualified individuals allowed for a covered task to be performed. Nonqualified individual(s) may be directed and observed by a qualified individual when performing a single covered task. The qualified individual must be able to effectively respond to errors or abnormal operating conditions that may occur during the performance of the task by the non-qualified individuals. Tapping a pipeline, welding steel, and joining plastic pipe have a span of control of zero. Meaning, the Operator Qualified individual must perform the entire task. Certain other covered tasks also have a span of control of zero, and those are detailed in their applicable specifications and the OQ Written Plan. All other covered tasks shall be completed by either Operator Qualified individuals or individuals under the direct observation of someone who is Operator Qualified. Direct observation means that the Operator Qualified individual remains in direct visual and verbal contact at all times with the individual performing the single covered task. When span of control is being used, both the nonqualified and qualified individuals should be identified on the applicable records being generated, for the work performed under span of control.

5.0 ENVIRONMENT, HEALTH, AND SAFETY (EH&S) REQUIREMENTS

5.1 Prior to starting any task pursuant to this Specification, CECONY personnel should be familiar with the hazards associated with excavations and with the general requirements in CEHSP S13.00 “Excavation and Trenching”. If Company or contractor personnel are performing the excavation activities, these activities are to be in accordance with GEHSI E05.10 “Management of Excavation Soils on Company Property” and GEHSI E05.11

"Management of Excavation Soils on Property Not Owned By The Company".

5.2 Third-party vendors performing functions outlined in this Specification must be in compliance with the requirements in CEHSP A12.03 "EH&S Qualifications for Supplier Procurement and Oversight", including the preparation and approval of an Environmental, Health, and Safety Plan (EHASP). The approved EHASP is to be available on the job location. Job functions pursuant to this Specification are to be performed in compliance with the EHASP.

5.3 All work performed pursuant to this Specification shall be performed with due diligence for the safety of CECONY employees, contractor personnel, the public, and public property.

5.4 Notify the EH&S Control Desk (212-580-8383) immediately if CECONY personnel or company contractor personnel are involved in an accident, injury, or property damage at the job location, as per CEHSP S08.00 "Notification, Reporting, and Recording of Accidents, Injuries, and Property Damage". Contact EH&S Gas Operations Support to initiate the incident investigation.

5.5 Notify the EH&S Control Desk (212-580-8383) immediately if a spill is discovered, as per GEHSI E02.01 "Spill Reporting". Contact EH&S Gas Operations Support for guidance related to spill clean-up.

5.6 Prior to starting any task pursuant to this Specification, Con Edison employees should be familiar with Con Edison's Job Safety Analysis (JSA) library. Any Con Edison employee preparing a job briefing for any task to be accomplished pursuant to this Specification should review the JSA library to determine if there is a JSA applicable to the task. Any relevant JSA found in the library should be discussed during the job briefing for the task. This provision is applicable to Con Edison employees.

6.0 NOTIFICATIONS

★ 6.1 Gas Control, at telephone numbers listed in Attachment C, shall be notified of any excavation activity within 25 feet of the following:

- A gas pipeline operating at 125psig and above.
- An unenergized gas pipeline that will be energized to operate at 125psig or above in the future (i.e. newly installed facilities).

This notification includes **planned and emergency work** by all Company forces, Company contractors, municipal contractors and all third party contractors. Gas Control shall also be notified of **any of the following**:

- known or suspected water leak(s) (main and/or service water leaks);
- sinkholes/depressions;
- facility installation(s) using trenchless technology;
- overhead pole installation work;
- soil borings;
- any work in or around open excavations and backfilling;
- pavement removal or rehabilitation which includes but is not limited to milling and paving, pavement saw cutting, or pavement breaking (jack hammering).

NOTE:	Notifications for permanent paving restoration, including milling and paving, may be made via an email to GasSSGroup@coned.com.

This notification includes any Code Rule 753 mark-out requests by all company crews, contractors, municipalities, or private contractors. This notification shall be emailed to the Gas Sequencing and Scheduling Group.

The notification to the Gas Sequencing and Scheduling Group shall include:

- The location of the work;
- Name and telephone number of the contractor;
- Start and completion dates;
- Brief description of the planned excavation;
- Remarks (e.g. identifying where work will take place);
- Gas transmission main size; and
- M&S plate number

All initial notifications of planned work should be made at least two (2) business days prior to the start of the excavation/work so Gas Sequencing and Scheduling Group can establish a Contingency. Notification will also be required when work is completed.

★ 6.2 Upon notification of any work 25 feet or less from said pipelines, Gas Control shall:

- Review the information acquired in Section 6.1
- Identify the appropriate transmission contingency case(s) which could be used in the event of an emergency*****

*** Note:**	This requirement is not required for unenergized pipelines. Gas Control shall note that "No Contingency Case" is available on Contingency Communication (4.1).

- Log the activity in a Gas Transmission Management System.

6.3 Gas Control shall maintain a Gas Transmission Management System to track all reported 3rd party excavation activity and communicate this activity to the following internal Con Edison groups: Gas Transmission Integrity

Management, Corrosion Control, the applicable Gas Construction and Gas Distribution Services groups, Gas Control and Construction.

6.4 Gas Control shall notify Gas Transmission Engineering –Transmission Maintenance and request a review if it receives any notifications of the following:

- Planned facilities being installed using trenchless technology (microtunneling, directional drilling, pipe bursting, underground piercing tools (a.k.a hole hogging)) that may cross or impact a Pipeline.

- Pile driving, blasting or other conditions that may potentially impact the Pipeline.

6.5 If Gas Control receives notifications of water services or other facilities being installed using trenchless technology (microtunneling, directional drilling, pipe bursting, underground piercing tools (a.k.a hole hogging)) that crosses a Pipeline, they shall notify Gas Transmission Integrity Management to review.

★ 6.6 If Gas Control receives notification of a suspected water leak, the caller shall be instructed to call the Gas Emergency Response Center (GERC) to generate a special surveillance to dispatch Gas Distribution Services (GDS).

- If the water leak is within 25 feet of a Pipeline, Gas Distribution Services or approved company personnel shall perform a gas leak investigation.

- If the water leak is within 5 feet of a Pipeline, Gas Control shall request a review by Gas Engineering - Transmission Maintenance. Based on their inspection, they shall determine the need to excavate.

Upon notification from Gas Control, Construction shall assign full-time inspection of:

A) confirmed water leaks that are within 5 feet of a Pipeline;

B) confirmed water leaks that are within 5 to 15 feet of a Pipeline in which a gas leak is detected in the water leak area.

6.7 Whenever a Pipeline is fully or partially exposed; or damaged (including coating), the group overseeing the work shall notify: Gas Control so the occurrence can be documented; and Corrosion Control to request an inspection of the pipeline coating including any visible metal surface.

6.8 The Gas Sequencing and Scheduling Group shall maintain appropriate mailing lists for their outward communications including routine daily reports.

6.9 Upon notification to Gas Control that work within 25 feet of the Pipeline has been completed, the Gas Sequencing and Scheduling Group shall update their *Gas Contingency Management System* to indicate the completion and/or cancellation of that contingency.

6.10 Gas Distribution Engineering – Maps & Records shall notify Gas Transmission Integrity Management anytime a section of Transmission Main is updated on a gas M&S Plate.

7.0 DAMAGE PREVENTION – EXCAVATION OVERSIGHT INSPECTION

★ 7.1 Definition of Parties performing work in the vicinity of the gas transmission pipeline:

- **1st Party** - Any Con Edison Gas Operator Qualified employee or crew.
- **2nd Party Contractors** - Any Gas Operator Qualified contractor working for Gas Operations or Construction. The Gas Operator Qualified contractor must be qualified as per OQ Job Function Matrix found on the Gas Hub. *"**2nd Party Contractor (G-11863)"**.*
- **3rd Party Contractors** - Any contractor or Company crew which is not Gas Operator Qualified. This includes: Electric and Central Operations

employees and/or Municipal, Telephone, fiber optic, cable company or other contractors and/or personnel working in the vicinity of the Gas Transmission main.

7.2 Prior to any excavation within 25 feet of a Pipeline, a Con Edison Company Authorized Representative shall meet with the excavator at the field site to explain the physical attributes of the Pipeline, such as size, operating pressure, depth of cover, presence of special facilities or appurtenances (regulators, drips, etc.). The Company Authorized Representative shall also discuss limits of excavation and methods and procedures for supporting and protecting the pipeline and facilities.

7.3 Con Edison Company Authorized Representative shall perform a daily visual inspection of all excavation work within 15 to 25 feet of a Pipeline to ensure the contractor's scope of work has not changed; and markings are renewed as required.

7.4 Con Edison Company Authorized Representative shall provide daily updates to Gas Control via phone for all known excavations and work within 25 feet of a Pipeline. Gas Control shall document excavation activities using the "Damage Prevention Checklist" found in Attachment B as a guideline, based on communication with Construction's Company Authorized Representatives. Communications regarding 3rd party excavation activity details reported to Gas Control shall be logged in the *Gas Contingency Management System*.

7.5 Oversight requirements for excavation and other work categories defined in Section 6.1 which falls within 15 feet of a pipeline:

★ A) Anytime **3rd Party Contractor** work is being performed within 15 feet (see Figure 1 below) of a gas Pipeline centerline, Construction shall assign a full-time inspector.

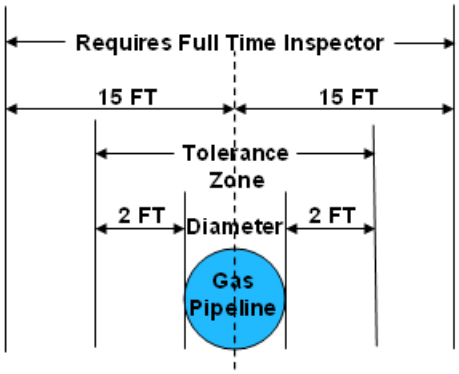


Figure 1

★ B) Anytime **2nd Party Contractor** (Gas Operator Qualified Contractor) work is being performed within 15 feet of a gas Pipeline centerline, an operator qualified Company Authorized Representative from the overseeing company organization shall perform two field inspections of the 2nd Party contractor per shift. The operator qualified Company Authorized Representative must be qualified as per OQ Job Function Matrix found on the Gas Hub. "***Transmission Main Oversight (G-11863)".***

Con Edison Company Authorized Representatives shall provide daily updates to Gas Control via phone, for each excavation oversight inspection performed per shift. Gas Control shall document inspection activities using the "Damage Prevention Checklist" found in Attachment B as a guideline, based on communication with inspector. Communications regarding 3rd party excavation activity details reported to Gas Control shall be logged in the *Gas Contingency Management System*.

NOTE: A full time inspector is not required for permanent paving restoration (milling and paving) within 15' of the gas Pipeline centerline. Locations shall be monitored by the overseeing company organization to ensure work is completed.

C) **1st Party** work within 15 feet of a gas Pipeline centerline shall not require oversight.

For guidance related to this section and for specific circumstances which may not require full coverage, contact Gas Transmission Integrity Management (See Attachment C).

7.6 Inspection process flow diagrams are included in Attachment D of this procedure. These diagrams shall be used as an aid to assist in handling various typical types of excavations and work within 25 feet of a Pipeline. Other non-typical excavations, work, and situations in the vicinity of a pipeline shall be addressed as specified herein or as directed by Gas Transmission Engineering -Transmission Maintenance. The three (3) representative cases covered in the flow diagrams are:

- **Unregistered excavations within 25 feet of a Pipeline** – excavations or work which was **not** reported to Gas Control.
- **Registered excavation activity within 25 feet of a Pipeline** - excavations or work which was reported to Gas Control.
- **Water leaks within 25 feet of a Pipeline** – water main in the vicinity of a Pipeline.

★ 7.7 Allowable Excavation Practices in Vicinity of pipelines

Excavating five feet or more from Pipeline: Powered or mechanical excavating equipment may be used as per Code Rule 753.

Excavating less than five feet from Pipeline: Hand excavation methods shall be used. See Figure 2 below.

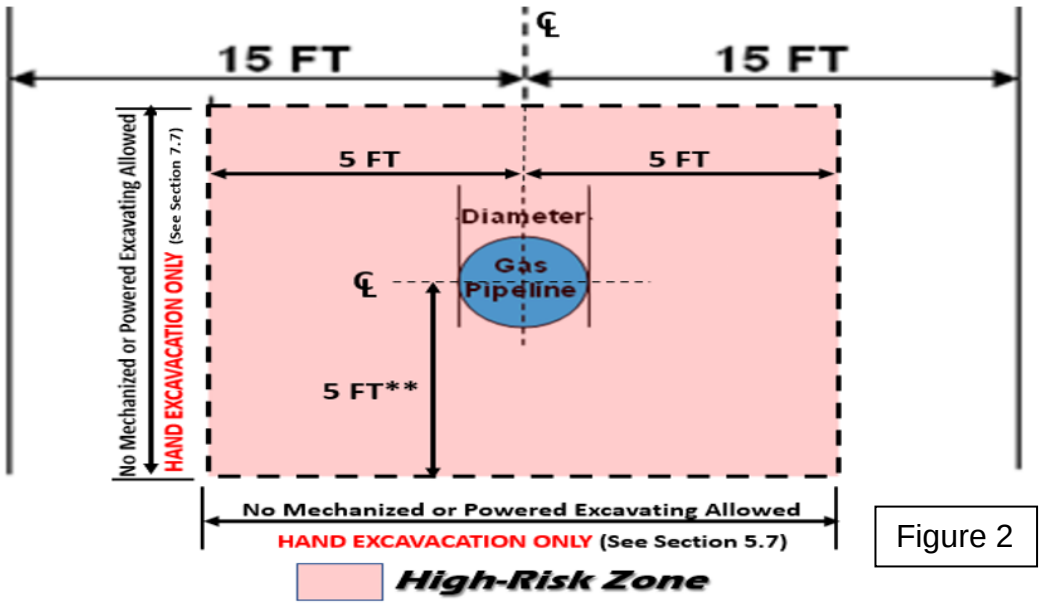


Figure 2

** Pipeline must be located by hand digging prior to use of any trenchless technology installations Within the high-risk zone.

Special Precautions in vicinity of Drip Pots:

Special precautions should be taken in areas of Drip Pots due to the potential presence of small diameter drip pot flushing riser piping that run horizontally on either side or directly above the pipeline. Existence of a valve box at the drip pot and an additional valve box (flush point) situated nearby may be indicative of the presence of drip pot flushing riser piping. Drip pot flushing riser piping lengths may vary in distance from the pipeline/drip pot; and may not be captured on company mapping system. Review company drawings, hand dig to verify the complete path of the riser piping and contact Gas Transmission Engineering if assistance is needed. (See Figure 3 below)

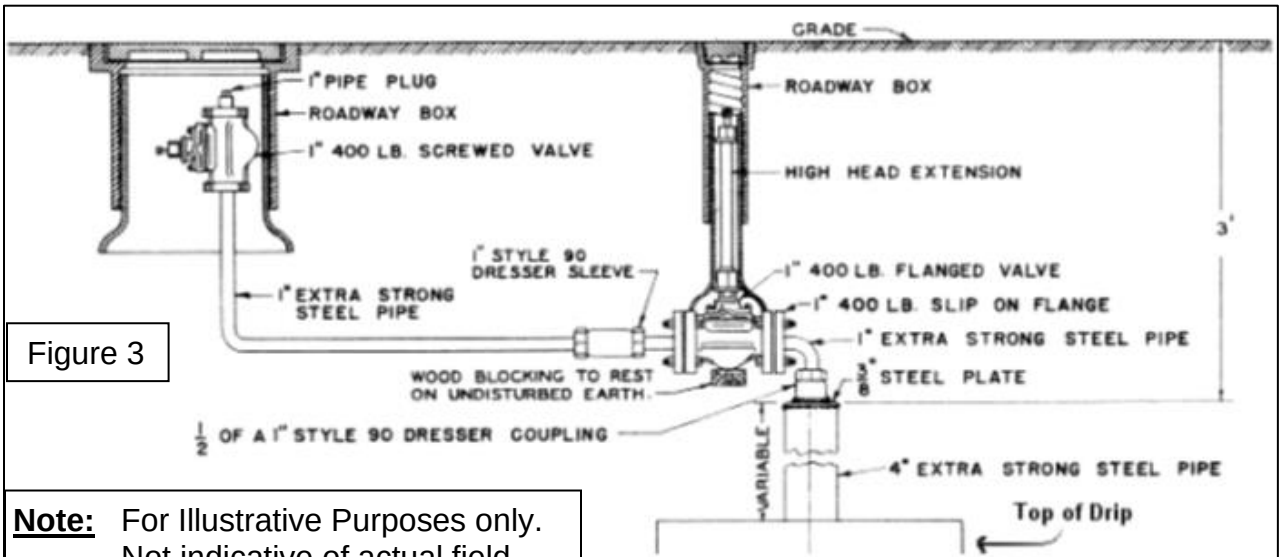


Figure 3

Note: For Illustrative Purposes only. Not indicative of actual field configurations.

Special Cases:

1. Permission to machine excavate less than five feet from the gas pipelines may be granted in special planned cases, given the following criteria:

   - A written request for permission to utilize powered or mechanical excavating equipment within five feet of the Pipeline shall be submitted to Gas Sequencing & Scheduling Group, Gas Transmission Engineering and Gas System Planning no less than five (5) business days in advance of the work.
   - Written permission must be received from the Gas Transmission Chief Engineer.
   - Hand excavation shall be performed to verify the exact location and depth of the Pipeline by exposing the Pipeline as per Code 753.

- Use of powered or mechanical excavating equipment requires a minimum of **12-inches clearance** from the Pipeline, after verifying the exact location of the Pipeline by hand excavation.
- Approved use of powered or mechanical excavating equipment within five feet of the Pipeline requires staffing of isolation valves (contingency valves) coordinated by Gas Control.
- The Pipeline should be protected from damage (i.e. sandbags, plating, sheeting, etc.) and supported as required following exposure and for the duration of work.

2. Permission to machine excavate less than five feet from a pipeline may be granted in special cases during system emergencies given the following criteria:

   - An emergency situation (ex: Transmission Leak) where the transmission main has been lowered to an operating pressure below 125psig and coordinated with Gas Control.
   - Written permission has been received from the Gas Transmission Chief Engineer.
   - As required by Code Rule 753, hand excavation shall be performed until the exact location of the pipeline is determined before powered equipment can be used within the tolerance zone (one half of the pipe diameter plus two feet). A minimum of **4 inches clearance** from a Pipeline shall be maintained after verifying the location.

Use of powered or mechanical excavating equipment within five feet of the Pipeline is considered high risk due to the potential existence of unmapped pipeline appurtenances (High-Hats, side-out fittings, stubs, etc.) protruding from the pipeline body. Extreme caution and preplanning shall be required as follows:

NOTE: 3rd Party Contractors should be made aware of CECONY stringent excavation requirements in the vicinity of Pipelines by Gas Control and/or Con Edison field oversight personnel.

Construction must also witness and report to Gas Control on backfilling activities to assure adequate support and to prevent large rocks or other injurious debris (e.g. wood, asphalt, rags, etc.) from being placed in contact with the Pipeline.

7.8 Gas Control shall arrange for crews to staff valves whenever an excavator is using mechanical excavation equipment within five feet of a Pipeline or whenever any heavy mechanical construction work is being performed within five feet of a Pipeline (e.g. lifting/placing of heavy materials that could potentially damage the Pipeline). They shall also arrange for valve crews when otherwise requested by Gas Engineering – Transmission Maintenance or Gas Transmission Integrity Management .

The local Gas Operations area shall verify the locations and accessibility of the isolation valves (except Remote Operating Valves (ROVs)). When crews are staffing valves. Construction shall maintain a full-time inspector who shall maintain communication with Gas Control. Gas Control shall direct gas field crews as required.

7.9 For excavations parallel to and within 5 to 15 feet of a Pipeline and within the angle of repose of a pipeline, Construction shall contact Gas Control, who shall advise Gas Engineering -Transmission Maintenance. If the pipeline is within the angle of repose and the excavation is longer than shown in the table below, Gas Transmission Engineering –Transmission Maintenance shall discuss the project with Construction to evaluate sheeting being used, type of soil, method of excavation and other field conditions. When warranted, field visits shall also be made by Gas Transmission Engineering - Transmission Maintenance with Construction.

The need for follow-up visits by Construction shall be jointly determined after the discussion and/or field visit.

Pipe Size	Length of Excavation
8" or less	20 feet
12"	30 feet
16"	35 feet
20" or larger	40 feet

7.10 For all third party boring activity within 15 feet of a pipeline, Con Edison's Facilities Protection Group must perform all pipeline mark-outs using a conductive locating technique. The Con Edison construction representative on location shall confirm that the main has been marked out using a conductive method. If the vendor is not capable of conductively locating the main, Corrosion Control must be contacted to locate the main.

If Corrosion Control cannot conductively mark out the pipeline, the Con Edison construction group on location must contact Gas Transmission Engineering – Transmission Maintenance. Transmission Maintenance will decide if a test pit is required to verify the Pipeline location before the boring activity can begin. The construction group on location will be responsible to coordinate and perform test pits and make all proper notifications to Gas Control.

8.0 DAMAGE PREVENTION – PIPELINE PATROLS AND FOLLOW-UP ACTIONS

8.1 Corrosion Control shall patrol the routes of all pipelines (mains, services, regulator laterals, stubs and appurtenances) on a weekly basis not to exceed 12 calendar days; and daily in Manhattan by Gas Distribution Services (GDS).

★ 8.2 The patrol (visual survey) shall be conducted to observe surface conditions for evidence of construction activity or any other hazardous condition along the route of all pipelines operating at 125psig or greater, as per G-11810 "Procedure for Inspection and Maintenance of Gas Pipelines Operating at

125 PSIG or More", in all four gas operating areas. Their observations shall be recorded, and the records retained for the lifetime of the pipeline. The patroller shall have up-to-date M&S Plates (hard copy or electronically) in their possession for the pipeline being patrolled. The Patroller shall also use the *Gas Contingency Management System* established by the Gas Sequencing and Scheduling Group, during patrol of the pipelines to identify excavation work that is not on the list (Unregistered Excavation).

★ 8.3 The patrol shall include observation and reporting of potential hazards such as the following:

- Construction activity and other factors that would affect the pipeline integrity or operation by one or more of the following:
    - Damage to the pipe;
    - Loss of support due to settlement or shifting of soil around the pipe;
    - Undermining or damage to pipe supports;
    - Loss of cover; or
    - Excessive fill
    - Abnormal conditions that could potentially affect the pipe
- Evidence that excavation, grading, demolition, or other construction activity may take place or has taken place, such as the presence of any new patches, cuts, excavations, or steel plates over the pipeline not previously reported or listed in the - *Gas Contingency Management System*. (Unregistered Excavation)
- The presence and condition of pipeline markers including signs at submarine crossings.
- Land subsidence, earth slippage, soil erosion, flooding, climatic conditions, and other natural causes that can result in impressed secondary loads.

- The presence of suspected water leaks, which may include sunken depressions and visible water at street surface. The patroller shall immediately notify the GERC, who shall notify the DEP and municipalities, regarding any suspected water leaks.
- Location of roadway or sidewalk depressions, sinkholes, and cave-in over or within 5 feet of the pipeline. The patroller shall notify the GERC. Reference DOJT GAS0576 for specification G-11884 "Sinkholes/Street Collapses and Roadway Depressions near Gas Facilities".
- The presence of bubbles at any submarine crossings that might indicate a gas leak (visual Inspection for leakage). The patroller shall notify the GERC.
- Damage to casing vents and leakage from encased pipe. The patroller shall notify the GERC.
- Areas of continual earth moving activities, such as quarries and industrial plants or large construction sites which may require special attention.

8.4 If a leak or some other situation that presents an immediate danger to the pipeline is discovered, the patroller shall immediately notify Gas Control and standby for further instructions. The patroller should make every attempt to stop work or other situations that are presenting immediate danger to the pipeline, including requesting Fire Department assistance to protect the pipeline until further instructions are provided.

★ 8.5 If a recent patch or plate is within 25 feet of a Pipeline that was not previously identified in the *Gas Contingency Management System*, the patroller shall notify Gas Control, who shall request a review by Construction. If Construction determines an excavation was performed and not covered by Con Edison personnel within 5 feet of a Pipeline, the Gas Sequencing and Scheduling Group shall identify the location as an "unregistered excavation" and contact Corrosion Control to perform an indirect inspection tool survey (Close Interval Survey – CIS) of the pipeline. Survey indication classification and indirect inspection prioritization shall be in accordance with G-11868 "External Corrosion Direct Assessment (ECDA) Process for Buried Onshore Gas Transmission Pipelines"– Table 1

& Table 2. "Unregistered excavation" locations may be required to be excavated to perform a detailed pipeline integrity assessment to ensure that the Pipeline and its associated appurtenances have not been damaged.

The indirect inspection tool survey shall be performed within fifteen (15) calendar days of the date the patch or plate was discovered. Results of this survey will be used in determining the scheduling of excavation based on indication severity. An indirect inspection tool survey will not be required if the location is excavated for direct assessment/examination within fifteen (15) calendar days of the date the patch or plate was discovered. Refer to Section 10.0 for specifics on Direct Assessment requirements and scheduling.

8.6 Gas Transmission Integrity Management may require excavation of "unregistered excavation" locations to perform a detailed pipeline integrity assessment to ensure that the Pipeline and its associated appurtenances have not been damaged. Gas Transmission Integrity Management shall work with Construction and/or Gas Operations to excavate the locations as required.

9.0 DAMAGE PREVENTION – MARK-OUT VERIFICATION

9.1 Corrosion Control shall monitor/verify the accuracy of the mark-outs completed by Con Edison's Code Rule 753 vendor(s) for any excavation activity within 25 feet of a Pipeline. A minimum of 15% of planned mark-outs shall be monitored for accuracy. A planned mark-out is defined when notification is received at least 48 hours prior to the commencement of excavation activity. The monitoring can be performed before, during or after excavation as long as the mark-outs are still visible.

9.2 If a discrepancy (more than 2 feet) is found, Corrosion Control shall immediately notify Construction and Gas Distribution Engineering - Maps & Records for a resolution. Maps & Records shall correct any confirmed mapping errors. Gas Transmission Integrity Management shall maintain records of all locations verified for the lifetime of the pipeline.

9.3 For all third party boring activity within 15 feet of a pipeline (in all areas excluding Manhattan), Con Edison's Facilities Protection Group must perform all Pipeline mark-outs using a conductive locating technique. The Con Edison Construction Company Authorized Representative on location shall confirm that the main has been marked out using a conductive method. If the vendor is not capable of conductively locating the main, Corrosion Control must be contacted to conductively mark out the main.

If Corrosion Control cannot conductively mark out the Pipeline, the Con Edison construction group on location must contact Gas Transmission Engineering – Transmission Maintenance. Transmission Maintenance will decide if a test pit is required to verify the Pipeline location before the boring activity can begin. The construction group on location will be responsible to make all proper notifications to Gas Control, and coordinate with the area Construction Management group to perform test pits.

9.4 For all third party boring activities within 15 feet of a Pipeline in Manhattan, Con Edison's Facilities Protection Group must contact Transmission Maintenance, who will determine the additional requirements for locating the main (i.e. test pitting, toning, etc.). The construction group on location will be responsible for coordinating the appropriate locating procedure.

10.0 PIPELINE DIRECT ASSESSMENT

★ 10.1 Gas Transmission Integrity Management shall arrange for a pipeline integrity investigation excavation (test pit) when an "unregistered excavation" (i.e. unknown patch, plate or unmonitored excavation) is discovered over or within 5 feet of a pipeline as reported to them. Gas Transmission Integrity Management shall work with Construction and/or Gas Operations to excavate the locations as required.

Scheduling locations for excavation and direct assessment shall be based on indirect inspection tool survey indication severities in accordance with the following:

- "Immediate" tool indications, which may be indicative of severe coating damage and potential 3rd party damage, shall be scheduled to be excavated within sixty (60) calendar days (system condition permitting).

- "Scheduled" or "Monitored" indications shall be completed as soon as possible (system condition permitting) but not to exceed 180 days from date of discovery.

> **NOTE:** Excavation of locations not exhibiting any indications shall not be required.

The Pipeline must be fully exposed and examined for coating and/or pipe damage, unless Company personnel (Corrosion Control, Construction, Gas Transmission Integrity Management, etc.) can provide verification or documentation that the pipeline was not exposed by 3rd party activity. A pipeline integrity investigation excavation (test pit) shall also be requested when a water service crossing a Pipeline was installed using trenchless technology.

10.2 Gas Transmission Engineering - Transmission Maintenance or Gas Transmission Integrity Management shall review any reports of defects or damage to the pipeline. They shall also determine what corrective actions, if any, are needed. A report of their review and the corrective actions taken shall be prepared and maintained for the life of the structure.

10.3 Water impingement rubber mat(s) (Class & Stock #: 059-5306) shall be installed between water facilities and the pipelines, anytime a water service or main crosses (above or below) the gas pipeline.

Where possible, a minimum clearance of 12 inches must be maintained from any water main or service. If this clearance cannot be maintained, rubber matting (2' X 2' X 1/2" thick mat, class and stock #059-5306) must be installed. The matting shall be installed either horizontally over/under the gas main or vertically alongside the gas main (DO NOT wrap the rubber mat around the gas main). The rubber matting shall be installed a minimum

of 2 inches from the gas main and shall not be installed "edge to edge". When more than one rubber mat is installed to protect the gas, the mats shall overlap a minimum of 6 inches.

10.4 Installation of Phenolic boards shall be installed between subsurface structures (including electric facilities) when clearances are less than 12 inches. If 12 inches clearance cannot be maintained, then a minimum clearance of 2 inches is acceptable, provided that the service is properly protected (e.g. with phenolic board - 1' X 2' - class and stock #596-4473; 1' X4' - class and stock #596-4432) from damage that might result from the proximity to the other structure.

★ 10.5 If a Pipeline is exposed, a qualified Corrosion Control employee shall visually inspect the coating of the exposed surface and determine if further excavation and a full direct assessment inspection is required. Visual inspection of the exposed pipeline shall be documented on the "Pipeline Visual Inspection Form" located in Attachment A.

A) Visual inspections that do not reveal coating and/or pipeline anomalies shall require completion of the "Pipeline Visual Inspection Form" located in Attachment A.

B) Visual inspections that reveal coating and/or pipeline anomalies shall be reviewed by a qualified Corrosion Control employee to determine if the entire circumference of the pipe should be excavated and a full direct assessment inspection performed.

- Visual inspections that reveal minor coating anomalies (with no pipeline anomalies) do not require a full direct assessment inspection or excavation of the entire pipe circumference. These findings shall require completion of the "Pipeline Visual Inspection Form" located in Attachment A and repair with mastic in accordance with G-8209 “Preparation and Field Coating of Gas and Other Steel Pipes Installed Aboveground and Underground”.

A minor coating anomaly is defined as an area of the coating which has damage such as a scrape, scratch, abrasion, etc.

The underlying steel pipe surface has not been exposed, scratched, scraped, defaced, etc. as determined by the inspection performed by a qualified Corrosion Control employee.

- Visual inspections that reveal coating and/or pipeline anomalies that may require further investigation shall require a full direct assessment inspection. A qualified Corrosion Control employee shall inspect the coating and pipe; and document the inspection on the "Direct Assessment Data Collection Form" in accordance with G-11868 (Attachment B) and Con Edison's Transmission Integrity Management Plan (Chapter 7). Associated activities performed by a qualified Corrosion Control employee shall include, but are not limited to, the following:
  - Arrange for the entire circumference of the pipe to be excavated.
  - Arrange for the appropriate level of coating removal/abatement and/or pipe cleaning in order to perform an accurate inspection.
- Coating that is inspected and found to be sound and well adhered to the pipe does not require removal unless required by the qualified Corrosion Control employee to perform an accurate inspection of the pipeline or its coating.
  - Gather all pertinent data (field measurements, pipe anomaly measurements, field testing, and photographic documentation) necessary to analyze the integrity of the affected section of gas main.
  - Arrange for coating repairs.
  - Document all inspections and file a copy of the Direct Examination Data Collection Form in the appropriate pipeline integrity file.

★ 10.6 Upon notification of the anomalous condition and receipt of pertinent pipe inspection data (Direct Examination Data Collection Form, etc.), the Anomaly Review Team shall evaluate any potential threat to pipeline integrity and determine through remaining strength calculations (as per section 10.7) whether the affected pipeline section can safely remain in-service, requires remediation, or shall be protected by an immediate pressure reduction commensurate with the remaining strength of the pipe. Results of the evaluation and action recommendations shall be communicated to the Chief Gas Transmission Engineer via email for approval.

★ 10.7 When a corrosion pipe anomaly is discovered on a pipeline, the Anomaly Review Team shall calculate its remaining strength from the remaining wall thickness and geometry of the corroded area in accordance with methodology described in Chapter 10 of the Transmission Integrity Management Plan (i.e. this methodology is based on ASME B31G "Manual for Determining the Remaining Strength of Corroded Pipelines, A Supplement to ASME B31 Code for Pressure Piping") or an equivalent method.

A) Any corrosion that results in a local wall thickness less than the mill tolerance of new pipe is deemed significant and requires an evaluation of the strength of remaining metal at the corroded area.

B) The applicability of ASME B31G is limited to evaluating the remaining strength of steel pipe damaged by corrosion pitting or general area corrosion. (Corrosion pitting that is closely grouped and affects the overall strength of the pipe is considered general area corrosion.)

C) The remaining strength evaluation of steel pipe with anomalies other than corrosion, such as mechanical damage (e.g. dent, gouge, scratch, or groove) caused by a third party, defective welds, arc burns, cracks, or manufactured defects, cannot be evaluated using ASME B31G. These anomaly types shall be assessed in accordance to G-11870 "Integrity Assessment and Repair of Steel Gas Transmission Pipelines Operating at 125 PSIG or More" by the Anomaly Review Team or an approved metallurgical vendor.

10.8 Documentation of integrity assessment, analysis, and recommendations shall be maintained by the Anomaly Review Team in accordance with Con Edison's Transmission Integrity Management Program (IMP), Chapters 7A and 10.

★ 10.9 Anomalies shall be repaired in accordance with G-11870.

★ 10.10 Steel plates shall be installed to provide protection, if feasible, whenever company forces or company contractors expose a pipeline. If other subsurface structures interfere with the installation of protection plates and the subsurface structures are located above the pipeline(s), Gas Engineering – Transmission Maintenance must be notified. Refer to EO-6799-C "Protective Covers for Gas Main and Service Installations" for plate installation.

★ 11.0 EXCAVATION OVER POTENTIAL PIPELINE LEAK AT FULL OPERATING PRESSURE

With approval from Gas Engineering Major Projects or Transmission Maintenance, the below steps should proceed while an IP-9 procedure is being developed:

- Identify contingency valves
- Request planning study
- Evaluate embedment and pipe geometry per G-8153 "Reinforcing Non-Restraining Compression Fittings".
- Staff contingency valves
- Remove pavement with the use of pavement breakers
- Excavate by hand (Vac truck is considered hand excavation)
- Continuously monitor the excavation and refer to IP-42 "Requirements for Airline Respirators (ALR), Flame Retardant Coveralls (FRC), Harness & Line (H/L), Harness & Gantry (H/G) and Continuous Atmospheric Monitoring (CAM)" for PPE.

12.0 RECORDS RETENTION

Any records generated in the course of performing work in accordance with this specification shall be maintained as required by Corporate Instruction CI-870-1 "Records Management". Guidance on the retention of Company Gas Operations records can also be found on the Records Management intranet site

★ 13.0 REFERENCE SPECIFICATIONS AND CORPORATE INSTRUCTION

EO-6799-C	-	Protective Covers for Gas Main and Service Installations
G-11810	-	Procedure for Inspection and Maintenance of Gas Pipelines Operating at 125 PSIG or More
G-11854	-	Installation, Inspection and Maintenance of Pipeline Markers and Signs for Gas Transmission and Distribution Mains
G-11868	-	External Corrosion Direct Assessment (ECDA) Process for Buried Onshore Gas Transmission Pipelines
CI-870-1	-	Records Management
G-11870	-	Integrity Assessment and Repair of Steel Gas Transmission Pipelines Operating at 125 PSIG or More
G-11884	-	Sinkholes/Street Collapses and Roadway Depressions Near Gas Facilities
G-8005	-	General Specification for the Installation of Gas Distribution Mains
G-8153	-	Reinforcing Non-Restraining Compression Fittings
G-8209	-	Preparation and Field Coating of Gas and Other Steel Pipes Installed Aboveground and Underground

IP-42	-	Requirements for Airline Respirators (ALR), Flame Retardant Coveralls (FRC), Harness & Line (H/L), Harness & Gantry (H/G) and Continuous Atmospheric Monitoring (CAM)
ASME B31G	-	Manual for Determining the Remaining Strength of Corroded Pipelines
TIM Plan	-	Transmission Integrity Management Plan
OQ Job Function Matrix	-	OQ Job Function Matrix

14.0 ATTACHMENTS

	Attachments A	Pipeline Visual Inspection Form
★	Attachments B	Damage Prevention Checklist for Construction and Gas Control for Excavations Within 25 Feet of Pipeline Described in G-11863 (Section 1.0)
	Attachments C	Contact Information - Gas Operations
★	Attachments D	Process Flow Diagrams

ATTACHMENT A

PIPELINE VISUAL INSPECTION FORM

1. GENERAL INFORMATION

Location (Dimension /Street):

Date of Inspection:

Technician(s)/Inspector(s):

Contingency Number:

Pipeline Section: **Segment:**

Corrosion Section: **Segment:**

Pipe Diameter: **inch**

Reason for Excavation: (Check One)

- ☐ **3rd Party Excavation**
- ☐ **Planned Gas Work**
- ☐ **Contingency/Patrol Finding**
- ☐ **Other**

Supervisor Review:

Date of Review:

2. ACCESSIBILITY

Is pipeline accessible for a visual inspection?

☐ **YES** **Continue to Section 3**

☐ **NO** **Explain in Remarks/Notes below**

3. VISUAL INSPECTION

Coating or pipeline damage or anomaly?

☐ **NO** **Inspection Complete.**

☐ **YES; Minor coating damage only**
- Coating Repair completed? ☐ **YES** ☐ **NO**

☐ **YES; damage or anomaly is not minor** **Perform full direct assessment; document on "*Direct Assessment Data Collection Form*".**

Remarks/Notes:

4. HAND SKETCH AREA

(E, W, N, S) ⟶

NOTE: Photos supporting findings should be taken and filed with this inspection form.

★ ATTACHMENT B

DAMAGE PREVENTION CHECKLIST FOR CONSTRUCTION AND GAS CONTROL GROUP FOR EXCAVATIONS WITHIN 25 FEET OF A PIPELINE DESCRIBED IN G-11863 (SECTION 1.0)

Gas Control shall document the following information for each known excavation within 25 feet of a Pipeline:

- **Location**
- **Work Description**
  - **Excavation Type (Hand/Machine)**
  - **M&S Plate Number**
  - **Facility Main Size**
  - **Called In By:**
- **Code 753 Ticket Number**
- **Transmission Contingency Case Number**
  - **Valve Number/Segment**
  - **Is staffing of valves required?**
- **Contractor's Name**
- **Contractor's Contact Info**
- **Project Start Date**
- **Project Completion Date**
- **Inspector's Name**

When applicable, the following items shall be addressed by either Construction, Gas Operations, etc., for each known excavation within 25 feet of a Pipeline main as noted:

- **The location is monitored daily by Construction and mark-outs are renewed as required until start of excavation;**
- **The physical attributes (size, pressure, cover, etc.) of the main we are protecting from damage is communicated by Construction to the excavator;**
- **The methods and means for supporting and protecting the main is reviewed with the excavator by Construction;**
- **That, if the excavation is within 15 feet of the pipe centerline, Construction has assigned a fulltime inspector to the location throughout the excavation or other heavy mechanical construction work ;**
- **That, if the excavation is a boring excavation, and is within 15 feet of the pipe centerline, the 753 Mark Out has been performed using a conductive mark out method.**
- **That, if the excavation or other heavy mechanical construction work is within 5 feet of the pipe centerline, Gas Operations shall standby the valves during excavation;**
- **That, if the pipe is/was exposed, Corrosion Control is notified to inspect the pipe;**
- **That, if the pipe was exposed and following inspection, Construction documents any damage to the pipe and/or coating by the excavator;**

★ ATTACHMENT B

DAMAGE PREVENTION CHECKLIST FOR CONSTRUCTION AND GAS CONTROL GROUP FOR EXCAVATIONS WITHIN 25 FEET OF A PIPELINE DESCRIBED IN G-11863 (SECTION 1.0)

- **That, if the pipe was exposed and following inspection, Construction inspector has witnessed the backfilling operation to ensure no large rocks or other injurious material are placed against the pipe and that protection plates have been installed as per Section 10.10.**

NOTE: Code 753 information should be provided as soon as possible for emergency or short lead time work

ATTACHMENT C

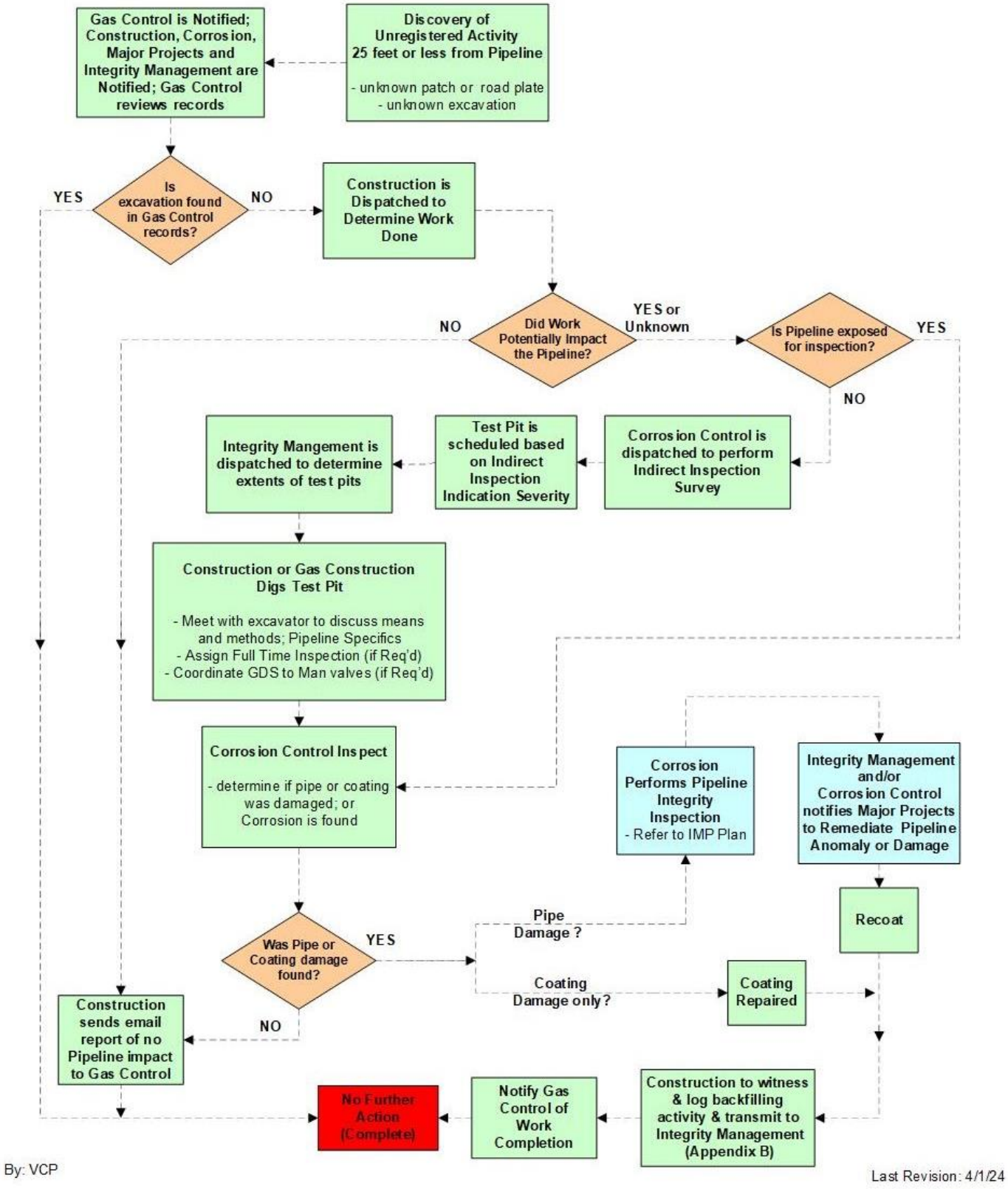
CONTACT INFORMATION – GAS OPERATIONS

Section	Contact Information
Gas Engineering – Major Projects (Section 002)	dlgastransengmajorprojectsall@coned.com
Gas Engineering – Transmission Maintenance (Section 003)	dl-gasengtm-mgmt@coned.com
Gas Engineering Gas Integrity Management - (Section 633)	dl-PipelineIntegrity@coned.com
Corrosion Control	dl-corrosionmanagement@coned.com
Leak Survey	dl-leakagesurvey2@coned.com
Gas Control Contingency Numbers	Bronx: 718-319-5447 Queens: 718-319-5492 Manhattan: 718-319-5481 Westchester: 718-319-5498
Gas Sequencing & Scheduling Group	GasSSGroup@coned.com

★ ATTACHMENT D

PROCESS FLOW DIAGRAMS

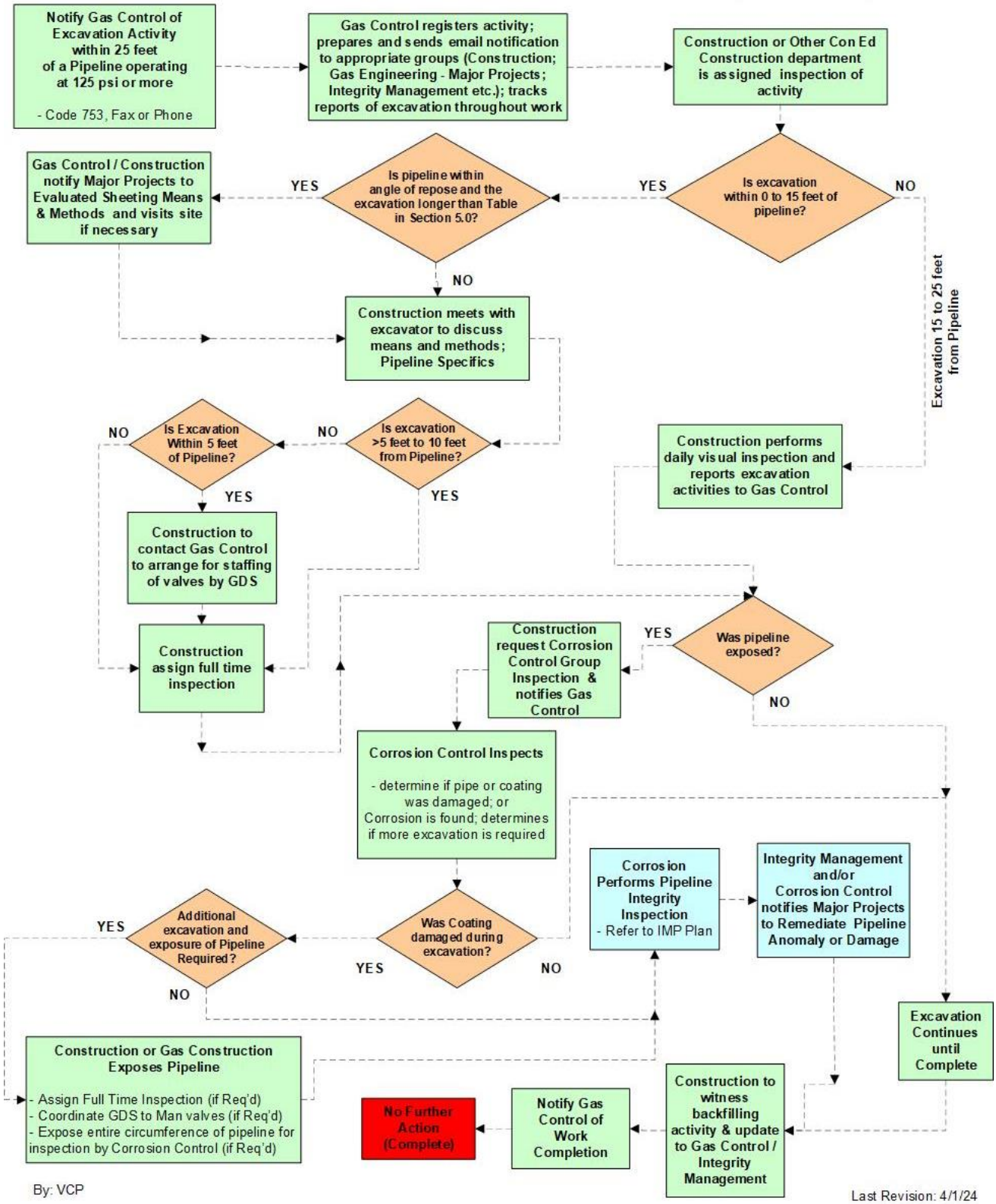
UNREGISTERED EXCAVATION ACTIVITY WITHIN 25 FEET OF ENERGIZED & UNENERGIZED PIPELINE DESCRIBED IN G-11863 (SECTION 1.0)



★ ATTACHMENT D

PROCESS FLOW DIAGRAMS

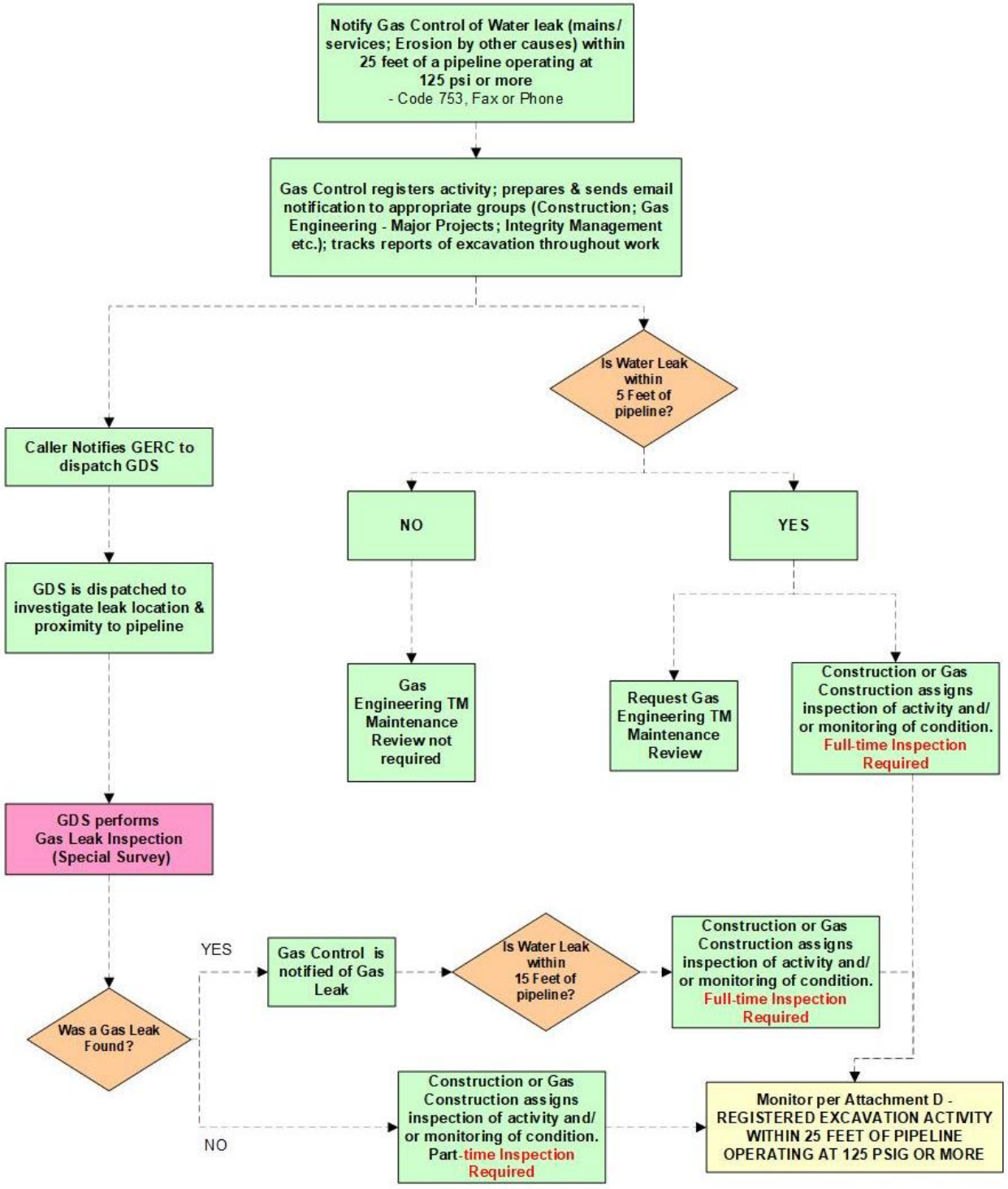
UNREGISTERED EXCAVATION ACTIVITY WITHIN 25 FEET OF ENERGIZED & UNENERGIZED PIPELINE DESCRIBED IN G-11863 (SECTION 1.0)



★ ATTACHMENT D

PROCESS FLOW DIAGRAMS

WATER MAIN LEAKS WITHIN 25 FEET OF ENERGIZED & UNENERGIZED PIPELINES DESCRIBED IN G-11863 (SECTION 1)



By: VCP

Last Revision: 4/1/24

conEdison

Corporate Instruction

SUBJECT

GAS FACILITIES—CLEARANCES, ENCROACHMENTS, INTERFERENCE, CORROSION AND INSPECTIONS

1.0 **PURPOSE** -- In accordance with the Rules and Regulations of the State of New York NYCRR 16 Part 255 (Sections 325, 361, 459, 475, 604, 755, 756, and 757), PSC Case 14-G0212, and the Code of Federal Regulations 49 CFR 192.325, 361, 459, 475, 465, 604 and 755, this Instruction establishes procedures for:

a. Documenting and taking necessary action to maintain sufficient clearances for new installations between gas facilities and sub-surface facilities.

b. Inspecting and documenting the conditions of existing gas main cover; clearance concerns; and application of phenolic board, rubber matting, and steam blankets when found in excavations during the normal course of business.

c. Identifying and correcting encroachments on cast iron gas facilities caused by excavation within the Company's gas franchise areas.

d. Examining exposed steel gas facilities for evidence of external and/or internal corrosion.

e. Documenting actions taken when exposed electric conduit or cable is found in deteriorating condition and is within 12 inches of gas facilities.

f. Notifying Gas Control, Gas Operations, for excavation work within 25 feet of any gas facility operating at 125 pounds per square inch gauge (psig) and above.

g. Inspectiing and documenting gas PE plastic fusions exposed in excavations during the normal course of business.

2.0 **APPLICATION** -- This Instruction applies to all Consolidated Edison Company of New York, Inc. (CECONY) organizations (hereafter referred to as the “Company”) and contractors working for the Company in designing, planning, commencing or engaging in underground construction activities associated with excavations and demolitions within the Company's franchise areas. This also applies to organizations with oversight responsibility for municipal public improvement contractors and non-municipal contractors (e.g., telephone, cable, plumbing, homeowner, etc.) engaging in excavation activity where the Company provides direct oversight.

3.0 **DEFINITIONS** -- NOTE: All Gas Specifications referenced in this Instruction are available on the Gas Operations Gas Hub or by accessing this link: https://ceorg/sites/GasOps/GasEng/GasSpecs/Gas%20Specifications%20%20Index/Forms/Index%20%20Numerical.aspx.

3.1 Angle of Repose –

a. The space above a line drawn at an angle upward and outward from the base of the vertical walls of an excavation based on the soil condition present. (Reference Gas Specification EO-15447-B, "Replacement and Maintenance of Cast Iron Gas Mains" and OSHA Technical Manual, Section V: Chapter 2, VIII Sloping and Benching).

b. An angle of repose encroachment occurs when a buried cast iron gas facility eight inch diameter or smaller runs alongside an excavation and half or more of the gas facility diameter lies in the angle of repose.

3.2 Encroachment – When an eight inch diameter or smaller cast iron gas facility is exposed, undermined or lies in the angle of repose in any excavation activity being performed other than for work on the CI gas main.

3.3 Facility – A gas main or service line.

3.4 Gas Clearance Mitigation Form- form used to document the installation and/or inspection of new and existing gas facility cover and clearance concerns.

3.5 Gas Line Clearance Report – The Gas Line Clearance Report can be found on the Gas Forms website and is used to document encroachments.

3.6 Hold Point- A documented inspection, confirming that the required protective measures have been utilized to protect the newly installed gas facilities prior to being backfilled. Reference Tailboard Talk (TBT) GAS6042 "Hold Points for Gas Construction Work."

3.7 Interference – A situation where an existing gas facility is located in the lane of another proposed underground facility.

3.8 Operator Qualified – An individual who has been evaluated and can perform assigned covered tasks (e.g., visually inspecting a facility for external/internal corrosion, inspecting the condition of exposed facility, or pipe coating for atmospheric corrosion) and can recognize and react to abnormal operating conditions (e.g., escaping/blowing gas, damage to a gas facility).

3.9 Protection – Provisions taken to ensure the gas facilities are guarded or shielded from damage. Forms of protection include but are not limited to: supporting exposed gas facilities, performing leak surveillances, installing phenolic board between gas facilities and electric facilities or between gas and non-electric facilities (e.g., telephone, cable), installing rubber mats (or most current approved material) between gas facilities and water or sewer facilities, installing steam blankets between gas facilities and steam facilities, installing steel protection plates over facilities due to shallow cover, and over gas facilities operating at 125 psig and above when exposed, etc.

3.10 Undermined Gas Facility – An encroachment situation where half or more of a cast iron gas facility eight inch diameter or smaller is exposed within an excavation or is above an area that has been excavated below it.

4.0 PROCEDURES --

4.1 Pipeline Integrity –

a. When any excavation activity (including planned and emergency work) is within 25 feet of any gas facility operating at 125 psig or above, Gas Control must be notified and the inspection and maintenance procedures as prescribed in Gas Specification G-11863, "Inspection and Assessment Requirements Associated with Excavation Activities Near Gas Pipelines and other Hazardous Conditions for Pipelines Operating at 125 PSIG and Above" must be followed.

b. For gas facilities operating at 125 psig or above, protective plates or cover pipes are required for all new installations and if feasible, whenever an existing main is exposed. When the cover on the main is less than three feet, rubber matting shall be installed below the protective steel plate or cover pipe at a minimum of two inches from the gas main. If the rubber matting is compromised or missing, it must be replaced as required. New gas facility installations must be documented by submitting a Hold Point through the approved mobile application. Existing locations shall be entered into the Gas Clearance Mitigation Form (Reference Gas Specifications EO-6799-C, "Protective Covers for Gas Main and Service Installations" and G-11863.)

4.2 Construction Excavation Activities near Gas Regulator Stations-

a. If excavation work is within 200 feet of the "Control Area" of a regulator station or will directly impact a regulator station or a contingency will impact a regulator station, contact Pressure Control prior to the start of excavation (Reference GAS DOJT GAS6039, "Regulator Stations Near Gas Distribution Layouts").

4.3 Gas PE Plastic Fusions Exposed During Normal Course of Business-

a. PE plastic fusions exposed during the normal course of business excavation activities must be inspected and documented by Operator Qualified personnel. (Reference Gas DOJT GAS6020 "Visual Inspection of Exposed PE Plastic Fuses".)

4.4 Clearances –

a. Maintain the following standard required clearances between gas facilities and subsurface facilities: (Reference Electric Standards EO-6224, "Trenching Requirements for Installing URD Cables in Conduit or DBC and Joint Trenching.")

Subsurface Facility	Gas Service	Gas Distribution Main (<125 psig)	Gas Transmission Main (≥ 125 psig)	Minimum Clearance with Protection
Electric conduit or structure	6 inches**	6 inches**	12 inches	2 inches
Electric Underground Residential Development system (URD) (direct buried) cable	12 inches	12 inches	12 inches	2 inches
Electric oil-o-static (Electric Transmission)*	12 inches	12 inches	12 inches	6 inches
Steam	6 inches** (metallic gas pipe) 35 feet (PE plastic gas pipe)	6 inches** (metallic gas pipe) 35 feet (PE plastic gas pipe)	12 inches	2 inches (metallic gas pipe) 35 feet (PE plastic gas pipe)
Water & sewer	6 inches**	6 inches**	12 inches	2 inches
Other facility (e.g., telephone, cable, petroleum)	6 inches**	6 inches**	12 inches	2 inches

**Where gas mains/services run parallel to electric transmission lines for significant distances contact electric transmission for guidance.*
***It is recommended that where practical, a minimum of 12" clearance be maintained.*

b. All practical means must be considered, including offsets and relocating facilities, to obtain the standard required clearances specified in paragraph 4.4 a for new and eixitng facilities. When field conditions preclude these standard required clearances from being met between gas and other subsurface facilities or structures, protection shall be installed between the two facilities. **Exception**: 35 feet clearance must be maintained between polyethylene (PE) plastic gas pipe and steam facilities at all times and any PE pipes found not in compliance shall be relocated or replaced with metallic (e.g., steel or copper) gas pipe.

(1) For instances where the proximity of the electric facility is not within allowable clearance to a gas facility, either facility shall be relocated or phenolic board (Class and Stock # 596-4473 or 596-4432) shall be installed between the two facilities for protection. (Reference Electric Standards EO-6224.) New gas facility installations must be documented by submitting a Hold Point through the approved mobile application. Excavations made during the normal course of business containing existing electric and gas facilities must be inspected for proper phenolic board installation and any evidence of electric burn-through. Phenolic board that is compromised or missing must be replaced. Existing location conditions found must be documented through the Gas Clearance Mitigation Form.

(2) In any instance where exposed electric conduits within 12 inches of gas facilities are found to be deteriorated to the extent that cable is visible, the deteriorated conduits shall be removed in accordance with Distribution Engineering Specification EO-10613, “Procedure for Removing Conduit From Underground Distribution Cable” and repaired in accordance with Distribution Engineering Specification EO-8007, “Installation of Precast Concrete Conduit.” If it can be ascertained that the cable installation is visibly damaged or further guidance is required to repair the damaged conduits, contact the applicable Electric Operations’ Control Center to coordinate the replacement of the damaged cable prior to any repair. If cable and/or conduit repair is made, the location must be entered into the Gas Clearance Mitigation Form.

(3) For instances where the proximity of the steam facility is not within the allowable clearance to a PE plastic gas facility, the PE plastic gas facility shall be relocated or the gas facility shall be replaced with metallic (e.g., steel or copper) gas pipe. For instances where the proximity of the steam facility is not within the allowable clearance to a metallic gas facility, the gas facility shall be relocated or a steam blanket (Class and Stock #415-0116) shall be installed between the two facilities for protection. New gas facility installations must be documented by submitting a Hold Point through the approved mobile application. (Reference Gas

Specifications G-8005, "General Specification for the Installation of Gas Distribution Mains" and G-8100, "General Specification for the Installation of Gas Distribution Services.", and G-8223, "General Specification for the Installation of Gas Transmission Pipelines.") Excavations made during the normal course of business containing existing steam and gas facilities, must be inspected for proper installation of a steam blanket. If the steam blanket is compromised or missing, it must be replaced as required. Existing location conditions found must be documented through the Gas Clearance Mitigation Form.

(4) For instances where the proximity of the water or sewer facility is not within allowable clearance to a gas facility, either facility shall be relocated or water impingement rubber mat(s) (Class & Stock # 059-5306) shall be installed between the two facilities for protection. The rubber matting shall be installed a minimum of two inches from the gas main. (Reference Gas Specifications G-8005, G-8100, G-11863, and G-8223.) New gas facility installations must be documented by submitting a Hold Point through the approved mobile application. Excavations made during the normal course of business containing existing water and/or sewer facilities and gas facilities, must be inspected for proper installation of rubber matting. If the rubber matting is compromised or missing, it must be replaced as required. Existing location conditions found must be documented through the Gas Clearance Mitigation Form.)

(5) For instances where the proximity of a facility other than electric, steam, water, or sewer (e.g., telephone, cable, petroleum) is not within allowable clearance to a gas facility, either facility shall be relocated or phenolic board (Class and Stock # 596-4473 or 596-4432) shall be installed between the two facilities for protection. (Reference Gas Specifications G-8005, G-8100 G-11863, and G-8223.) New gas facility installations must be documented by submitting a Hold Point through the approved mobile application. Excavations made during the normal course of business containing existing gas facilities and facilities other than electric, steam, water, or sewer (e.g., telephone, cable, petroleum) must be inspected for proper installation of phenolic boards. If the phenolic boards are compromised or missing, it must be replaced as required. Existing location conditions found must be documented through the Gas Clearance Mitigation Form.)

c. For gas facilities operating at pressures up to 99 psig, steel protective plates or cover pipes are required when the cover on the main or service is less than two feet. Where the cover is less than 18 inches (one foot six inches) consult Gas Distribution Engineering at dl-srfieldengineers@coned.com for guidance. (Reference Gas Specification

EO-6799-C.) New installation locations must be documented by submitting a Hold Point through the approved mobile application. Existing location conditions found shall be addressed and entered into the Gas Clearance Mitigation Form.

4.5 Identifying Potential Encroachments, Clearances, and Interferences –

a. New York City Public Improvement Projects. The responsible section of Public Improvement Engineering, Engineering and Planning, will be responsible for identifying potential encroachments and interference work for planned municipal projects in the Bronx, Manhattan, and Queens. Test pits must be excavated to confirm questionable encroachments and interferences. Layouts shall be prepared to replace any cast iron gas facilities that will be encroached or exposed and undermined. Every effort must be made to replace the affected cast iron facilities prior to the start of municipal construction. Gas Line Clearance Reports (found on the Gas Forms website) will be prepared by Public Improvement, Construction, for encroachments that are encountered in the field during construction. Gas Distribution Engineering will prepare layouts for unplanned or unscheduled public improvement projects to correct these deficiencies.

b. Westchester. For planned municipal projects in Westchester, Gas Distribution Engineering is responsible for identifying potential encroachments and interference work. Test pits must be excavated to confirm questionable encroachments and interferences. Layouts shall be prepared by Gas Distribution Engineering to replace any cast iron gas facilities that will be encroached. Public Improvement will be advised. Every effort must be made to replace the affected cast iron facilities prior to the start of municipal construction. Gas Line Clearance Reports will be prepared by Public Improvement for encroachments encountered in the field during construction. Gas Distribution Engineering will prepare layouts for unplanned or unscheduled public improvement projects to correct these deficiencies.

c. Facilities Protection, Construction, is responsible for identifying possible encroachments by a third party (e.g., plumbers, telecom providers, etc.) or non-municipal projects engaging in underground construction activities associated with excavations and demolitions within the Company's franchise areas. Gas Line Clearance Reports will be prepared by Facilities Protection for encroachments encountered in the field during construction.

d. All other excavations or Company Projects (i.e., Electric, Gas, or Steam - New Business, System Reinforcement, etc.). Prior to construction, the sponsoring organization's engineering department is responsible for identifying potential encroachments and clearance requirements for its planned projects in the Company's franchise areas. If potential

encroachments and clearance issues are identified, contact appropriate personnel in Gas Engineering Public Improvement and Interference Support/Gas Distribution Engineering to determine an appropriate solution. For unplanned projects or emergencies, the organization overseeing the construction is responsible for identifying potential ecnroachments and clearance requirements. Gas Line Clearance Reports will be prepared by the organization overseeing construction for encroachments encountered in the field during construction. Test pits must be excavated to confirm questionable encroachments and clearances. Gas Distribution Engineering will prepare layouts to correct these deficiencies. Every effort must be made to replace the affected cast iron facilities prior to the start of construction.

4.6 Identified Interference Locations –

a. Negotiations with outside organizations to eliminate interferences will be conducted by Public Improvement Engineering or others authorized by the responsible officer.

b. Gas Distribution Engineering or the responsible section of Public Improvement Engineering will prepare layouts for replacement, retirement, protection, or relocation of gas facilities in interference with other construction.

4.7 Actual Encroachments on Cast Iron Gas Facilities –

a. Whenever a CECONY cast iron gas facility eight inches in diameter or smaller is crossed by an excavation and/or is located in parallel to an excavation, an Operator Qualified individual from the responsible Company organization is accountable for identifying the encroachment and preparing a Gas Line Clearance Report. Gas Distribution Engineering personnel assigned to handle interference work will determine the extent of replacement required in accordance with Gas Specification G-11839, “Replacement and Maintenance of Cast Iron Pipe Located in Construction Areas,” and its referenced drawing Gas Specification EO-15447-B.

b. If a CECONY cast iron gas facility greater than eight inches in diameter is undermined, in the angle of repose, or may be subject to damage, Gas Distribution Engineering personnel assigned to handle interference work must be notified to evaluate the need for support, replacement, or retirement.

c. Cast iron gas facilities exposed for maintenance need not be replaced in accordance with paragraphs 4.7a and 4.7b. Proper care shall be taken to support the facility if it is undermined during repairs and to ensure proper compaction when backfilling in accordance with EO-1181, “General Specification for Backfilling of Trench and Small Openings.”

d. Gas Distribution Engineering or the responsible section of Public Improvement Engineering will prepare layouts for replacement, retirement, protection, or relocation of gas facilities as needed.

4.8 Annual Review of Procedures –

a. All Company organizations will maintain files of their respective completed Gas Line Clearance Reports and associated layouts. Annually, Gas Compliance and Quality Assessment will review Gas Distribution Engineering's encroachment files for compliance with this Instruction.

b. Each excavating organization and organization that oversees excavation work will be subject to Gas Compliance and Quality Assessment reviews of the requirements of this Instruction.

c. Gas Compliance and Quality Assessement will perform annual field reviews of the requirements of this Instruction in conjunction with their normal review schedule.

4.9 Gas Line Clearance Report –

a. A Gas Line Clearance Report will be prepared as specified in paragraphs 4.5 and 4.7 and sent to Gas Distribution Engineering to document the following:

(1) If a cast iron main of 8- inch diameter or less is exposed and undermined for any length.

(2) If a trench runs parallel to a cast iron main of 8- inch diameter or less, and the distance between the edge of the trench and the marked out location of the main is less than one and a half times the depth of the trench (this criteria accounts for a 34^{o} angle of repose to ensure all soil conditions, including Type C are properly addressed).

Depth of Trench	Minimum distance from edge of the trench to the marked out location of the main where a clearance report is not required
3′	4.5′
4′	6′
5′	7.5′
6′	9′
7′	10.5′
8′	12′
9′	13.5′
10′	15′
11′	16.5′
12′	18′
13′	19.5′
14′	21′
15′	22.5′
16′	24′
17′	25.5′
18′	27′
19′	28.5′
20′	30′

(3) If the gas mains and services (m & s) plates and/or the mark out of an 8-inch or less cast iron gas mains indicated that the main was going to be exposed or undermined. The reports are also required if the main was subsequently not found in the excavation.

b. Reporting and paper flow for encroachments will be in accordance with Gas Specification G-11839, “Replacement and Maintenance of Cast Iron Pipe Located in Construction Areas.”

4.10 External Corrosion Control –

a. Whenever an existing buried steel gas facility is exposed in an excavation made for gas purposes, the exposed portion must be examined by an Operator Qualified individual for evidence of external corrosion if the pipe is bare or if the coating is deteriorated. If corrosion is found, the exposed steel pipe will be inspected longitudinally and circumferentially in/around the corroded area and the findings shall be recorded on the paperwork for the respective job (e.g., Leak History Report [50-13R] or its electronic equivalent in the Computer Aided Dispatch [CAD] system). This may

require additional excavation. If corrosion is found to a degree that will require replacement, the responsible Gas Distribution Engineering will be contacted to perform an additional inspection to determine if further action is needed. (Reference Gas Specification G-11814, "Procedure for Determining the Soundness of Steel Gas Distribution Piping," and Gas Specification G-11863 for additional inspection criteria.)

b. Whenever a gas facility operating at 125 psig or above is fully or partially exposed, or damaged (including coating), notify Corrosion Control and request an inspection of the pipeline coating, including any visible metal surface. If corrosion is found, the topography and pit depth measurements of the corroded area will be recorded by Corrosion Control or its representative and reviewed for integrity assessment by Gas Engineering—Corrosion Control, Pipeline Integrity, or Major Projects - System Reliability. (Reference Gas Specifications G-11814 and G-11863 for additional inspection criteria.)

4.11 Internal Corrosion Control –

a. Whenever any portion or section of an existing pipeline is removed for any reason, the internal surface must be visually inspected by an Operator Qualified individual and the observations documented on the paperwork for the respective job (e.g., Leak History Report [50-13R] or its electronic equivalent in the CAD system). If corrosion is found, visually inspect the adjacent internal pipe surface, both longitudinally and circumferentially, in/around the corroded area and record findings. If corrosion is found to a degree that requires replacement, notify Gas Engineering so that an additional inspection can be performed to determine if further action is needed. (Reference Gas Specifications G-11814 and G-11863 for additional inspection criteria.)

b. If a gas facility operating at 125 psig or above is removed for any reason, the internal surface must be visually inspected and documented by Corrosion Control in accordance with the provisions of Gas Specification G-11879, "Gas Transmission System Internal Corrosion Monitoring Program." Corrosion Control should be called to schedule an inspection in advance of internal surfaces being exposed, if feasible. (Reference Gas Specifications G-11814 and G-11863 for additional inspection criteria.)

5.0 RESPONSIBILITIES --

5.1 Gas Distribution Engineering – Review gas line clearance reports to confirm encroachment conditions, calculates the minimum replacement length for cast iron encroachment jobs and designs the layouts for encroachment jobs in all Gas operating areas and interference jobs in Westchester.

5.2 **All Company Excavating Organizations –** Ensure proper clearances between electric and gas facilities and repair or replacement of deteriorated electric conduits in accordance with paragraph 4.4. All corrections are to be made while excavations are opened and entered into the Gas Clearance Mitigation Form. or documented by submitting a Hold Point through the approved mobile application. Ensure encroachments are identified, reported to Gas Distribution Engineering, and documented in acordance with G-11839.

5.3 **Report Preparation and Training –**

a. As required, each organization is responsible for identifying potential encroachments and clearance requirements for its planned projects in the Company's franchise areas in accordance with paragraphs 4.5 and 4.7. In addition, each organization is responsible for the preparation of Gas Line Clearance Reports in accordance with paragraph 4.9. The documentation of external and internal corrosion shall be followed in accordance with paragraphs 4.10 and 4.11 by Operator Qualified individuals.

b. In accordance with the provisions covered in paragraph 2.0, each General Manager or Director is responsible for ensuring that engineers, construction inspectors and appropriate construction personnel are trained in and are adhering to these procedures and instructions. Annual training for cast iron encroachments (available through eLearning ONL0006 or equivalent DOJT GAS0426 "Replacement and Maintenance of Cast Iron Pipe Located in Construction Areas.") will be provided by The Learning Center (TLC), Learning and Inclusion, and will be given to all engineers, inspectors and appropriate construction personnel responsible for gas facility clearances. Training will cover rules and regulations and inspection of in-progress jobs.

c. Each engineering, excavating organization and each organization that designs, plans or oversees excavation work will perform refresher training annually on the requirements of paragraph 4.4b of this Instruction. (Reference Documented On-The-Job Training [DOJT] GAS0466, "Gas Clearance Mitigation Requirements.")

5.4 **Learning and Inclusion –** Individuals must be properly trained and Operator Qualified to perform any covered task per Con Edison's Operator Qualification Compliance Program (e.g., inspection of third party excavations for damage prevention/cast iron encroachment; visually inspecting gas pipe for internal corrosion; inspecting gas pipe for atmospheric corrosion). Contact TLC for appropriate training and Operator Qualification.

6.0 **ADVICE AND COUNSEL --** The Vice President, Gas Engineering, will provide advice and counsel on this Instruction.

PART 1 GENERAL

1.01 SUMMARY

A. This Section details the requirements for construction and demolition activities affecting Asbestos-Containing Materials (ACM), trace asbestos materials (i.e., Building Materials containing 1% or less of asbestos), and Asbestos-Containing Waste Materials, as shown in the following report and on Table No. 3, Summary of Asbestos Analysis (Asbestos was not detected), attached to Section 01 35 45 – Hazardous Materials Control, specified herein, or required to complete the Work, including all ACM identified and impacted by the Work.

1. Hazardous Materials Mitigation Report, Rev.1, Contract WP-169 CSO-FC-DF, Bidwell Environmental, LLC, June 2025.

B. All Work under this Section shall be performed to minimize the creation of airborne emissions; minimize the quantity of waste generated; protect the health and safety of all personnel and welfare of the public; and avoid adverse environmental impacts.

C. It should be noted that DEP Asbestos Projects being conducted on New York City property that is physically located outside of the five boroughs, would be subject to the requirements of 12 NYCRR 56, and not the requirements of RCNY Title 15, Chapter 1.

D. In the absence of analytical testing results for certain materials, the material shall be classified as suspect ACM pending the analytical results. Abatement of unforeseen or suspect/confirmed asbestos during the Work performed under this Section shall be in accordance with Section 01 35 45 – Hazardous Materials Control.

E. All Independent Third-Party air monitoring shall be outside this Contract and performed by others.

F. The Contractor shall label all known ACM in the field to prevent accidental disturbance by workers.

G. The following index of this Section is presented for convenience:

H.

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s), or allowance(s) as set forth in Section 01 27 00 – Measurements and Payments.

1.03 RELATED SECTIONS

A. Section 01 35 27 – Environmental Health and Safety Requirements

B. Section 01 35 45 – Hazardous Materials Control

C. Section 01 41 00 – Regulatory Requirements

D. Section 01 51 11 – Temporary Water and Sanitary Services

E. Section 01 51 12 – Temporary Heat and Ventilation

F. Section 01 51 30 – Temporary Electrical System

1.04 REFERENCES

A. Definitions

1. Abatement: Any and all procedures physically taken to control fiber releases from ACM. This includes Removal, Encapsulation, enclosure, cleanup, and Repair.

2. Adequately Wet: Defined by the EPA (40 CFR 61.141) as a material sufficiently mixed or penetrated with amended water to prevent the release of Visible Emissions. If Visible Emissions are observed coming from an ACM or asbestos waste, then the material has not been "Adequately Wetted." However, the absence of Visible Emissions is not evidence of being Adequately Wet. ACM must be fully penetrated with the wetting agent to be Adequately Wet. If the ACM being abated is resistant to amended water penetration, the wetting agent shall be applied to the

material prior to and during Abatement as necessary to minimize the potential for fiber releases.

3. Aggressive Air Sampling: A method of sampling within a Negative Pressurized Enclosure (NPE) in which mechanical equipment is used before and during the sampling period to stir up settled dust/asbestos fibers. Mechanical equipment includes 20-inch fans and forced air equipment (e.g., a one-horsepower leaf blower).

4. Air Sampling Technician: A person who performs Asbestos Project air sampling and possesses a valid Air Sampling Technician certificate issued by the NYSDOL.

5. Ambient Air Monitoring: The measurement or determination of airborne asbestos fiber concentrations outside but in the general vicinity of the Work site, performed in accordance with NIOSH or EPA sampling methodologies.

6. Asbestos Abatement Contractor: A Subcontractor licensed by the NYSDOL who performs Abatement during an Asbestos Project, or employs persons performing such Abatement.

7. Asbestos Abatement Permit: A permit issued by the DEP ACP in accordance with RCNY Title 15, Chapter 1, authorizing the performance of construction Work for Asbestos Projects involving any of the activities defined in RCNY Title 15, Chapter 1-26(a) (1)-(13).

8. Asbestos Assessment Report (Form ACP-5): A form submitted to the DEP ACP by which a DEP-certified Asbestos Investigator certifies that a building or structure (or portion thereof) is free of ACM or the amount of ACM to be abated constitutes a Minor Asbestos Project.

9. ACM: Any material containing greater than one percent asbestos.

10. Asbestos Handler: An individual certified by the DEP and/or NYSDOL who disturbs, removes, encapsulates, repairs, or encloses ACM. Asbestos Handlers working on projects within the five boroughs shall possess both DEP and NYSDOL certifications. Asbestos Handlers working on projects outside of the five boroughs shall possess NYSDOL certifications.

11. Asbestos Handler Supervisor: An individual certified by the DEP and/or NYSDOL who supervises the asbestos handlers during an Asbestos Project, and ensures that proper asbestos Abatement procedures as well as individual safety procedures are being adhered to. Asbestos Handler Supervisors working on projects within the five boroughs shall possess both DEP and NYSDOL certifications. Asbestos Handler Supervisors working on projects outside of the five boroughs shall possess NYSDOL certifications.

12. Asbestos Project: Any Work performed in connection with the alteration, renovation, modification, or demolition of a building or structure, or in connection with the replacement or repair of equipment, pipes, or electrical equipment not located in a building or structure, which will involve the

Abatement, Disturbance, or cleanup of friable or Non-Friable Asbestos. Asbestos Projects are classified as either Large Asbestos Projects, Small Asbestos Projects, or Minor Asbestos Projects in New York State and New York City, and each type of project involves several phases, which can include: background air monitoring, mobilization, pre-abatement/Containment construction, Abatement, cleaning/re-cleaning, final Clearance Air Monitoring, Containment breakdown, and demobilization.

13. Asbestos Project Notification (Form ACP-7): A form submitted to the DEP ACP for all Large Asbestos Projects and Small Asbestos Projects. Minor Asbestos Projects do not require an ACP-7 form.

14. Asbestos-Containing Waste Material: ACM or asbestos-contaminated objects requiring disposal.

15. Building Materials: Any and all materials listed in 12 NYCRR 56-5.1(f)(1), including but not limited to interior and exterior finished, equipment, plaster, roofing, flooring, caulking, sealants, tiles, insulation, and mortar and refractory bricks used in the construction of boilers.

16. Clean Room: An uncontaminated area or room that is part of the Personal Decontamination Enclosure System, with provisions for the storage and changing of "street clothes" into clean Personal Protective Equipment (PPE).

17. Clearance Air Monitoring: Area air monitoring performed inside the Restricted Area and Regulated Abatement Work Area after the completion of the final cleaning, final waiting period, and Final Visual Inspection by the Asbestos Handler Supervisor and Project Monitor. Aggressive Air Sampling shall be performed as part of the Clearance Air Monitoring activities inside of the Containment.

18. Containment: The NPE within the Restricted Area, which establishes the Regulated Abatement Work Area, and surrounds the location where the asbestos Abatement is actually taking place.

19. Critical Barrier: A term used by the NYSDOL to define barriers that seal-off all openings to or within the defined Regulated Abatement Work Area, including but not limited to operable windows, skylights, doorways, ducts, grills, diffusers, and any other penetrations to surfaces adjacent to or within the Regulated Abatement Work Area.

20. Disturbance: Any activities that disrupt the matrix of ACM, or Asbestos-Containing Waste Materials. This includes activities that generate dust, debris, Visible Emissions, or airborne asbestos fibers, including moving friable ACM or Asbestos-Containing Waste Materials from one place to another.

21. Encapsulation: The coating or spraying of ACM, or the bare substrate surface that is exposed after an Abatement, with a pigmented (i.e., non-

transparent) liquid sealant that creates a membrane over the surface of the material (bridging encapsulant) or penetrates into the material and binds its components together (penetrating encapsulant).

22. Excursion Limit: Defined in the OSHA Asbestos Standard for the Construction Industry (29 CFR 1926.1101) as individual exposure, without regard to the use of respirators, to an airborne concentration of asbestos fibers of 1.0 fiber per cubic centimeter of air (1.0 f/cc) averaged over a 30-minute sampling period. No employee of the Contractor shall at any time be exposed to concentrations of asbestos fibers above the Excursion Limit.

23. Worker Exposure Monitoring: Personal air sampling performed outside the respirator within the breathing zone of individuals that are representative of the 8-hour TWA and 30-minute short-term exposures of each employee, for the purpose of determining compliance with OSHA's Asbestos Standard for the Construction Industry (29 CFR 1926.1101). Analytical results from Worker Exposure Monitoring will be used to select appropriate respiratory protection and PPE for individuals within a Restricted Area and Regulated Asbestos Work Area. For the purpose of this Section, Worker Exposure Monitoring samples shall be collected from individuals who are representative of each task being conducted by the Contractor, and all Worker Exposure Monitoring shall follow pertinent NIOSH or EPA sampling methodologies.

24. Final Visual Inspection: An inspection performed by the Project Monitor and Asbestos Handler Supervisor at the completion of the final waiting period on an Asbestos Project (but prior to Clearance Air Monitoring). The inspection is performed in accordance with ASTM E1368 to determine the completeness of Abatement and cleanup.

25. Friable Asbestos: A term used by the NYSDOL to define any ACM or asbestos waste that can be crumbled, pulverized or reduced to powder when dry, by hand pressure.

26. Glovebag: A manufactured, impervious, bag-like enclosure with two (2) inward-projecting long sleeve gloves, one (2) inward-projecting waterwand sleeve, an internal tool pouch, and an attached, labeled receptacle for asbestos waste. The Glovebag is constructed and installed to surround an object or area to be abated, and contain all asbestos fibers released during the Abatement process.

27. High-Efficiency Particulate Air (HEPA) Filter: A filter designed to remove 99.97% of all particles greater than 0.3 micrometers (μm) in diameter. For the purpose of this Section, HEPA vacuum and Negative Air Pressure Equipment (i.e., Microtraps) used by the Contractor shall meet the Standard for Safety High-Efficiency, Particulate, Air Filter Units (UL 586) developed by Underwriters Laboratories.

28. Holding Area: A room or area in the Waste Decontamination Enclosure System utilized for the temporary (i.e., no longer than the current work shift)

storage of containerized asbestos waste, prior to its transfer to a final on-site storage container (i.e., dumpster, trailer, or roll-off) or a licensed asbestos waste transport vehicle. The Holding Area is located between the washroom and an uncontaminated area.

29. Independent Third-Party Monitor: A NYSDOL-licensed asbestos contractor who will be contracted by the Engineer or the City, and is completely independent of the Asbestos Abatement Contractor involved with the Asbestos Project. The Independent Third-Party who conducts ambient and clearance air monitoring or Project Monitoring on an Asbestos Project shall not have any business, personal, or other relationship with the Asbestos Abatement Contractor.

30. Isolation Barrier: A term used to define the construction of partitions, the placement of solid materials, and the plasticizing of apertures to seal off the Regulated Abatement Work Area from surrounding areas and contain asbestos fibers.

31. Large Asbestos Project: An Asbestos Project involving the Removal, enclosure, Encapsulation, Repair, Disturbance, cleanup, or handling of 260 linear feet or more of ACM, or 160 square feet or more of ACM.

32. Log: An official record, maintained by the Asbestos Abatement Contractor, of all activities that occurred during the Asbestos Project. The Log shall be in the form of a bound notebook, and at a minimum, identify the following information: (a) the building owner, agent, contractor, and workers; (b) daily activities, cleanings, and waste transfers; (c) the names and certificate numbers of all Asbestos Handlers and Asbestos Handler Supervisors; (d) the results of inspections of decontamination systems, barriers, and negative pressure ventilation equipment; (e) summaries of all corrective actions and Repairs; (f) work stoppages with reasons for stoppages; (g) manometer readings at least twice per work shift; (h) daily checks of emergency and fire exits; (i) any unusual events.

33. Microtrap: (See definition of "Negative Air Pressure Equipment").

34. Minor Asbestos Project: An Asbestos Project involving the Removal, enclosure, Encapsulation, Repair, Disturbance, cleanup, or handling of 25 linear feet or less of ACM, or 10 square feet or less of ACM.

35. Negative Air Pressure Equipment: A local exhaust system capable of maintaining air pressure within the Containment at a lower pressure than the air outside of the Containment. The Negative Air Pressure Equipment also provides for the HEPA filtration of all air exhausted from the Containment.

36. Non-Friable Asbestos: A term used by the NYSDOL to define any ACM or asbestos waste that cannot be crumbled, pulverized or reduced to powder when dry, by hand pressure.

37. Obstruction: The blocking of a means of egress with any temporary structure or barrier. Polyethylene sheeting shall not be considered an Obstruction when it is prominently marked with exit signage or paint, and cutting tools (i.e., a knife or razor blade) are attached to the work area side of the sheeting for use in the event that the sheeting must be cut to permit egress. A corridor shall not be considered obstructed when there is a clear path measuring at least three feet wide.

38. OSHA Monitoring: (See definition of "Worker Exposure Monitoring").

39. P-100 Filter: (See definition of: "HEPA").

40. Perimeter Monitoring: (See definition of "Area Monitoring").

41. Permissible Exposure Limit (PEL): Defined in the OSHA Asbestos Standard for the Construction Industry (29 CFR 1926.1101) as individual exposure, without regard to the use of respirators, to an airborne concentration of asbestos fibers of 0.1 fibers per cubic centimeter of air (f/cc) calculated as an 8-hour Time-Weighted Average (TWA). No employee of the Contractor shall at any time be exposed to concentrations of asbestos fibers above the PEL. See also Excursion Limit.

42. Personal Decontamination Enclosure System: A series of connected rooms designed to control the passage of Asbestos Handlers, and other authorized individuals into the Regulated Abatement Work Area from uncontaminated areas. The system consists of a Clean Room, a Shower Room, and an equipment room separated from each other and the Regulated Abatement Work Area by airlocks and curtained doorways.

43. Personal Monitoring: (See definition of "Worker Exposure Monitoring").

44. Phase Contrast Microscopy (PCM): An analytical method (e.g., NIOSH 7400 and 7401) used for determining the asbestos fiber concentration in an air sample.

45. Polarized Light Microscopy (PLM): An analytical method (e.g., 40 CFR 763, Subpart F, Appendix A or ELAP Item 198.1 or 198.6) used for determining the asbestos content in a bulk material.

46. Post Abatement Air Monitoring: (See definition of "Clearance Air Monitoring").

47. Presumed Asbestos-Containing Material (PACM): Material suspected of containing asbestos as described in 15 RCNY 1-38. PACM is considered to be ACM unless proven otherwise by appropriate bulk sampling and laboratory analysis.

48. Project Designer: A person who performs Asbestos Project design functions and possesses a valid Project Designer certificate issued by the NYSDOL.

49. Project Monitor: A person who performs Asbestos Project Monitoring functions and possesses a valid Project Monitor certificate issued by the NYSDOL

50. Regulated Abatement Work Area: The portion of the Restricted Area where Abatement Work actually occurs. This includes the interior of the Restricted Area Containment enclosure. For Glovebag operations, the areas contiguous to where the operation takes place are Regulated Abatement Work Areas. For tents, the interior of each tent is a Regulated Abatement Work Area. For exterior, Non-Friable Asbestos Abatement conducted without the establishment of negative air ventilation systems or Containment enclosures, the entire Restricted Area surrounding the Abatement location is considered to be the Regulated Abatement Work Area.

51. Removal: The stripping of any ACM from surfaces or components of a building or structure.

52. Repair: A term used by the DEP to define a corrective action using specified work practices (e.g., Glovebags or tents) to minimize potential asbestos fiber releases from minimally damaged ACM.

53. Restricted Area: An area established and marked for the Abatement portion of an Asbestos Project. The area shall include, but not be limited to, Regulated Abatement Work Areas and any contiguous decontamination enclosure systems, adjoining staging areas where work materials, debris, or waste materials from such Work may accumulate, and waste storage areas (e.g., dumpsters, trailers, or roll-offs).

54. Shower Room: A room between the Clean Room and the equipment room in the Personal Decontamination Enclosure System set up to prevent cross-contamination by ensuring the removal of potential asbestos contamination from the body that may have accumulated during Abatement operations. The Shower Room shall have hot and cold running water controllable at the tap, shall be arranged for complete showering during decontamination, and shall include clean, dry towels, soap, and shampoo in quantities sufficient to accommodate the personnel working on the Asbestos Project.

55. Small Asbestos Project: An Asbestos Project involving the Removal, enclosure, Encapsulation, Repair, Disturbance, cleanup, or handling of more than 25 linear feet but less than 260 linear feet of ACM, or more than 10 square feet but less than 160 square feet of ACM.

56. Suspect ACM: All friable and non-friable materials suspected of containing asbestos as determined by a certified NYSDOL Asbestos Inspector and/or certified DEP Asbestos Investigator, which have not been sampled and analyzed for asbestos content. Suspect ACM includes PACM.

57. Tent: (See definition of “Containment”).

58. Transmission Electron Microscopy (TEM): An analytical method (e.g., 40 CFR 763, Subpart F, Appendix A or ELAP Item 198.4) used for determining the asbestos fiber concentration in an air sample, or for determining the asbestos content in a bulk material.

59. Trace Asbestos-Containing Material: A building material that contains less than or equal to 1% of asbestos.

60. Variance: Relief from specific requirements set forth in state or local asbestos regulations, which is granted in writing by the agency that enforces the regulations.

61. Visible Emission: Any emission containing particulate material that can be seen without the aid of instruments.

62. Waste Decontamination Enclosure System: A series of connected rooms designed to control the transfer of materials and equipment from the Regulated Abatement Work Area. The system consists of a washroom and a Holding Area separated from each other and the Regulated Abatement Work Area by airlocks and curtained doorways.

63. Wet Cleaning: The process of eliminating asbestos contamination from surfaces, equipment, or other objects by using cloths, mops, or other cleaning tools that have been saturated with amended water.

64. Worker Decontamination Enclosure System: (See definition of "Personal Decontamination Enclosure System").

65. Work Place Safety Plan: Construction documents prepared by a registered design professional and submitted for review to the DEP ACP in order to obtain an Asbestos Abatement Permit. The plan shall include, but not be limited to, plans, sections, and details of the Regulated Abatement Work Area clearly showing the extent, sequence, and means and methods by which the Work is to be performed.

B. Reference Standards:

1. The Contractor shall comply with all applicable regulations, standards, and guidelines of federal, state, and local environmental and occupational safety and health agencies regarding ACM, trace asbestos materials, and Asbestos-Containing Waste Materials. These regulations, standards, and guidelines include, but are not limited to the following:

   a. ASTM International:

      1) D2898 – Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing;

      2) E84 – Standard Test Method for Surface Burning Characteristics of Building Materials;

      3) E1368 – Standard Practice for Visual Inspection of Asbestos Abatement Projects.

   b. United States (U.S.) Department of Transportation (DOT):

      1) 49 CFR 171 - General Information, Regulations, and Definitions;

2) 49 CFR 172 – Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response information, and Training Requirements;

3) 49 CFR 173 – Shippers: General Requirements for Shipments and Packagings;

4) 49 CFR 178 – Specifications for Packagings.

2. United States Environmental Protection Agency (EPA):

   a. 40 CFR 61 - National Emission Standards for Hazardous Air Pollutants (NESHAP);

   b. 40 CFR 262 - Standards Applicable to Generators of Hazardous Waste;

   c. 40 CFR 268 – Land Disposal Restrictions;

   d. 40 CFR 302 – Designation, Reportable Quantities, and Notification;

   e. 40 CFR 763 - Asbestos Hazard Emergency Response Act (AHERA).

3. National Institute for Occupational Safety and Health (NIOSH):

   a. Method 7400 – Asbestos and Other Fibers by PCM;

   b. Method 7401 – Asbestos by TEM.

4. National Fire Protection Association (NFPA):

   a. NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials;

   b. NFPA 701, Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

5. New York City Department of Environmental Protection (DEP):

   a. Environmental Health and Safety Policies and Procedures – Vol. II, Spill Prevention, Environmental Release Reporting and Investigation;

   b. Environmental Health and Safety Policies and Procedures – Vol. III, Asbestos Management;

   c. RCNY Title 15 Chapter 1 - Asbestos Control Program Rules and Regulations; RCNY Title 15 Chapter 19 – Discharges of Wastewater and Other Materials to Public Sewers.

6. New York City Department of Sanitation (DSNY):

   a. RCNY Title 16 Chapter 8 – Asbestos Rules and Regulations.

7. New York State Department of Environmental Conservation (NYSDEC):

a. 6 NYCRR 360 - Solid Waste Management Facilities;

b. 6 NYCRR 364 - Waste Transporter Permits;

c. 6 NYCRR 376 – Land Disposal Restrictions.

8. New York State Department of Health (NYSDOH):

a. 10 NYCRR 55-2 – Approval of Laboratories Performing Environmental Analysis.

9. New York State Department of Labor (NYSDOL):

a. 12 NYCRR 56 - Asbestos Rules and Regulations.

10. Occupational Safety and Health Administration (OSHA):

a. 29 CFR 1910 – Occupational Safety and Health Standards;

b. 29 CFR 1910.28 – Safety Requirements for Scaffolding;

c. 29 CFR 1926.65 – Hazardous Waste Operations and Emergency Response;

d. 29 CFR 1910.134 - Respiratory Protection Standard;

e. 29 CFR 1910.1001 - Asbestos Standard for General Industry;

f. 29 CFR 1910.1200 - Hazard Communication Standard;

g. 29 CFR 1926 - Safety and Health Regulations for Construction;

h. 29 CFR 1926.1101 - Asbestos Standard for the Construction Industry.

11. Underwriters Laboratories, Inc. (UL):

a. UL 586 – Standard for Safety High Efficiency, Particulate, Air Filter Units;

b. UL 723 – Standard for Test for Surface Burning Characteristics of Building Materials.

1.05 DESCRIPTION

A. Commencement of Work: Ten (10) business days prior to the proposed start of Work at each separate location, the Contractor shall notify the Engineer, the onsite safety staff, and building occupants. No Work may proceed at any location until authorized by the Engineer.

B. The Contractor shall coordinate any required equipment shutdowns with the Engineer prior to starting the work.

C. Access Restrictions: The Contractor shall inform the Engineer of proposed access restrictions (i.e., areas or items of equipment which will not be accessible during the proposed Asbestos Project), and provide them estimated time frames (including specific dates) of such proposed access restrictions. The Contractor shall notify Other Contractors in advance of the abatement Work included herein, to provide

them with sufficient time for coordination of interrelated items that are included in their contracts and that must be performed before, after, or in conjunction with the Work included under this Section.

D. The Contractor shall ensure that Personal and Waste Decontamination Enclosure Systems along with the Regulated Abatement Work Area are constructed of solid materials with lockable doors to prevent unauthorized entry during non-working hours.

E. Meetings: In addition to the pre-construction meeting and site walk-through, other meetings may be required or may be requested by the Engineer, including briefings with Site Operations personnel. Written documentation (i.e., "minutes") of all meetings shall be generated by the Contractor, and copies shall be provided to DEP within three (3) business days following each meeting.

1.06 QUALITY ASSURANCE

A. Permits and Notifications: The Contractor shall make all necessary notifications, secure any necessary permits and Variances, complete agency-required forms, and pay all fees in conjunction with asbestos Abatement activities, waste transportation, and waste disposal in accordance with federal, state, and local asbestos regulations (as per 01 41 00 - Regulatory Requirements). Prior to the submittal of any notifications, permit/Variance applications, or forms to regulatory agencies, the Contractor shall provide them to the Engineer for review.

B. Scheduling: The Contractor shall coordinate and schedule all phases of the Work to be performed under this Section with the DEP, subcontractors, material suppliers, and other parties as necessary to ensure the proper execution of the Work.

C. Compliance: In addition to the requirements of this Section, DEP EHS Policies and Procedures and Section 01 35 27 – Environmental Health and Safety Requirements, the Contractor shall comply with all applicable regulations of federal, state, and local authorities pertaining to the Abatement, disturbance, cleanup, handling, transportation, storage, and disposal of ACM, trace asbestos materials, and Asbestos-Containing Waste Materials. All matters regarding the interpretation of any regulations, standards, or policies shall be submitted to the Engineer for resolution before starting the Work. Where the requirements of this Section, DEP EHS Policies and Procedures, and federal, state, or local regulations conflict or vary, the most stringent requirements or regulations shall apply.

D. Rejection of Non-Complying Items: DEP reserves the right to reject Contractor submittal items, including proposed disposal facility, vendors, subcontractors or personnel with regulatory citations/violations, that it deems inappropriate or unacceptable by the Engineer or DEP. The DEP further reserves the right, and without prejudice to other recourse, to accept non-complying items subject to an adjustment in the Contract amount, as approved by the DEP.

E. Suspect Material Characterization: All caulking and bitumastic coatings are considered suspect ACM. Therefore, if a confirmatory sample will be collected, the sampling shall be performed by a certified DEP Asbestos Investigator or NYSDOL Asbestos Inspector.

F. Qualifications:

1. Asbestos Abatement Contractor: The Contractor shall possess a current NYSDOL asbestos license and shall have successfully completed at least two (2) Asbestos Projects of comparable scope and methodologies within the past three (3) years. This experience shall be documented and provided as follows: (a) the name, address, and phone number of each facility where the work was performed; (b) the volume and type of each material that was abated; (c) the specific methods of Abatement (including the tools, technologies, and engineering controls employed);

2. Asbestos Handler Supervisor:

   a. Shall be currently certified by the DEP (if working on Asbestos Projects in the five boroughs) and NYSDOL (for all Asbestos Projects).

   b. Shall have a minimum of two (2) years of experience on Asbestos Projects, and shall have served as the Asbestos Handler Supervisor on at least three (3) Asbestos Projects of comparable scope and methodologies to the work being performed under this Section.

3. Asbestos Handler:

   a. Shall be currently certified by the DEP (if working on Asbestos Projects in the five boroughs) and NYSDOL (for all Asbestos Projects), and

   b. Shall have a minimum of one (1) year of experience on Asbestos Projects, and shall have worked on at least three (3) Asbestos Projects of comparable scope and methodologies to the Work being performed under this Section.

1.07 SUBMITTALS

A. Thirty (30) business days prior to commencement of the Work of this Section or as directed by the Engineer, the Contractor shall submit the following to the Engineer:

1. Asbestos Inspection and Sampling Plan: The Contractor shall provide an Asbestos Inspection and Sampling Plan to identify suspect asbestos-containing materials and collect confirmatory samples, as appropriate during the inspection.

2. The Asbestos Inspection and Sampling Plan shall include at a minimum:

   a. At a minimum, the inspection shall be performed by a certified NYSDOL Asbestos Inspector or a certified NYCDEP Asbestos Investigator (if performed within the City), who shall have OSHA 10-hour certification, and confined space entry training as applicable to the location or work, and shall have performed similar inspection work on at least three (3) projects of comparable scope.

b. Credentials of the laboratory providing sample analysis. The credentials shall include current certification by the NYSDOH ELAP.

c. Sample collection, analysis and reporting protocol in accordance with RCNY Title 15 Chapter 1 or 12 NYCRR Part 56, as applicable to the Work location.

d. Health and safety protocol (Job Hazard Analysis) for all investigation activities.

3. Asbestos Inspection Report: The Contractor shall provide an Asbestos Inspection Report summarizing the results of all inspection activities, and as applicable, a sampling narrative, laboratory data packages and an inventory, including photographs, of all identified suspect and confirmed asbestos-containing materials. All reporting shall be in accordance with RCNY Title 15, Chapter 1 or 12 NYCRR Part 56, as applicable to the Work location.

4. Asbestos Work Plan: The Asbestos Work Plan shall be prepared in accordance with RCNY Title 15, Chapter 1 or 12 NYCRR 56, all applicable DEP EHS Policies and Procedures, and all other pertinent federal, state, and local regulations. In addition, the Asbestos Work Plan shall be coordinated with the Engineer. The Asbestos Work Plan shall also be signed and dated by a NYSDOL-certified Project Designer, with a copy of the Project Designer's current NYSDOL certification, attached to the Work Plan. The Asbestos Work Plan shall include the following elements:

a. Asbestos Control:

1) Drawings showing the location and details of the following: (a) each Regulated Asbestos Work Area; (b) the type, location, and number of negative air pressure machines that will be used, as well as all exhaust locations; (c) proposed electrical hookups and temporary electrical panels; (d) proposed water hookups; (e) each Restricted Area; (f) each Personal Decontamination Enclosure System; (g) each Waste Decontamination Enclosure System; (h) each waste storage area (e.g., dumpster, trailer, or roll-off); (i) restroom areas; (j) areas designated for eating and drinking.

2) A section on the interfacing of trades (i.e., other contractors) and the sequencing of asbestos-related Work.

3) A section on the collection, handling procedures, cleanup, and disposal of Asbestos-Containing Waste Materials (including the collection, filtering, and disposal of wastewater).

4) A section on the procedures and methodologies that will be used to conduct Worker Exposure Monitoring, including the

name and qualifications (i.e., training and experience documentation) of the individual who will be responsible for conducting the Worker Exposure Monitoring.

5) A section on housekeeping procedures to be used for maintaining clean Regulated Abatement Work Areas, clean Restricted Areas, and clean decontamination enclosure systems.

6) A section on the specific methods and procedures that will be used to control fiber releases, and ensure that as per 40 CFR Part 763, Subpart E, of the EPA Asbestos in Schools Rule measured by Phase Contrast Microscopy (PCM), fiber concentrations less than or equal to the clearance and action criteria of 0.01 f/cc of air, or background levels (whichever are greater), are not exceeded outside of each Regulated Abatement Work Area. For projects conducted outside of the five boroughs of New York City, the clearance and action criteria is less than 0.01 f/cc; of air, or background levels (whichever is greater).

7) Task Analysis: Each task analysis shall include, but is not limited to, the following information: (a) the type of Work activity; (b) the tools/equipment that will be used and their respective decontamination procedures; (c) the types of ACM that will be disturbed, or Asbestos-Containing Waste Materials that may be generated when performing the activity; (d) the engineering controls that will be used to control the spread of asbestos fibers during the activity; (e) the proposed crew size for the activity and individual employee responsibilities during the activity; (f) housekeeping procedures that will be used during the activity; (g) PPE and proposed respiratory protection that will be used for the activity.

8) Equipment and Supplies: Identify the materials and equipment that will be used to perform the Work, including materials and equipment designed to be non-combustible or fire retardant in accordance with NFPA 701 and 255. Materials and equipment utilized for Abatement activities that take place within the five boroughs, shall conform to RCNY Title 15 Chapter 1-61.

9) Rental Equipment Notification: If rental equipment is to be used during the Work, the Contractor shall notify the rental agency in writing concerning the intended use of the equipment, and shall develop and submit an equipment decontamination plan to the Engineer for review and approval prior to the start of Work.

10) Safety Data Sheets (SDSs): Provide SDSs for all chemical products (including wetting agents and encapsulants) to be used for the Work.

b. Waste Management:

1) A description of the types of ACM and Asbestos-Containing Waste Materials associated with the Work (include details regarding whether the materials are friable or non-friable) as per 49 CFR 171 and 172.

2) The estimated quantity of each waste stream that will be generated as per 40 CFR 302.

3) Name, address, telephone number and current permit documentation for the disposal facility indicating that the facility is approved by federal, state, and local regulatory agencies to receive Asbestos-Containing Waste Materials.

4) Current 6 NYCRR 364 and 49 CFR 173 permit documentation for the waste transporter that will transport Asbestos-Containing Waste Materials from the Work Site to the disposal facility.

5) Spill prevention, Containment, and cleanup contingency measures to be implemented during a suspected fiber release or emergency situation.

6) A detailed discussion of the on-site handling, storage, removal, cleanup, and disposal of waste materials, including the following: (a) description of the waste storage areas; (b) the methods and procedures that will be used to collect and containerize wastes on a daily basis; (c) the types of bags/containers; (d) the submittal of weekly waste inspection records.

7) The name and qualifications of the Asbestos Handler Supervisor. At a minimum, the Asbestos Handler Supervisor shall be onsite during all activities affecting ACM.

c. Asbestos Abatement Project Notifications and Permits: Submit completed permits and notifications to the Engineer for review and approval prior to submittal to the applicable agencies. All Large Asbestos Projects and Small Asbestos Projects that take place within the five boroughs are required to follow notification and permitting procedures per RCNY Title 15, Chapter 1. All Large Asbestos Projects require notification procedures per 12 NYCRR 56. Documents that may be required based upon the scope and location of the project include, but are not limited to, the following:

1) EPA Large Asbestos Project Notification;

2) DEP Asbestos Assessment Report (Form ACP-5);

3) DEP Asbestos Project Notification (Form ACP-7);

4) DEP Asbestos Project Amendment (Form ACP-8);

5) DEP Asbestos Variance Application (Form ACP-9);

6) DEP Asbestos Technical Review Unit Permit (A-TRU Permit);

7) DEP Work Place Safety Plan;

8) NYSDOL Asbestos Project Notification;

9) NYSDOL Asbestos Variance Application.

d. A detailed schedule for the implementation of the Asbestos Work Plan elements, including the different phases of the Asbestos Project, the projected start and completion dates for Restricted Area preparation, gross Removal and Abatement, cleanings, Clearance Air Monitoring, and demobilization activities.

e. Medical Surveillance: The Contractor shall provide a sufficient number of properly trained, experienced, and certified workers, each of whom shall: (a) have received a medical exam that included a Pulmonary Function Test (PFT) within the past year; (b) have received written medical clearance within the past year, by a licensed physician, to wear a respirator; (c) have received a qualitative or quantitative respirator fit-test within the past year for the specific respirator the employee will be using for this Work.

f. Employee Documentation: The Contractor shall provide a sufficient number of properly trained, experienced, and certified workers, each of whom shall: (a) have current NYSDOL-issued and DEP-issued asbestos certificates; (b) documentation for Asbestos Handlers and Asbestos Handler Supervisors, including required work experience; and (c) dates and written proof of respiratory clearance, including fit-test and medical examinations by the Contractor or other employer within the past year.

g. A current (i.e., within the last month) signed and notarized statement disclosing all of the Abatement Contractor's OSHA, EPA, NYSDOL, DEP, DSNY, and DOT citations/violations on Asbestos Projects within the past three (3) years.

h. A current (i.e., within the last month) signed and notarized statement disclosing all of the Asbestos Handler Supervisor's NYSDOL and DEP citations/violations within the past three (3) years.

i. Analytical Laboratory Qualifications for Analyzing Air Samples: Submit the name, address, and telephone number of each analytical laboratory, including copies of current AIHA and ELAP certificates

along with dates of accreditation/reaccreditation. ELAP certificates should show evidence of certification for the specific analytical methods that will be used.

5. The Contractor shall submit all Worker Exposure Monitoring results to the DEP no later than 24-hours after the collection of the air samples.

B. Field Reports and Recordkeeping: The Contractor shall maintain and provide the following documentation:

1. Worker Exposure Monitoring Documentation: Worker Exposure Monitoring Documentation shall be made available to the DEP immediately upon request. All laboratory analytical results shall be accompanied by complete COC documentation.

a. The signed Worker Exposure Monitoring documentation shall include, but not be limited to, the following information: (a) sample "start" and "stop" times; (b) flow rates (initial and final) for each sample; (c) the total volume of air collected for each sample; (d) names of individuals being sampled along with the specific Work task each individual is performing; (e) specific respiratory protection and PPE worn by each individual; (f) types (i.e., makes and models) of sampling equipment used; (g) types of sample media (i.e., filters and cassettes) used; (h) the most recent calibration dates, along with the calibration results, for the sampling equipment used; (i) name of the individual who conducted the Worker Exposure Monitoring; (j) dates that the Worker Exposure Monitoring was conducted; (k) Work tasks being performed adjacent to the Restricted Area during the Worker Exposure Monitoring; (l) unique sample numbers used to identify each sample; (m) the phase of the Asbestos Project being performed (i.e., background, pre-abatement, Abatement, cleaning, or clearance).

2. Waste Manifest Documentation: A Waste Profile for all asbestos waste shall be completed and submitted to the Engineer for review and approval prior to DEP signature. The Contractor shall submit a Facility Letter of Acceptance form the selected asbestos-permitted landfill stating that the facility will accept the asbestos wastes generated during abatement. The Contractor shall also submit advance copies of the completed manifest for the Engineer's review and approval, prior to NYCDEP signature on the date of disposal. Following disposal, completed and signed waste manifests from the approved, asbestos-permitted landfill, shall be provided to the DEP within 10 business days of disposal. In addition, on-site waste storage areas shall be inspected weekly by the Asbestos Handler Supervisor.

3. Waste Storage Area Inspection Documentation: Each weekly waste storage area inspection shall be documented in the Asbestos Abatement Contractor's bound Log. The Log shall be signed by the Asbestos Handler Supervisor, and shall be made available to the DEP immediately upon

request. The content of this documentation shall include, but not be limited to, the following information: (a) the name of the inspector; (b) descriptions of waste streams; (c) waste container type and quantity; (d) the current disposal status (i.e., when the waste container is scheduled to be removed from the Work Site) and physical condition of each waste container; (e) the present condition of each waste storage area; (f) proper label type; (g) storage area security method to prevent unauthorized entry.

4. Asbestos Project Inspection Documentation: Project Monitors and Restricted Areas shall be inspected daily by the Asbestos Handler Supervisor.

   a. Each daily Asbestos Project inspection shall be documented in the Asbestos Abatement Contractor's bound Log. The Log shall be signed by the Asbestos Handler Supervisor, and shall be made available to the DEP immediately upon request. The content of the Log shall include, but is not limited to, the following information: (a) the type of Asbestos Project (i.e., Large Asbestos Project, Small Asbestos Project, or Minor Asbestos Project) being conducted; (b) the current phase of the Asbestos Project (i.e., mobilization, background pre-Abatement, abatement, cleaning, Clearance Air Monitoring, or Containment breakdown); (c) the names of the Asbestos Handlers, Asbestos Handler Supervisors, Project Monitors, and Air Sampling Technicians on site, as well as the name of the company each individual is representing; (d) the types of air monitoring (i.e., Worker Exposure Monitoring or area monitoring) being conducted, and the number of samples being collected for each type of air monitoring activity; (e) the results of decontamination enclosure system, Critical Barrier, Isolation Barrier, and Negative Air Pressure Equipment inspections; (f) a summary of corrective actions and Repairs; (g) reasons for Work stoppages, if any; (h) manometer readings (at least twice per work shift); (i) emergency and fire exit checks; (j) verification that functional fire extinguishers are present in the Restricted Areas; (k) any unusual events that occurred during the Work; (l) non-compliance issues observed, including their corrective actions.

5. Contractor Project Record: The Asbestos Handler Supervisor shall maintain a project record in the Regulated Abatement Work Area. The Contractor Project Record shall be made available to the Engineer or DEP for review at any time during the Asbestos Project, and shall be submitted to the DEP within 24- hours after the completion of the Asbestos Project.

   a. At a minimum, the Contractor Project Record shall contain the following information: (a) copies of DEP and NYSDOL asbestos certificates/licenses for all individuals/companies working on the Asbestos Project; (b) copies of all notifications, amendments, permits, work safety plans, and Variances related to the Asbestos

Project; (c) copies of all exposure and Ambient Air Monitoring results generated during the Asbestos Project; (d) documentation of all pressure differential readings for Regulated Abatement Work Areas; (e) copies of all available bulk sample analytical data as well as asbestos survey reports relating to the Asbestos Project; (f) copies of all daily sign-in sheets as defined in this Article; (g) a list of emergency phone numbers, including the local fire department, local police department, nearest hospital, as well as phone numbers for the Engineer and DEP personnel responsible for administering the Asbestos Project; (h) a copy of New York City's Asbestos Control Program Rules and Regulations (Title 15, Chapter 1); (i) a copy of New York State's Asbestos Rules and Regulations (12 NYCRR 56); (j) a copy of EPA's asbestos regulations (40 CFR 61, Subparts A and M); (k) copies of all SDSs pertaining to all chemicals being used during the Asbestos Project; (l) a copy of the Contractor's Asbestos Work Plan; (m) copies of all daily air monitoring reports as defined in this Article; (n) copies of all daily Asbestos Project inspection reports as defined in this Article; (o) copies of all weekly waste storage area inspection reports as defined in this Article.

6. Daily Sign-In Documentation: The Contractor shall generate daily sign-in documentation for all individuals entering and exiting each Regulated Abatement Work Area and Restricted Area, for the duration of the Asbestos Project. The daily sign-in documentation shall be maintained in the Asbestos Abatement Contractor's bound Log. The daily sign-in documentation shall be made available to the Engineer or DEP for review at any time during the Asbestos Project.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Respirators: The Contractor shall select respirators approved by NIOSH for use in Regulated Abatement Work Areas where the Abatement or Disturbance of ACM

or Asbestos-Containing Waste Materials will occur. If not included within the EHASP the Contractor shall submit their Respiratory Protection Program to DEP for review prior to abatement activities. At a minimum, the Contractor shall provide each individual within a Regulated Abatement Work Area with a half-face, negative pressure, air purifying respirator equipped with HEPA filter cartridges. The Contractor's Asbestos Handler Supervisor shall make all determinations regarding respiratory protection modifications that will be implemented for the Work. All modifications shall be in accordance with the OSHA Asbestos Standard for the Construction Industry (29 CFR 1926.1101) and the Contractor's Asbestos Work Plan. At no time during the Asbestos Project shall respiratory protection within a Regulated Abatement Work Area be downgraded to below the minimum requirement of a half-face, negative pressure, air purifying respirator equipped with HEPA filter cartridges.

B. PPE: The Contractor shall provide personnel who have a potential to be exposed to asbestos with appropriate PPE.

C. HEPA Filters: HEPA filters used in vacuuming equipment and Negative Air Pressure Equipment must meet or exceed any manufacturer's specifications and recommendations, as well as specifications presented in the Standard for Safety High Efficiency, Particulate, Air Filter Units (UL 586).

D. Containment Materials: Plastic sheeting used in the construction of temporary enclosures shall be fire retardant in accordance with NFPA 701. Wood or other materials used in the construction of temporary enclosures shall be non-combustible or fire-retardant in accordance with NFPA 255, ASTM D2898, ASTM E84 and UL 723.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Safe Work Practices for Trace Asbestos materials

1. An exposure assessment shall be performed in accordance with 29 CFR 1926.1101(f) (2) (i) to determine if workers disturbing, handling, or performing cleanup activities involving trace asbestos materials, must wear PPE or respiratory protection.

2. Wetting agents or special work methods shall be utilized to control potential employee exposures to asbestos during the handling, mixing, removing, cutting, application, or cleanup, of trace asbestos materials, except if the use

of these wetting agents/work methods is not feasible (e.g., using them may create electrical hazards or equipment malfunctions).

3. Asbestos-contaminated wastes and debris shall be cleaned-up promptly and disposed of in leak-tight containers. The handling, disposal, and transport of Trace Asbestos-Containing Material wastes is not regulated since the wastes are not ACM (i.e., they do not contain greater than 1% asbestos).

4. The use of high-speed abrasive saws that are not equipped with "point-of-cut" ventilators or enclosures with HEPA-filtered exhaust air shall be prohibited.

5. The use of compressed air to cleanup or remove trace asbestos materials is prohibited.

B. Preparation

1. Utilities: The temporary use of any on-site utilities shall be subject to the approval of the DEP. The Contractor shall furnish all water, hoses and water filtration devices needed for the Work as per 01 51 11 - Temporary Water and Sanitary Services; as well as any temporary electrical hookups and temporary lighting to the Asbestos Control Area as per 01 51 30 - Temporary Electrical System. All temporary lighting and temporary electrical service to an Asbestos Control Area shall be provided by the Contractor and shall be in weather-proof enclosures and be ground fault protected. Also, the Contractor shall supply all heating and ventilation equipment needed for the Work as per 01 51 12 Temporary Heat and Ventilation.

2. Signs: The Contractor shall post conspicuous warning signs at all approaches to Regulated Abatement Work Areas, Restricted Areas, and waste storage areas. The signs shall be located at such a distance so that personnel may read the sign and take necessary precautions before entering a Regulated Abatement Work Area, Restricted Area, or waste storage area. Signs shall comply with the requirements of federal, state, and local regulations. Once Clearance Air Monitoring results indicate that a Regulated Abatement Work Area is in compliance with the provisions for re-occupancy set forth in RCNY Title 15, Chapter 1 or 12 NYCRR 56, the signs shall be removed. At a minimum, each sign shall bear the following information in English and the predominant language that is spoken by the Contractor's employees if English is not spoken:

DANGER
ASBESTOS CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING
ARE REQUIRED IN THIS AREA
NO SMOKING

C. Fire Extinguishers: The Contractor shall maintain at least two functional fire extinguishers in each Restricted Area. The fire extinguishers shall have a minimum rating of 2-A:10-B:C, and each fire extinguisher shall be checked daily by the Asbestos Handler Supervisor to ensure that it remains functional throughout the duration of the Asbestos Project.

3.02 IMPLEMENTATION

A. Bulk Removal

1. Protection of Existing Work to Remain: All Work involving the Abatement or Disturbance of ACM or Asbestos-Containing Waste Materials, must be conducted without damage to, or contamination of equipment or surfaces within the Regulated Abatement Work Areas, Restricted Areas, or other areas adjacent to these areas. All such damage or contamination shall be immediately corrected and cleaned up by the Contractor at the Contractor's expense.

2. Containments and Negative Air Pressure Equipment: Pressure differential readings for each workday shall be obtained, documented in the Contractor's Project Record, and reviewed by the Asbestos Handler Supervisor on a daily basis. The Asbestos Handler Supervisor shall notify the Engineer and the DEP immediately, if any variations in the pressure differential readings may have led to the migration of asbestos fibers outside of a Regulated Abatement Work Area. Corrective actions shall be implemented immediately to ensure that negative pressure is restored.

3. Personal Decontamination Enclosure System: The Contractor shall ensure that employees do not leave a Regulated Abatement Work Area wearing any potentially contaminated protective work clothing or PPE. Employees are required to shower prior to leaving the Regulated Abatement Work Area.

3.03 FIELD TESTING / QUALITY CONTROL

A. Air Monitoring

1. Air monitoring for airborne concentrations of asbestos fibers shall be conducted by the Asbestos Handler Supervisor (or by a qualified air monitoring firm) in accordance with OSHA.

a. Worker Exposure Monitoring: Worker Exposure Monitoring shall be conducted during each phase of the Asbestos Project (e.g., pre-abatement, Abatement, and cleanup) for one (1) Work shift from at least one (1) employee that is representative of each type of Work task that is being performed. Each personal air sample will "run" for the employee's entire Work shift in order to ensure that enough volume (of air) is collected and an accurate 8-hour TWA can be calculated. Representative 30-minute short-term employee exposures shall also be conducted and shall be determined on the basis of one or more samples representing 30-minute exposures

associated with operations that are most likely to produce exposures above the excursion limit for employees in each Regulated Abatement Work Area as per OSHA 1926.1101(f)(1)(iii). Documentation regarding the sample numbers, specific shift when the sampling was conducted, the Work tasks that were sampled, the dates of sampling, the employee hours that were worked during the shift, and the total sampling times, shall accompany each laboratory COC form.

b. Complete documentation of all Worker Exposure Monitoring activities shall be in accordance with this Article.

c. The Contractor shall submit all Worker Exposure Monitoring results to the DEP within 24- hours from when the air samples were collected.

d. If at any time, PCM analysis of any air sample (i.e., from Worker Exposure Monitoring performed by the Contractor) in any phase of the Asbestos Project (i.e., pre-abatement, Abatement, cleanup, or clearance) indicates that the filter was "overloaded" and a fiber count cannot be obtained, the sample shall immediately undergo TEM analysis. All costs of the additional TEM analysis will be at the Contractor's expense.

2. Area Monitoring: Air monitoring for airborne concentrations of asbestos fibers shall be conducted by the DEP.

a. All Clearance Air Monitoring results shall meet or be below background ambient air levels or 0.01 f/cc of air (whichever is greater), prior to the breakdown of the Containment. If Clearance Air Monitoring results indicate a fiber count greater than background ambient air levels or 0.01 f/cc of air in any area, the Contractor will be required to re-clean that area. For projects conducted outside of the five boroughs, the clearance and action criteria is less than 0.01 f/cc; of air, or background levels (whichever is greater). Repeated cycles of cleaning and Clearance Air Monitoring will be performed until a fiber count is achieved that meets or is below background ambient air levels or 0.01 f/cc of air within the area. All costs of re-cleaning and additional Clearance Air Monitoring will be at the Contractor's expense.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Cleanup: All cleaning Work shall progress from the point most remote from the intakes of the Negative Air Pressure Equipment, towards the intakes of the equipment, as well as from the highest point of the surfaces to be cleaned towards the lowest point of the surfaces. Dry sweeping and using compressed air to cleanup

a Regulated Abatement Work Area or a Restricted Area is strictly prohibited. HEPA-filtered vacuums and Wet Cleaning methods shall be used to ensure that these areas remain free of visible dust and debris on a daily basis. In addition, only cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the materials or as approved by the DEP, shall be used.

B. Collection, Filtration and Containerization of Wastes: The Contractor shall collect and containerize asbestos waste (solid and liquid), debris, PPE, and Containment materials on a daily basis in accordance with the Asbestos Work Plan. Using chutes to move construction debris or waste (bagged or not bagged) will not be permitted at any time.

1. Prior to containerizing Asbestos-Containing Waste Materials, the wastes shall be "Adequately Wetted," and wrapped in 6-mil (0.006") polyethylene sheeting, or double-bagged in 6-mil polyethylene bags. The bags shall be "goose necked" and sealed air tight with duct tape, and each bag (or wrapped item) shall be labeled before being placed in an appropriate container (i.e., dumpster, trailer, or roll-off) for disposal.

2. Corrugated cartons or drums may be used in conjunction with polyethylene bags and sheeting for the disposal of Asbestos-Containing Waste Materials that have sharp-edged components (e.g., nails, screws, or tin sheeting) which may tear the bags or sheeting. The waste within these drums or cartons must be wrapped or double-bagged, and the cartons/drums must be labeled.

3. Wastewater derived from the Asbestos Project shall be collected and filtered through a system with at least a 5.0-micron particle size collection capability. A system containing a series of several filters with progressively smaller pore sizes shall be used to avoid the rapid clogging of the filtration system by large particles. Contaminated filters shall be disposed of as asbestos waste. Filtered wastewater shall be discharged in accordance with all applicable federal, state, and local regulations.

   a. Discharging filtered asbestos decontamination water to a DEP Wastewater Treatment Plant (WWTP) will require written permission from the DEP Bureau of Wastewater Treatment (BWT) and the submission of analytical testing results for asbestos to the BWT for review and approval prior to discharge. The disposal requirements for filtered asbestos decontamination water generated on other DEP properties (e.g., drinking water shafts) may be more stringent or prohibited.

C. Storage of Wastes: The Contractor shall store all bagged Asbestos-Containing Waste Materials in DOT-approved container systems (e.g., a roll-off or trailer), as per 49 CFR 178. No container shall be filled in excess of the capacity marked on the container, and all containers shall be lined with 6-mil (0.006") polyethylene sheeting, have a hard top, and shall be lockable. In addition, all containers shall

have an intact and legible label affixed to it. No bagged asbestos waste shall be stored in a Regulated Abatement Work Area or decontamination enclosure system for longer than the current Work shift that generated the waste.

1. Non-Asbestos Waste: The Contractor shall store non-Asbestos-Containing Waste Materials separately from Asbestos-Containing Waste Materials, shall provide all non-asbestos waste containers, and shall make all transportation and disposal arrangements for non-Asbestos-Containing Waste Materials in accordance with federal, state, and local regulations.

D. Labeling: The Contractor shall affix warning labels to all asbestos waste disposal bags, wrapped items, and containers (i.e., drums, dumpsters, trailers, or roll-offs). Labels shall comply with the requirements of federal, state, and local regulations. At a minimum, each label on disposal containers/bags/items shall bear the following information in English:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
[Generator Name, Address, and Telephone Number]

E. Final Visual Inspection and Clearance Air Monitoring: The Independent Third-Party Monitor shall not conduct Clearance Air Monitoring until the Regulated Abatement Work Area has been inspected by the Asbestos Handler Supervisor and the Project Monitor has performed the Final Visual Inspection. During this inspection, the Asbestos Handler Supervisor and the Project Monitor shall determine if the following has been achieved: (a) all ACM and Asbestos-Containing Waste Materials have been abated and removed from the area; (b) the area is clean and dry; (c) Critical Barriers and Isolation Barriers are intact; (d) Negative Air Pressure Equipment is turned on and functioning. If any of these items have not been achieved, the Contractor shall perform the necessary corrective actions to achieve compliance before conducting the Clearance Air Monitoring.

F. Breakdown of the Regulated Abatement Work Area: Critical Barriers shall not be removed and Negative Air Pressure Equipment shall not be turned off until Clearance Air Monitoring results meet the criteria specified in this Section and RCNY Title 15, Chapter 1 or 12 NYCRR 56.

G. Asbestos Project Completion Form/Asbestos Project Conditional Completion: Upon successful completion of an Asbestos Project performed in the five boroughs, a copy of the Asbestos Project Completion Form (ACP-21) or Asbestos Project Conditional Completion Form (ACP-20) issued by the DEP shall be submitted to the Engineer.

H. Disposal of Wastes: Asbestos-Containing Waste Materials shall be disposed of to ensure that containers do not remain on the job site for longer than necessary.

Containers that have reached their storage capacity shall not remain on site and transportation arrangements shall be made for their removal.

I. Disposal Documentation: Once all waste profiles have been completed and signed by DEP, the Contractor shall provide DEP with a "Letter of Acceptance" issued by the TSDF indicating that the wastes will be accepted, and a copy of the advance manifest. On the date of disposal, the Contractor shall submit one (1) copy of the completed manifest that has been signed and dated by the initial transporter in accordance with 6 NYCRR 372, 40 CFR 262 and 40 CFR 302, to the DEP for signature as Generator. All manifests and Land Disposal Restrictions (LDRs) must be signed by a DEP employee as per 6 NYCRR 376 and 40 CFR 268, and as described in Section 01 35 45 - Hazardous Materials Control.

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. This Section details the requirements for construction and demolition activities affecting materials and structures coated with or containing Lead as shown on Table No.1, Summary of Lead and PCB Analysis on Paints, attached to Section 01 35 45 – Hazardous Materials Control, specified herein, or required to complete the Work, including all affected coatings identified and impacted by the Work.

1. Hazardous Materials Mitigation Report, Rev. 1, Contract WP-169 CSO-FC-DF, Bidwell Environmental, LLC, June 2025.

B. All Work under this Section shall be performed to minimize the creation of airborne emissions (40 CFR 50); minimize the quantity of hazardous waste generated; protect the health and safety of all site personnel and the welfare of the public; and avoid adverse environmental impacts.

C. The Contractor shall perform the abatement and disposal of additional lead-containing materials not included in the reports listed in 1.01A. In the absence of analytical testing results for a specific painted/coated material, air monitoring and worker Personal Protective Equipment (PPE) requirements, including respiratory protection, shall address the potential presence of Lead.

D. The following index of this Section is presented for convenience:

E.

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1.02 PAYMENT

A. No separate payment will be made for performing any work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s), or allowance(s) as set forth in Section 01 27 00 – Measurements and Payments.

1.03 RELATED SECTIONS

A. Section 01 35 27 – Environmental Health and Safety Requirements

B. Section 01 35 45 – Hazardous Materials Control

C. Section 01 41 00 – Regulatory Requirements

D. Section 01 51 11 – Temporary Water and Sanitary Services

E. Section 01 51 12 – Temporary Heat and Ventilation

F. Section 01 51 30 – Temporary Electrical System

G. Section 01 74 20 – Construction Waste Management

H. Section 02 41 10 – Demolition and Removals

I. Section 02 84 05 – PCB Management

1.04 REFERENCES

A. Definitions

1. Abatement: Any measure or set of measures designed to permanently eliminate Lead Paint hazards (refer to 40 CFR 745.223 for description of what is included). Abatement does not include renovation, remodeling, landscaping, or other activities, when such activities are not designed to permanently eliminate Lead Paint hazards, but instead, are designed to repair, restore, or remodel a given structure or dwelling, even though these activities may incidentally result in a reduction or elimination of Lead Paint hazards. Furthermore, Abatement does not include interim controls, (e.g., the spot removal of a Lead paint/bitumastic coating on a surface in order to perform torch cutting at that location), Operation and Maintenance (O&M) activities, or other measures and activities designed to temporarily reduce Lead Paint hazards.

2. Action Level: Defined by OSHA as individual exposure, without regard to the use of respirators, to a specific airborne concentration of a contaminant expressed in micrograms per cubic meter of air ($\mu g/m^3$) calculated as an 8-hour Time-Weighted Average (TWA). Once an Action Level is met or exceeded, the Contractor is responsible for meeting specific requirements outlined in the applicable OSHA standard, which may include additional worker Exposure Monitoring, the use of PPE including respiratory protection, the use of Hygiene Facilities, medical surveillance, or training

for workers. The following Action Levels are pertinent to the disturbance, removal, construction/demolition, and disposal activities associated with painted/coated materials and structures (as per 01 74 20 - Construction Waste Management, 02 41 10 - Demolition and Removals):

a. Lead - 30 µg/m^3 per 29 CFR 1926.62.

3. Area Monitoring: Stationary air sampling outside of a Lead Control Area for the purpose of determining compliance with OSHA's Lead in Construction Standard (29 CFR 1926.62), and for the purpose of ensuring that airborne Lead concentrations remain below 30 ug/m^3 outside of the Lead Control Area during all work activities that have the potential to disturb Lead-Containing Materials or Lead Wastes. All Area Monitoring shall follow pertinent NIOSH (Methods 5503, 7048, 7082, 7105, 7300, 7600, 7604, 7900) or ASTM sampling methodologies.

4. Certified Industrial Hygienist (CIH): Refers to an individual employed by the Contractor who is currently certified by the American Board of Industrial Hygiene (ABIH).

5. Competent Person: Defined in the OSHA Lead in Construction Standard (29 CFR 1926.62) as one who is capable of identifying existing and predictable hazards in the surroundings or working conditions, and who has authorization to take prompt corrective measures to eliminate them. Duties of the Competent Person include the following: (a) determining prior to the performance of the Work, whether Lead is present in the workplace; (b) establishing Lead Control Areas and assuring that access to and from those areas is limited to authorized personnel; (c) assuring the adequacy of any employee Exposure Monitoring required by OSHA; (d) assuring that all employees exposed to airborne contaminant levels above Action Levels, Permissible Exposure Limits, or Recommended Exposure Limits wear appropriate PPE, respiratory protection, and are trained in the use of appropriate methods of exposure control for all of the contaminants present; (e) assuring that proper Hygiene Facilities are provided and that workers are trained to use those facilities; (f) assuring that engineering controls specific to the contaminants present are implemented, maintained in proper operating condition, and functioning properly.

6. Decontamination Area: Designated area within the Hygiene Facilities for removing gross contamination from PPE (using a HEPA vacuum), washing away contamination that has accumulated on the skin and hair (using soap and water), removing and disposing/washing of contaminated PPE, and donning clean clothing that will not potentially contaminate areas outside of a Lead Control Area's Physical Boundary.

7. DOT Hazardous Materials Transportation Training: Training that meets the criteria outlined in 49 CFR 172.704. This training shall include discussions from 49 CFR 171 of the following: (a) hazardous materials tables within 49 CFR 172; (b) material packaging and labeling within 49 CFR 178; (c)

shipping papers and placards within 49 CFR 173; (d) material loading and segregation within 49 CFR 173.

8. EPA Lead-Based Paint Supervisor Training: A training course administered by the EPA or approved company - which includes discussions of the following: (a) worker protection and safety; (b) occupant protection; (c) clan-up and clearance; (d) waste disposal; (e) residence and community relations; (f) regulatory aspects; (g) use of X-Ray Fluorescence (XRF) paint analyzers; (h) legal and insurance issues.

9. Exclusion Zone: (See definition of "Lead Control Area").

10. Exposure Monitoring: Personal air sampling performed outside the respirator within the breathing zone of individuals, for the purpose of determining compliance with OSHA's Limits for Air Contaminants Table (29 CFR 1910.1000, Table Z-1) and Lead in Construction Standard (29 CFR 1926.62). Analytical results obtained from Exposure Monitoring will be used to select appropriate respiratory protection and PPE for individuals within a work area. For the purpose of this Section, Exposure Monitoring samples shall be collected from individuals who are representative of each type work task being conducted by the Contractor, and all Exposure Monitoring shall follow pertinent NIOSH or ASTM sampling methodologies.

11. Hazardous Waste Operations (HAZWOPER) Training: Training that meets the criteria outlined in the OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120). A minimum of 24-hour HAZWOPER Training will be required for Abatement work being performed under this Section. However, certain types of work may require 40-hour HAZWOPER Training.

12. High-Efficiency Particulate Air (HEPA) Filter: A filter designed to remove 99.97% of all particles greater than 0.3 micrometers (μm) in diameter. For the purpose of this Section, HEPA vacuum and local exhaust filtration equipment used by the Contractor shall meet the Standard for Safety High-Efficiency, Particulate, Air Filter Units (UL 586) developed by Underwriters Laboratories.

13. Homogenous Materials: Lead-Containing Materials which are similar in appearance, color, texture, and substrate type.

14. Hygiene Facilities: Facilities within the Physical Boundary of a Work area that are set up to prevent cross contamination and are equipped with change areas and separate storage facilities for PPE and clean clothing. Hygiene Facilities shall include adequately supplied hand washing station(s) (i.e., running water, soap, and clean towels) or shower(s) (hot and cold water that is controllable at the tap, soap, shampoo, and clean towels).

15. Lead: Defined in the OSHA Lead in Construction Standard (29 CFR 1926.62) as metallic Lead, all inorganic Lead compounds, and organic Lead soaps. Excluded from this definition are all other organic Lead compounds.

16. Lead-Based Paint (LBP): A term used by Department of Housing and Urban Development (HUD) and the EPA to define paint or other surface coatings (e.g., glazes) with Lead levels equal to or exceeding 1.0 milligram per square centimeter (1.0 mg/cm^2) in a paint XRF reading, or 0.5% by dry weight (5,000 mg/kg (ppm)) in a paint chip sample. LBP is subject to the requirements set forth in the OSHA Lead in Construction Standard (29 CFR 1926.62).

17. Lead-Containing Material: Any material that contains, or is coated with, a detectable concentration of Lead.

18. Lead-Containing Paint (LCP): A term used to define paint or other surface coatings (e.g., glazes) with any detectable amount of Lead less than 1.0 milligram per square centimeter (1.0 mg/cm^2) in a paint XRF reading, or 0.5% by dry weight (5,000 mg/kg (ppm)) in a paint chip sample. LCP is subject to the requirements set forth in the OSHA Lead in Construction Standard (29 CFR 1926.62).

19. Lead Control Area: The area within the Physical Boundary where worker Hygiene Facilities are located and where all Work activities take place that involve the disturbance of Lead-Containing Materials and Lead Wastes.

20. Lead Paint: A generic term that refers to both LBP and LCP.

21. Lead Waste: Non-specific liquid or solid waste generated during the Abatement, removal, construction/demolition, handling, or cleanup of a Lead-Containing Material.

22. Organic Vapor Cartridge: A NIOSH approved respirator filter typically containing 25 to 40 grams of sorption media such as activated charcoal.

23. OSHA Lead Awareness Training: Annual training that meets the criteria outlined in the OSHA Lead in Construction Standard (29 CFR 1926.62) for individuals that have the potential to be exposed to Lead-Containing Materials or Lead Wastes. This training shall include discussions of the following: (a) current federal, state, and local regulations pertaining to Lead (including 29 CFR 1926.62) and other heavy metals that may be disturbed during the Work; (b) the health effects of Lead and other heavy metal exposure; (c) state-of-the-art work practices, engineering controls, and procedures for Abatement, removal, construction/demolition, materials handling, waste management, and housekeeping activities that involve Lead-Containing Materials and Lead Wastes; (d) the use and maintenance of PPE and the use and maintenance of respirators in accordance with 29 CFR 1910.134; (e) medical surveillance programs and the medical removal protection program; (f) requirements regarding warning signs, labeling, and Safety Data Sheets (SDSs) in accordance with 29 CFR 1910.1200; (g) responsibilities of the Competent Person.

24. OSHA Lead in Construction Standard (29 CFR 1926.62): A federal standard that applies to all construction work where an employee may be occupationally exposed to Lead. In this standard, “construction work” is

defined as work for construction, alteration, or repair, including painting and decorating. It also includes, but is not limited to, the following: (a) the demolition or salvage of structures where Lead or materials containing Lead are present; (b) the removal or encapsulation of materials containing Lead; (c) new construction, alteration, repair, or renovation of structures, substrates, or portions thereof, that contain Lead, or materials containing Lead; (d) the installation of products containing Lead; (e) Lead contamination/emergency cleanup; (f) the transportation, disposal, storage, or containment of Lead or materials containing Lead on the site or location at which construction activities are performed; (g) maintenance operations associated with any of the construction activities described in this definition.

25. OSHA Monitoring: (See definition of "Exposure Monitoring").

26. P-100 Filter: (See definition of: "High-Efficiency Particulate Air (HEPA) Filter").

27. Perimeter Monitoring: (See definition of "Area Monitoring").

28. Permissible Exposure Limit (PEL): Defined by OSHA as employee exposure, without regard to the use of respirators, to a specific airborne concentration of a contaminant expressed in micrograms per cubic meter of air ($\mu g/m^3$) calculated as an 8-hour TWA. Once a PEL is met or exceeded for a particular contaminant, the Contractor is responsible for meeting specific requirements outlined in the applicable OSHA standard, which may include worker Exposure Monitoring, the use of PPE including respiratory protection, the use of Hygiene Facilities, medical surveillance, or training for workers. The following PELs are pertinent to removal, demolition, and disposal activities associated with Lead-Containing Materials and Lead Wastes:

    a. Lead - 50 $\mu g/m^3$ per 29 CFR 1926.62.

29. Personal Monitoring: (See definition of "Exposure Monitoring").

30. Physical Boundary: A physical barrier designated with ropes, "caution tape," or a partition that surrounds a work area in order to limit the entry of unauthorized personnel and delineate "clean areas" from areas that may meet or exceed an Action Level, PEL, or REL.

31. Recommended Exposure Limit (REL): An exposure limit recommended by the NIOSH that can be expressed as a TWA, Ceiling Limit, or Short-Term Exposure Limit (STEL). Once an REL is met or exceeded for a particular contaminant, the Contractor is responsible for ensuring that workers receive appropriate Exposure Monitoring, PPE, including respiratory protection, Hygiene Facilities, medical surveillance, and training.

32. Regulated Area: (See definition of "Lead Control Area").

33. Resource Conservation and Recovery Act (RCRA) Training: Training that meets the criteria outlined in 40 CFR 265.16. This training shall include

Site-specific discussions of the following: (a) hazardous waste identification; (b) waste storage container use and labeling; (c) waste storage area management; (d) personal health and safety, including fire safety; (e) manifesting and the off-site transportation of wastes; (f) procedures for using, inspecting, repairing, and replacing emergency equipment and monitoring equipment; (g) procedures for communicating with other employees and outside emergency response personnel; (h) responses to fires or explosions; (i) responses to leaks, spills, and potential groundwater contamination incidents ; (j) the shutdown of operations.

34. Time Weighted Average (TWA): The average time over a given work period (e.g., an 8-hour workday) of a person's exposure to a chemical or agent. The average is determined by sampling for the chemical or agent throughout the time period.

35. Trigger Activities: Certain activities that involve a disturbance of Lead-Containing Materials or Lead Wastes. Depending upon whether the performance of these activities exceeds an Action Level, PEL, or REL, the requirements may include additional worker Exposure Monitoring, the use of PPE including respiratory protection, the use of Hygiene Facilities, medical surveillance, or training for workers. Examples of Trigger Activities include, but are not limited to, the following: abrasive blasting, welding, torch cutting/burning, heat gun usage, needle gunning/scaling, rivet busting, using a roto peen, mechanical sanding/grinding, using mechanical shears, hand scraping/sanding, chemical stripping, and the manual demolition of Lead-Containing Materials.

36. X-Ray Fluorescence (XRF): An analytical method that can be used in the field for determining the Lead content of paints/coatings on a building component or material surface.

B. Reference Standards

1. The Contractor shall comply with all applicable regulations, standards, and guidelines of federal, state, and local environmental and occupational safety and health agencies regarding Lead-Containing Materials and Lead Wastes. These regulations, standards, and guidelines include, but are not limited to the following:

a. United States (U.S.) Department of Transportation (DOT):

1) 49 CFR 171 - General Information, Regulations, and Definitions;

2) 49 CFR 172 – Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements;

3) 49 CFR 173 – Shippers: General Requirements for Shipments and Packaging's;

4) 49 CFR 178 – Specifications for Packaging.

b. United States Environmental Protection Agency (EPA):

1) 40 CFR 50 – National Primary and Secondary Ambient Air Quality Standards;

2) 40 CFR 116 – Designation of Hazardous Substances;

3) 40 CFR 117 – Determination of Reportable Quantities for Hazardous Substances;

4) 40 CFR 260 – Hazardous Waste Management Systems: General;

5) 40 CFR 261 – Identification and Listing of Hazardous Waste;

6) 40 CFR 262 – Standards Applicable to Generators of Hazardous Waste;

7) 40 CFR 263 – Standards Applicable to Transporters of Hazardous Waste;

8) 40 CFR 264 – Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities;

9) 40 CFR 265 – Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities;

10) 40 CFR 268 – Land Disposal Restrictions;

11) 40 CFR 302 – Designation, Reportable Quantities, and Notification;

12) 40 CFR 745 – Lead-Based Paint Poisoning Prevention in Certain Residential Structures.

c. National Institute for Occupational Safety and Health (NIOSH):

1) Method 5503 – Polychlorobiphenyls;

2) Method 7082 – Lead by FAAS;

3) Method 7105 – Lead by GFAAS;

4) Method 7300 – Elements by ICP;

5) NIOSH Pocket Guide (NPG) to Chemical Hazards.

d. New York City Department of Environmental Protection (DEP):

1) Environmental Health and Safety Policies and Procedures – Vol. III, Lead Management;

2) Environmental Health and Safety Policies and Procedures – Vol. IV, Hazardous Waste Management;

3) Environmental Health and Safety Policies and Procedures – Vol. III, EHS Reporting and Investigation

4) RCNY Title 15, Chapter 19 – Discharges of Wastewater and Other Materials to Public Sewers.

e. New York State Department of Environmental Conservation (NYSDEC):

1) 6 NYCRR 364 – Waste Transporter Permits;

2) 6 NYCRR 370 – Hazardous Waste Management Regulations;

3) 6 NYCRR 371 – Identification and Listing of Hazardous Waste;

4) 6 NYCRR 372 – Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities;

5) 6 NYCRR 373 – Hazardous Waste Management Facilities;

6) 6 NYCRR 376 – Land Disposal Restrictions.

f. Occupational Safety and Health Administration (OSHA):

1) 29 CFR 1910 – Occupational Safety and Health Standards;

2) 29 CFR 1910.28 – Safety Requirements for Scaffolding;

3) 29 CFR 1910.120 – Hazardous Waste Operations and Emergency Response;

4) 29 CFR 1910.134 – Respiratory Protection Standard;

5) 29 CFR 1910.1200 - Hazard Communication Standard;

6) 29 CFR 1926 – Safety and Health Regulations for Construction;

7) 29 CFR 1926.62 – Lead in Construction Standard;

g. Society for Protective Coatings (SSPC):

1) SSPC Guide 6, Guide for Containing Debris Generated During Paint Removal Operations;

2) SSPC Guide 7, Guide for the Disposal of Lead-Contaminated Surface Preparation Debris;

3) SSPC SP COM, Surface Preparation Commentary for Steel and Concrete Substrates;

4) SSPC SP 1, Solvent Cleaning;

5) SSPC SP 2, Hand Tool Cleaning;

6) SSPC SP 3, Power Tool Cleaning;

7) SSPC SP 11, Power Tool Cleaning to Bare Metal;

8) SSPC SP 13/ NACE No.6, Surface Preparation of Concrete;

9) SSPC SP 15, Commercial Grade Power Tool Cleaning.

h. Underwriters Laboratories, Inc. (UL):

1) UL 586 – Standard for Safety High Efficiency, Particulate, Air Filter Units.

1.05 DESCRIPTION

A. Commencement of Work: Five (5) business days prior to the proposed start of the Work required under this Section at each separate location, the Contractor shall notify the Engineer and the onsite EHS staff. No Work may proceed at any location until authorized by the Engineer.

B. The Contractor shall coordinate any required equipment shutdowns with the Engineer prior to starting the Work.

C. Access Restrictions: The Contractor shall inform the Engineer of proposed access restrictions (i.e., areas or items of equipment which will not be accessible during the proposed work) and provide estimated time frames (including specific dates) of such proposed access restrictions. The Contractor shall notify other contractors in advance of the disturbance, Abatement, spot removal, construction/demolition, and disposal Work included herein, to provide them with sufficient time for coordination of interrelated items that are included in their contracts and that must be performed before, after, or in conjunction with the Work included under this Section.

D. Unexpected Entry into a Lead Control Area: In the event that DEP personnel must enter a Lead Control Area for emergency reasons, the Contractor shall immediately stop work and cleanup any loose debris, so as to permit the safe entry by DEP personnel. Any disturbance of paints/coatings, dusts, materials, or wastes that may potentially generate airborne concentrations of contaminants equal to or above an OSHA Action Level shall not proceed until all DEP personnel have exited from the Lead Control Area.

E. Meetings: In addition to the pre-construction meeting and Site walk-through, other meetings may be required or may be requested by the Engineer, including briefings with Site operations personnel. Written documentation (i.e., “minutes”) of all meetings shall be generated by the Contractor, and copies shall be provided to the DEP within three (3) business days following each meeting.

1.06 QUALITY ASSURANCE

A. Scheduling: The Contractor shall coordinate and schedule all phases of the Work to be performed under this Section with the DEP, subcontractors, material suppliers, and other parties as necessary to ensure the proper execution of the Work.

B. Compliance: In addition to the detailed requirements of this Section and DEP EHS Policies and Procedures, the Contractor shall comply with all applicable regulations of federal, state, and local authorities pertaining to the disturbance, Abatement, removal, construction/demolition, handling, storage, transportation, and disposal of Lead-Containing Materials and Lead Wastes. All matters regarding the interpretation of any regulations, standards, or policies shall be submitted to the Engineer for resolution before starting the Work. Where the requirements of this Section, DEP EHS Policies and Procedures, or federal, state, or local regulations conflict or vary, the most stringent requirements or regulations shall apply.

C. Rejection of Non-Complying Items: The DEP reserves the right to reject Contractor materials/tools/submittal items that are deemed inappropriate or unacceptable by the Engineer or DEP. Submittal items that may be deemed inappropriate or unacceptable include proposed TSDFs, vendors, or subcontractors with previous regulatory citations/violations. The DEP further reserves the right, and without prejudice to other recourse, to accept non-complying items subject to an adjustment in the Contract amount, as approved by the DEP.

D. Suspect Material Characterization: To classify a paint or coating as Lead-containing, a paint chip/coating sample or an XRF reading must be collected. The bulk samples shall be sent to an analytical laboratory meeting the requirements of this Section.

1. Suspect Lead: Although there are no certification requirements pertaining to an individual that collects paint chip/coating samples in an industrial or commercial setting, this Section requires paint chip/coating sampling to be performed by a Lead Sampler.

E. Qualifications:

1. The Paint Removal Company shall have successfully completed at least two (2) projects of comparable scope and methodologies, and shall document the following: (a) the name, address, and phone number of each facility where the Work was performed; (b) the volume and type of each material that was abated/removed; (c) the specific methods of Abatement/removal used (including the tools, technologies, and engineering controls employed).

2. Competent Person:

a. The Competent Person shall have successfully completed:

1) EPA Lead-Based Paint Supervisor Training Certification (current) in accordance with 40 CFR 745.225 (b)(7)(vi); and

2) OSHA Lead Awareness Training (annual); and

3) 24-hr HAZWOPER Training.

b. The Competent Person shall have a minimum of two (2) years' experience on projects involving Lead and has served as the

Competent Person on at least three (3) projects of comparable scope and methodologies to the work being conducted under this Section.

3. Waste Manager:

   a. The Waste Manager shall have successfully completed:

      1) DOT Hazardous Materials Transportation Training; and

      2) RCRA Training - Each training course shall have been completed within the past year in the form of either an initial course or a refresher course.; and

      3) 24-hr HAZWOPER Training; and

      4) OSHA Lead Awareness Training (annual).

   b. The Waste Manager shall have a minimum of two (2) years' experience on projects involving hazardous wastes (including Lead). It is acceptable for an individual who meets the criteria of the Competent Person, to also serve as the Waste Manager for this Contract as long as the individual fulfills all of the requirements of this paragraph.

4. Lead Worker:

   a. Lead Workers shall have successfully completed:

      1) OSHA Lead Awareness Training (annual) as defined in this Section; and

      2) EPA-certified Lead Worker Training for all Lead Abatement activities (current). OSHA Lead Awareness Training satisfies the training requirement for other Lead removal activities (e.g., spot removal and demolition work).

   b. Each Lead Worker shall have a minimum of one (1) year of experience on projects involving Lead and have worked on at least three (3) projects of comparable scope and methodologies to the work being conducted under this Section.

5. Lead Sampler:

   a. Lead Sampler shall have successfully completed:

      1) OSHA Lead Awareness Training (annual) as defined in this Section; and

      2) EPA Certified Lead Inspector course or EPA-certified Risk Assessor course (current).

   b. The Lead Sampler shall have documented experience in collecting paint chip samples.

   c. The qualifications of the Lead Sampler must be approved by the Engineer prior to sample/reading collection.

6. Air Monitor:

   a. The Air Monitor shall have successfully completed:

      1) OSHA Lead Awareness Training (annual).

   b. The Air Monitor shall have a minimum of two (2) years' experience in conducting Area Monitoring and Exposure Monitoring on projects involving hazardous wastes (including Lead). It is acceptable for an individual who meets the criteria of the Competent Person or Waste Manager to also serve as the Air Monitor for this Contract as long as the individual satisfies all of the requirements of this paragraph.

1.07 SUBMITTALS

A. Thirty (30) business days prior to the Work of this Section or as directed by the Engineer, the Contractor shall submit the following to the Engineer:

1. Lead Inspection and Sampling Plan: The Contractor shall provide a Lead Inspection and Sampling Plan to identify suspect Lead-Containing Materials and collect confirmatory samples, as appropriate during the inspection. The Lead Inspection and Sampling Plan shall include at a minimum:

   a. At a minimum, the inspection shall be performed by an Environmental Professional, who has current OSHA Lead Awareness and EPA Lead Inspector Training, as applicable to the location of the work, and has performed inspection work on at least three (3) projects of comparable scope.

   b. Credentials of the laboratory providing sample analysis, including current certification by the New York State Department of Health's (NYSDOH) Environmental Laboratory Approval Program (ELAP) and by the American Industrial Hygiene Association (AIHA).

   c. Sample collection, analysis and reporting protocol.

   d. Health and safety protocol (Job Hazard Analysis) for all investigative activities.

2. Lead Inspection Report: The Contractor shall provide a Lead Inspection Report prepared by the Environmental Professional summarizing the results of all inspection activities, and as applicable, a sampling narrative, laboratory data packages and inventory, including photographs, of all identified suspect and confirmed Lead-Containing Materials.

3. Lead Management Plan(s): Work requiring a Lead Management Plan includes Lead Paint Abatement and Lead Paint spot removal activities. The Lead Management Plan shall be signed and dated by a CIH meeting the definition in this Section.

a. If the Lead-Containing Materials or Lead Wastes that will be disturbed also contain PCBs, it is acceptable to integrate the Lead Management Plan elements into the relevant PCB Management Plan (required under Section 02 84 05 - PCB Management). The Lead Management Plan shall include the following elements:

1) Lead Control:

a) Drawings showing the location and details of the following: (a) each Lead Control Area; (b) each Hygiene Facility; (c) proposed electrical hookups; (d) proposed water hookups: (e) each waste storage area: (f) restroom areas; (g) areas designated for eating, drinking, and smoking;

b) Section on the interfacing of trades (other Contractors) and the sequencing of Lead-Related Work;

c) Section on the collection, handling procedures, and disposal of Lead-Containing Materials and Lead Wastes (including the collection, filtering, and disposal of wastewater);

d) Section on the procedures and methodologies that will be used to conduct Exposure Monitoring and Area Monitoring for particulates. Also, provide the name and qualifications (i.e., training and experience documentation) of the Air Monitor who will be responsible for conducting the air monitoring activities. The Air Monitor shall at a minimum, satisfy the qualification requirements set forth in this Section;

e) Section on housekeeping procedures to be used for maintaining clean work areas and clean Hygiene Facilities;

f) Section on the specific methods and procedures of emissions control that will be used to ensure that airborne contaminant levels do not meet or exceed an OSHA Action Level outside of each Lead Control Area. It should be noted that even after paint/coating removal, the DEP has found that demolition activities (e.g., torch-cutting abated steel) still have the potential to generate elevated airborne levels of Lead. Therefore, the Contractor shall provide engineering controls to capture potential Lead dusts or fumes emitted during demolition work that

involves the cutting or burning of steel structures that have already been abated;

g) Task Analysis: Each task analysis shall include, but is not limited to, the following information: (a) the type of work activity; (b) the tools/equipment that will be used and their respective decontamination procedures; (c) operation and maintenance practices and procedures that will be used for the tools/equipment; (d) the types of Lead-Containing Materials that may be disturbed or Lead Wastes that may be generated when performing the activity; (e) the engineering controls that will be used to control the spread of contamination during the activity; (f) the proposed crew size for the activity and individual employee responsibilities during the activity; (g) housekeeping procedures that will be used during the activity; (h) PPE and proposed respiratory protection that will be used for the activity;

2) Equipment and Supplies: Identify the equipment and supplies that will be used to perform the Work;

3) Rental Equipment Notification: If rental equipment is to be used during the Work, the Contractor shall notify the rental agency in writing concerning the intended use of the equipment;

4) SDSs: Provide SDSs for all chemical products (including chemical stripping products) to be used for the Work;

5) The name and qualifications (i.e., experience and training documentation) of the Competent Person, who shall satisfy the qualification requirements set forth in this Section and be present whenever Work of this Section is being performed.

b. Waste Management:

1) The identification of Lead-Containing Materials, Lead Wastes, and hazardous wastes (as defined in 40 CFR 116, 40 CFR 260, 40 CFR 261, 6 NYCRR 370 and 6 NYCRR 371) associated with the Work;

2) The estimated quantity of each waste stream (regulated and non-regulated) that will be generated and disposed of/recycled as per 40 CFR 302;

3) The name, address, 24-hour phone number, and current permit documentation for each recycling facility or TSDF indicating that the facility is approved by federal, state, and local regulatory agencies to receive Lead-Containing

Materials and Lead Wastes, and that there are no outstanding violations or enforcement actions;

4) Current 6 NYCRR 364 and 40 CFR 263 permit documentation for the waste transporter that will transport Lead-Containing Materials and Lead Wastes from the Work Site to the TSDF;

5) Spill prevention, containment, and cleanup contingency measures to be followed during a suspected Lead emissions/bulk material release or emergency situation;

6) Section on the on-site handling, storage, removal, and disposal of waste materials, including but not limited to, the following: (a) secondary containment system for each drum storage area; (b) description of the waste storage areas; (c) the methods and procedures that will be used to collect and containerize wastes on a daily basis; (d) the types of containers; (e) the submittal of weekly regulated waste inspection and inventory records;

7) The name and qualifications (i.e., experience and training documentation) of the Waste Manager.

c. A detailed schedule for the implementation of the Lead Management Plan elements, including start and completion dates that allow for adequate time for cleanup, inspections, and air monitoring activities.

d. Medical Surveillance: For all activities within a Lead Control Area, each worker shall have: (a) an initial blood testing (including Zinc Protoporphyrin (ZPP) testing), and have a Blood Lead Level (BLL) below 35 micrograms per deciliter (µg/dl)(if the worker's BLL is in excess of 35 µg/dl, the worker shall show medical approval for this Work); (b) a medical exam, including a Pulmonary Function Test (PFT) within the past year; (c) written medical clearance within the past year, by a licensed health care professional, to wear a respirator; (d) a qualitative/quantitative respirator fit-test for the specified respirator within the past year.

e. Employee Documentation: For all activities that take place within a Lead Control Area, each worker shall: (a) have written proof of resumes and training (e.g., certificates) for Lead Workers, Competent Persons, Waste Managers, and Air Monitors; (b) dates and written proof of initial medical surveillance by the Contractor or other employer within the past year, and proof that the employee is currently participating in the employer's ongoing medical surveillance program in accordance with this Section; (c) dates and written proof of respiratory clearance and a medical exam; (d) dates and written proof of a respirator fit-test.

f. A current (i.e., within the last month) signed and notarized statement disclosing all of the Contractor's or subcontractor's OSHA, EPA, and DOT citations/violations on projects involving Lead within the past three (3) years.

4. Analytical Laboratory Qualifications for Analyzing Suspect Lead-Containing Materials and Lead Wastes: Submit the name, address, and telephone number of each analytical laboratory selected to perform the analyses of waste samples (solid and liquid), air samples collected for Area Monitoring and Exposure Monitoring purposes, and paint/coating samples collected to classify building components, including copies of current AIHA and ELAP certificates, including dates of accreditation/reaccreditation. .

B. Field Reports and Recordkeeping: The Contractor shall maintain and provide the following documentation:

1. Air Monitoring Documentation: All air monitoring results, including COC, and daily air monitoring reports shall be provided to the DEP within 24-hours from the date the samples are collected.

a. Each signed daily air monitoring report shall include, but not be limited to, the following information: (a) sample "start" and "stop" times; (b) flow rates (initial and final) for each sample; (c) the total volume of air collected for each sample; (d) sample location descriptions/sample location drawings/names of individuals being sampled; (e) types (i.e., makes and models) of sampling equipment used; (f) types of sample media (i.e., filters and cassettes) used; (g) the most recent calibration dates, along with the calibration results, for the sampling equipment used; (h) the name of the Air Monitor that conducted the air monitoring; (i) dates that the air monitoring was conducted; (j) work tasks being performed during the air monitoring; (k) unique sample numbers used to identify each sample.

2. Waste Documentation: Completed and signed waste manifests from TSDFs shall be provided to the DEP no later than thirty (30) days after disposal. In addition, on-site waste storage areas shall be inspected weekly by the Waste Manager.

a. Each waste storage area inspection shall be coordinated with the Engineer, documented in the form of a written signed report, and shall be provided to the DEP within 24-hours of the inspection date. These reports shall include, but not be limited to, the following information: (a) the name of the inspector; (b) descriptions of waste streams; (c) waste container type, physical condition, and quantity; (d) proper label type; (e) secondary containment system; (f) storage area security method to prevent any unauthorized entry; (g) the

presence of any containers that violate RCRA generator storage time limitations, as defined in 40 CFR 262.

b. In addition to performing weekly waste storage area inspections, the Waste Manager shall also maintain an ongoing waste inventory, including: (a) specific dates that each waste container was added/removed from the waste storage area; (b) the full name (printed) and signature of the individual responsible for adding/removing each waste container from the waste storage area.

3. Lead Control Area Inspection Documentation: Lead Control Areas shall be inspected daily by the Competent Person.

a. Each daily Lead Control Area inspection shall be documented in the form of a signed written report. All reports shall be provided to the DEP no later than 24-hours after the inspection is completed. The content of these reports shall include : (a) the types of Work being performed; (b) the names of the Lead Workers, Competent Person, Waste Manager, and Air Monitor on site, including company name; (c) the types of air monitoring and the number of samples being collected; (d) any non-compliance issues observed, including the corrective actions that were taken to achieve compliance.

4. Contractor Project Record: The Contractor's Competent Person shall maintain a project record at the Work Site that shall be made available to the Engineer or DEP for review at any time, and shall be submitted to the DEP within 24-hours after the completion of the Work.

a. At a minimum, the Contractor project record shall contain the following information: (a) copies of training certificates for all individuals involved with the Work; (b) copies of all air monitoring results generated during the Work; (c) copies of all available paint chip/coating sample analytical data and XRF analyzer data, as well as paint/coating survey reports related to the Work; (d) copies of all daily sign-in sheets; (e) a list of emergency phone numbers, including the local fire department, local police department, nearest hospital, as well as phone numbers for the Engineer and DEP personnel responsible for administering the Work; (f) a copy of the OSHA Lead in Construction Standard (29 CFR 1926.62); (g) copies of all SDSs pertaining to all chemicals being used during the Work; (h) a copy of the Contractor's Lead Management Plan; (i) copies of all daily Lead Control Area inspection records; (j) copies of all weekly waste storage area inspection records; (k) a copy of the waste inventory; and (l) a copy of the Contractor's Hazard Communication (HAZCOM) program.

5. Daily Sign-In Sheets: The Contractor shall generate daily sign-in sheets for all individuals entering and exiting each Lead Control Area for the duration of the Work. The daily sign-in sheets shall be maintained by the Competent

Person and shall be made available to the Engineer or DEP for review at any time during the Work. All daily sign-in sheets shall be submitted to the DEP within 24-hours after the completion of the Work.

a. At a minimum, each daily sign-in sheet shall include: (a) the individual's printed name and signature; (b) company name; (c) the time of entry and exit from each Lead Control Area.

6. HAZCOM Program: The Contractor's HAZCOM program shall be made available to the Engineer or DEP for review at any time during the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Respirators: The Contractor shall select respirators approved by the NIOSH for use in areas where paints/coatings, dusts, materials, or wastes containing contaminants may be disturbed. At a minimum, the Contractor shall provide each individual with a half-face, negative pressure, air purifying respirator equipped with HEPA/P-100 Filter cartridges until Exposure Monitoring results indicate that respiratory protection can be modified. The Contractor's CIH shall make all determinations regarding respiratory protection modifications that will be implemented for the Work. All modifications shall be in accordance with the OSHA Lead in Construction Standard (29 CFR 1926.62).

B. PPE: The Contractor shall provide personnel who have a potential to be exposed to materials or wastes containing contaminants, with appropriate PPE as prescribed by the Contractor's CIH.

C. HEPA Filters: HEPA/P-100 Filters used in vacuuming equipment, power tools, and local exhaust equipment must meet or exceed any manufacturer's specifications and recommendations, as well as specifications presented in the Standard for Safety High Efficiency, Particulate, Air Filter Units (UL 586).

D. Waste Containers: Containers for the storage of all wastes shall be DOT-approved, and shall be provided by the Contractor.

E. Abrasives: Mechanical paint/coating removal equipment shall not use any products containing crystalline silica, and the equipment shall not utilize any non-recoverable materials or any cutting materials which introduce toxic or hazardous materials into the environment.

F. Chemical Strippers: The Contractor shall utilize an environmentally safe chemical paint stripping system, with demonstrated suitability and efficiency in preparing cast-in-place concrete, cement, and plaster surfaces that are free of any visible residues of paints/coatings. The system shall include non-alkaline or alkaline strippers that provide the lowest possible level of toxicity consistent with the types of paints/coatings to be removed. Neutralization products and procedures shall be provided for all alkaline stripping systems, no stripping system shall contain methylene chloride, and the stripping system shall be low in volatile organic compounds (VOCs).

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Hygiene Facilities: The Contractor shall provide functional Hygiene Facilities as defined in this Section that are appropriate for the types of Work to be performed under this Section. The Contractor shall ensure that employees do not leave a Lead Control Area wearing any potentially contaminated PPE. Using compressed air to dislodge dust from clothing/PPE shall be strictly prohibited. The Contractor shall collect, test, and properly dispose of all wastewater generated from Hygiene Facilities.

1. Handwash Stations: The Contractor shall provide functioning handwash stations on all projects that disturb Lead-Containing Materials or Lead Wastes. Handwash stations shall have running water at the tap, clean towels, and soap per 29 CFR 1926.51. Substituting “hand wipes” in place of soap and running water will not be acceptable.

2. Showers: The Contractor shall provide shower facilities in accordance with 29 CFR 1926.62, for use by employees whose airborne exposure to Lead is above the PEL. When shower facilities are necessary, employees are required to shower at the end of the work shift each day prior to leaving the Lead Control Area that they are working in.

B. Utilities: The temporary use of any on-site utilities shall be subject to the approval of the DEP. The Contractor shall furnish all water, hoses and water filtration devices needed for the Work as per 01 51 11 Temporary Water and Sanitary Services; as well as any temporary electrical hookups and temporary lighting to the

Lead Control Area as per 01 51 30 Temporary Electrical System. All temporary lighting and temporary electrical service to a Lead Control Area shall be provided by the Contractor and shall be in weather-proof enclosures and be ground fault protected. Also, the Contractor shall supply all heating and ventilation equipment needed for the Work as per 01 51 12 Temporary Heat and Ventilation.

C. Signs: The Contractor shall post conspicuous warning signs at all approaches to work areas and waste storage areas. Signs shall comply with federal, state, and local regulations, including the requirements of OSHA. Signs shall not be removed until all Abatement, removal, and construction/demolition activities have been completed. At a minimum, each sign shall bear the following information in English and the predominant language that is spoken by the Contractor's employees if English is not spoken:

WARNING

LEAD WORK AREA

POISON

NO SMOKING, EATING OR DRINKING

1. Each sign shall be appropriately modified to include additional warnings for other contaminants that are identified during Exposure Monitoring.

D. Physical Boundary Delineation: The Contractor shall clearly delineate each Work area and waste storage area with a Physical Boundary as defined in this Section.

E. Work Area Preparation: The Contractor shall utilize HEPA-filtered vacuums, and wet methods during the initial cleaning of each work area. Prior to removal from each work area, all movable objects and mounted objects that can be removed shall be pre-cleaned using HEPA-vacuums and wet methods. Fixed objects that must remain within each work area shall be pre-cleaned using HEPA vacuums and wet methods, and subsequently covered with 6-mil polyethylene sheeting.

3.02 IMPLEMENTATION

A. Bulk Removal

1. Protection of Existing Work to Remain: All Work involving the disturbance of Lead-Containing Materials or Lead Wastes must be conducted without damage to, or contamination of equipment or surfaces within the work areas or other areas adjacent to the work areas. All such damage or contamination shall be immediately corrected and cleaned up by the Contractor at the Contractor's expense.

2. Prohibited Activities: Contractors shall not conduct activities that are prohibited by OSHA and EPA regulations. The following activities are prohibited, regardless of whether they are conducted subject to an exposure assessment and written compliance program: (a) burning-off paints/coatings; (b) using heat guns operating above 1100oF; (c) dry

machine sanding, grinding, or blasting paint without a HEPA vacuum exhaust tool; (d) uncontained hydroblasting or high-pressure washing; (e) welding painted/coated surfaces unless the paint/coating is removed at least 4-inches from area of heat application (per 29 CFR 1926.345(c)(1)), and local exhaust ventilation is used.

3. Test Patches: Prior to choosing the paint removal method(s) for paints/coatings, the Contractor shall perform test patches on surfaces subject to Abatement, to determine if the method(s) meet the requirements of this Section.

4. Mechanical Removal Equipment: When removing paints/coatings from metal surfaces, the paints/coatings must be removed to the extent that only the bare metal remains (i.e., no mill scale remains) as per SSPC SP 2, 3, 11, 15 and COM, as applicable. In the case of substrates other than metal (e.g., concrete, brick, and block), paints/coatings shall be removed from the surface of the substrate as per SSPC SP 13 and SSPC SP COM, as applicable, and managed in accordance with SSPC Guide 7. Acceptance of the Work shall be contingent upon inspection of the substrate surfaces by the Engineer and must demonstrate the absence of residual paint/coating layers that can be physically measured, pried loose, or peeled away using a scraping device. The Contractor may only use products and tools meeting the performance specifications outlined below:

   a. Contractor shall utilize a vacuum-assisted power tool system with demonstrated suitability and efficiency in preparing metal surfaces as per SSPC Guide 6 and SSPC SP 11, and with demonstrated effectiveness in maintaining Lead emissions below OSHA exposure limits during the disturbance of paints/coatings. Such systems may include dustless needle guns, dustless roto peens, and dustless right-angle grinders, all of which capture dust and debris at the cutting tool edge and transport the material under vacuum conditions to an air-tight disposal container. Dustless needle guns shall only be utilized on metal surfaces.

   b. The vacuum-assisted power tool system shall also be designed to permit the removal and replacement of collection containers under negative pressure in order to prevent the release of dusts. The system shall be equipped with an automatic “shut-off” in the event of vacuum failure.

   c. Abrasive/recovery tools shall be monitored at all times by a device capable of determining recovery at the face of each tool, and capable of automatically disabling the tool in the event that recovery levels are insufficient. The monitor, at a minimum, shall have the following features: (a) a remote warning light; (b) an adjustable recovery set point; (c) automatic equipment disabling capabilities; (d) a sensing range of 0 - 5 pounds per square inch (psi); (e) solid

state photohelic instrumentation; (f) remote sensing at the face of the tool.

d. The safe recovery point shall be calibrated each day before start-up, or each time a new tool or vacuum source is used. All manufacturer recommendations shall be followed with respect to the set up and use of the monitor, and the manufacturer's operations manual shall be kept on site at all times. A daily log shall be maintained by the Contractor, identifying all calibrations of recovery levels, as well as any “down time” as a result of insufficient recovery levels.

e. The cutting head of the vacuum-assisted power tool system that is used on flat surfaces shall be capable of cutting to within 1-1/2" of any inside corner, molding, or edge, and may include dustless roto peens or dustless needle guns. Tools for corners and moldings shall be specifically designed for that purpose, and conform to all inside corners, outside corners, curved, flat, and angled surfaces that are to be abated under this Section. These tools shall also maintain vacuum control at the work surface/cutting head interface at all times. HEPA vacuum-shrouded needle guns may be used for non-flat surfaces in accordance with manufacturer recommendations. Vacuum-assisted finishing tools, such as right angle grinders, may be used to achieve the SSPC SP 11 standard, but may not be used for primary removal.

f. Vacuum-assisted power tool systems meeting all of the specifications outlined herein, may be used pending the submittal of all required performance documentation, and their acceptance by the Engineer. Any tools which do not meet all of the specifications outlined herein, shall be removed from the project Site immediately, and shall not be used for the Work to be performed under this Section.

5. Chemical Strippers: Acceptance of the Work shall be contingent upon inspection of the abated substrate surfaces by the Engineer, and must demonstrate the absence of residual paint/coating layers that can be physically measured, pried loose, or peeled away using a scraping device. The Contractor may only use products and paint stripping systems meeting the performance specifications outlined below:

a. The Contractor shall utilize a chemical paint stripping system with a demonstrated effectiveness in maintaining Lead emissions below OSHA exposure limits during the disturbance of paints/coatings. The Contractor shall utilize a mechanical ventilation system during the Work that exhausts away from occupied areas. The application of all paint stripping systems shall be in accordance with manufacturer recommendations and SSPC SP 1. Debris shall be managed in accordance with SSPC Guide 7.

b. The Contractor should note that more than one product may be required to strip LCP/coatings. The use of multiple products shall be in accordance with Work practices approved by the individual manufacturer of each chemical paint stripping compound.

c. All chemical paint stripping products shall be presented to the Engineer for approval prior to the start of any Work to be performed under this Section. Also, the manufacturer's labels on each container shall be intact and legible.

d. Chemical paint stripping systems may be used pending the submittal of all required performance documentation, and its acceptance by the Engineer.

3.03 FIELD TESTING / QUALITY CONTROL

A. Air Monitoring

1. Air monitoring for airborne concentrations of Lead shall be conducted by the Air Monitor in accordance with OSHA and as defined in this Section.

a. Exposure Monitoring: For Work involving the disturbance of any detectable concentration of Lead, the Contractor shall collect personal air samples from employees who are anticipated to have the greatest risk of exposure, as determined by the Contractor's CIH or Competent Person. Personal air samples shall be collected during every work shift from at least one (1) employee that is representative of each type of work task that is being performed. Each personal air sample shall "run" for the employee's entire work shift to ensure that enough volume (of air) is collected and an accurate 8-hour TWA can be calculated. Documentation regarding the sample numbers, specific shift when the sampling was conducted, the work tasks that were sampled, the dates of sampling, the employee hours that were worked during the shift, and the total sampling times, shall accompany each laboratory COC form.

2. Area Monitoring: The Contractor shall collect a minimum of two (2) area air samples outside of each Lead Control Area on a daily basis for the duration of the Abatement, removal, or construction/demolition Work, as well as any other Work involving the disturbance of Lead-Containing Materials or Lead Wastes. During sampling activities, all air sample filter cassettes shall be positioned approximately five to six feet above the ground (to simulate an individual's breathing zone), and shall not be placed immediately adjacent to obstructions (e.g., walls or columns) which may restrict the flow of air to the filter cassettes. Each air sample shall be analyzed for all contaminants identified during the exposure assessment. If area air monitoring indicates an emission level in excess of an OSHA Action Level outside of a Lead Control Area, all Work in that area shall be stopped immediately. The Contractor shall then take immediate corrective actions to reduce emission levels to below the Action Level(s), and the

Contractor shall clean all adjacent areas that may have become contaminated due to the emissions. Documentation regarding the sample numbers, sample locations, the dates of sampling, the employee hours that were worked during the shift, and the total sampling times, shall accompany each laboratory COC form.

3. The Contractor shall submit all air monitoring results to the DEP within 24 hours of date of air sample collection.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Cleanup: The Contractor shall maintain all surfaces, including protective coverings (polyethylene sheeting) within each work area, free of accumulations of paint chips/coating debris, dusts, and wastes. Dry sweeping and using compressed air to cleanup a Work area shall be strictly prohibited. HEPA-filtered vacuums and wet methods shall be used to ensure that each Work area remains free of visible paint chips/coating debris, dusts, and wastes.

B. Collection, Separation, and Containerization of Wastes: The Contractor shall collect, separate (by waste stream/waste type), and containerize Lead Wastes (solid and liquid), debris, PPE, and containment materials on a daily basis in accordance with the Lead Management Plan. Where the TCLP analysis for the eight (8) RCRA metals are below hazardous waste standards, all PPE, poly and paint/coating waste will be characterized as Lead-Containing non-hazardous, contaminated waste, and should not be managed as construction and demolition (C&D) debris.

1. The Contractor shall store all wastes in DOT-approved container systems. No drum/container shall be filled in excess of the capacity marked on the drum/container. All drums/containers shall be sealed and covered immediately after filling, and each drum/container shall have an intact and legible label affixed to it.

2. No water mixed with or contaminated by hazardous waste may be released onto the ground or into any drain or sewer (RCNY Title 15, Chapter 19). It should be noted that a discharge of more than 10 pounds of Lead (this includes 10 pounds of debris containing Lead) onto the ground or into the water within a 24-hour period, shall be considered a violation of the Clean Water Act and shall be treated as a "reportable quantity" in accordance with 40 CFR 117. Such a release shall be grounds for immediate termination of this Contract, and the Contractor shall be liable for any fines, penalties, or remediation costs.

3. The Contractor shall store non-hazardous wastes separately from hazardous wastes, shall provide all non-hazardous waste containers, and shall make all transportation and disposal arrangements for non-hazardous wastes in accordance with federal, state, and local regulations.

C. Storage of Wastes: The Contractor shall ensure that all drummed wastes are stored in a secondary containment system, and that each waste storage area is demarcated with a Physical Boundary. In addition, the Contractor shall post weekly waste inspections and waste inventories in the regulated waste storage area, as well as the following emergency information in accordance with DEP's EHS Policies and Procedures: (a) the name and telephone number of the facility's Emergency Coordinator; (b) the location of fire extinguishers and fire alarms; (c) the location of spill control materials; (d) the telephone number for the fire department (unless the facility has a direct alarm).

D. Labeling: The Contractor shall affix warning labels to all waste drums/containers. At a minimum, all hazardous waste labels shall bear the following information in English:

HAZARDOUS WASTE

FEDERAL LAW PROHIBITS IMPROPER DISPOSAL

HANDLE WITH CARE

[Generator Name, Address, and Telephone Number]

[Specific Contents of Container]

[EPA-Issued Generator Identification Number]

[EPA Waste Identification Number]

[Accumulation Start Date]

[Accumulation End Date]

1. If waste classification is pending analysis, labels shall indicate "Hazardous Waste - Pending Analysis." If wastes contain PCBs, drums/containers must also be labeled per Section 02 84 05 - PCB Management.

E. Sampling and Laboratory Analysis of Paint Removal Wastes: For hazardous waste characterization, the Waste Manager shall sample all potential Lead-Containing Waste Streams in accordance with 40 CFR 261 and 6 NYCRR Part 371. All waste samples shall be collected in the presence of the Engineer using the following procedure:

1. One (1) composite waste sample shall be collected for laboratory analysis from each waste drum that is generated. Each composite sample shall be a mixture of four (4) grab samples. As an example, if the drum is full, collect four grab samples, if the drum is half-full, collect two grab samples, and if the drum is one-tenth full, collect one sample. Grab samples shall be composited into one (1) bulk composite sample. Each composite sample shall undergo Toxicity Characteristic Leaching Procedure (TCLP) analysis for the eight (8) RCRA metals.

2. In addition, if the waste stream is associated with the use of a chemical paint stripping system, the Contractor shall have the laboratory analyze each sample for pH and any other RCRA characteristic that may fail due to the chemical composition of the waste. Furthermore, if the waste stream contains PCB-Containing paint/coating chips, the Contractor shall collect samples in accordance with Section 02 84 05 - PCB Management. The Contractor shall ensure that the laboratory being used is also capable of performing these additional analytical tests.

3. One (1) representative wastewater sample shall be collected for laboratory analysis using appropriate field sampling equipment (e.g., a pipette or bailer), and shall be labeled appropriately.

F. Sampling and Laboratory Analysis of Painted Demolition Debris: The Contractor shall collect representative bulk samples of demolition wastes to determine proper disposal. All bulk samples shall undergo TCLP analysis for the eight (8) RCRA metals. Furthermore, if the waste stream may contain PCB-Containing paint/coating chips, the Contractor shall collect samples in accordance with Section 02 84 05 - PCB Management.

1. Scrap Metal Exemption for Recycling: Under 6 NYCRR 371.1(c)(7), painted scrap metal can be sent to a recycling facility, rather than be discarded as hazardous waste. For the DEP to submit a "c7 notification" to the NYSDEC and claim the "scrap metal exemption," the Contractor must first submit notification to their recycling facility indicating that Lead is present on the scrap metal. If PCBs are detected in the paints/coatings on the scrap metal, the Contractor shall also disclose this information to the recycling facility as per Section 02 84 05 - PCB Management. The Contractor shall submit this documentation to the Engineer for approval prior to disposal.

G. Disposal of Wastes: The Contractor shall notify the DEP at least 14 business days prior to the removal of any waste drums/containers. All hazardous waste profiles for containerized wastes must be reviewed by the Engineer and signed by the DEP as the generator of the waste streams. Wastes shall be disposed of so that drums/containers do not remain on the job site for more than 90 calendar days from the initial "accumulation start date" on the drum/container label. Containers that have reached their storage capacity shall not remain on site, and transportation arrangements shall be made for their immediate removal.

H. Disposal Documentation: Once all waste profiles have been completed, the Contractor shall provide the DEP a "Letter of Acceptance" issued from the TSDF indicating that the wastes will be accepted, and a copy of the advance manifest. On the date of disposal, the Contractor shall submit one (1) copy of the completed manifest that has been signed and dated by the initial transporter in accordance with 6 NYCRR 372 and 40 CFR 262, to the DEP for signature as Generator. All hazardous waste documentation (e.g., waste profiles, manifests and Land Disposal Restrictions (LDRs)) must be signed by a DEP employee as described in Section

01 35 45- Hazardous Materials Control. Non-hazardous waste documentation may be signed by a DEP-designated alternate.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This Section details the requirements for construction and demolition activities affecting materials and structures coated with or containing polychlorinated biphenyls (PCBs), as shown on Table No. 1, Summary of Lead and PCB Analysis on Paints and Table No. 2, Summary of PCB Analysis on Miscellaneous Materials, attached to Section 01 35 45 – Hazardous Materials Control, specified herein, or required to complete the Work, including all affected coatings identified and impacted by the Work.

1. Hazardous Materials Mitigation Report, Rev. 1, Contract WP-169 CSO-FC-DF, Bidwell Environmental, LLC, June 2025.

B. All Work under this Section shall be performed to minimize the creation of airborne emissions (40 CFR 50); minimize the quantity of hazardous waste generated; protect the health and safety of all site personnel and the welfare of the public; and avoid adverse environmental impacts.

C. The Contractor shall perform the abatement and disposal of additional PCB-containing materials not included in the reports listed in 1.01A. In the absence of analytical testing results for a specific painted/bitumastic-coated material, the material shall be classified as PCB-containing and lead-containing, until proven otherwise by sampling and testing. If the material is caulking or has a bitumastic coating, the material shall also be classified as asbestos-containing, until proven otherwise by sampling and testing.

D. Small Capacitors and Fluorescent Light Ballasts manufactured prior to 1978 may contain PCBs in their capacitors or potting materials. Unless a Fluorescent Light Ballast is marked “No PCBs” by the manufacturer, it shall be assumed that the ballast contains PCBs. All PCB-containing light ballasts and Small Capacitors shall be removed, handled, packaged, and disposed of in accordance with this Section.

E. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment will be made for performing any work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s), or allowance(s) as set forth in Section 01 27 00 – Measurements and Payment.

1.03 RELATED SECTIONS

A. Section 01 35 27 – Environmental Health and Safety Requirements

B. Section 01 35 45 – Hazardous Materials Control

C. Section 01 41 00 – Regulatory Requirements

D. Section 01 51 11 – Temporary Water and Sanitary Services

E. Section 01 51 12 – Temporary Heat and Ventilation

F. Section 01 51 30 – Temporary Electrical System

G. Section 01 74 20 – Construction Waste Management

H. Section 02 41 10 – Demolition and Removals

I. Section 02 82 05 – Asbestos Management

J. Section 02 83 05 – Lead Management

1.04 REFERENCES

A. Definitions

1. Abatement: Any measures or set of measures designed to permanently eliminate PCB paint/bitumastic coating hazards. Abatement includes, but is not limited to, the removal of PCB paints/bitumastic coatings or the replacement of PCB-painted/bitumastic-coated surfaces or fixtures. Abatement also includes the removal of paints/bitumastic coatings (with a PCB concentration greater than or equal to 50 parts per million (ppm)) when the underlying substrate is to remain in place. Abatement does not include renovation, remodeling, landscaping, or other activities, when

such activities are not designed to permanently eliminate PCB hazards, but instead, are designed to repair, restore, or remodel a given structure or dwelling, even though these activities may incidentally result in a reduction or elimination of PCB hazards. Furthermore, Abatement does not include interim controls (e.g., the spot removal of a PCB paint/bitumastic coating on a surface in order to perform torch cutting at that location), Operations and Maintenance (O&M) activities, or other measures and activities designed to temporarily reduce PCB hazards.

2. Area Monitoring: Stationary air sampling outside of a PCB Control Area for the purpose of determining compliance with OSHA's Limits for Air Contaminants Table (29 CFR 1910.1000, Table Z-1), and for the purpose of ensuring that airborne PCB concentrations remain below 1.0 mg/m^3 (Aroclor 1242) and 0.5 mg/m^3 (Aroclor 1254) outside of the PCB Control Area during all Work activities that have the potential to disturb PCB-Containing Materials with PCB concentrations greater than or equal to 50 ppm. Area Monitoring for lead will be required if Exposure Monitoring results exceed corresponding Action Levels, Permissible Exposure Limits (PELs), or Threshold Limit Values (TLVs). If asbestos is present, Area Monitoring shall also be conducted in accordance with DEP (RCNY Title 15, Chapter 1) or NYSDOL (12 NYCRR 56) regulations. All Area Monitoring shall follow pertinent NIOSH or ASTM sampling methodologies.

3. Certified Industrial Hygienist (CIH): Refers to an individual employed by the Contractor who is currently certified by the American Board of Industrial Hygiene (ABIH).

4. Competent Person: Defined by OSHA as someone who is capable of identifying existing and predictable hazards in the surroundings or working conditions, and who has authorization to take prompt corrective measures to eliminate them. Duties of the Competent Person include the following: (a) determining prior to the performance of the Work whether PCBs or lead are present in the workplace; (b) establishing PCB Control Areas and assuring that access to and from those areas is limited to authorized personnel; (c) assuring the adequacy of any employee Exposure Monitoring required by OSHA; (d) assuring that all employees exposed to airborne contaminant levels above Action Levels, PEL, or TLV wear appropriate Personal Protective Equipment (PPE), respiratory protection, and are trained in the use of appropriate methods of exposure control for all of the contaminants present; (e) assuring that proper Hygiene Facilities are provided and that workers are trained to use those facilities; (f) assuring that engineering controls specific to the contaminants present are implemented, maintained in proper operating condition, and functioning properly.

5. Decontamination Area: Designated area within the Hygiene Facilities for removing gross contamination from PPE (using a HEPA vacuum),

washing away contamination that has accumulated on the skin and hair (using soap and water), removing, and disposing/washing of contaminated PPE, and donning clean clothing that will not potentially contaminate areas outside of a PCB Control Area's Physical Boundary.

6. DOT Hazardous Materials Transportation Training: Training that meets the criteria outlined in 49 CFR 172.704. This training shall include discussions of the following: (a) hazardous materials tables within 49 CFR 172; (b) material packaging and labeling within 49 CFR 178; (c) shipping papers and placards within 49 CFR 173; (d) material loading and segregation.

7. Exclusion Zone: (See definition of "PCB Control Area").

8. Exposure Monitoring: Personal air sampling performed outside the respirator within the breathing zone of individuals, for the purpose of determining compliance with OSHA's Limits for Air Contaminants Table (29 CFR 1910.1000, Table Z-1). Analytical results obtained from Exposure Monitoring will be used to select appropriate respiratory protection and PPE for individuals within a work area. For the purpose of this Section, Exposure Monitoring samples shall be collected from individuals who are representative of each type work task being conducted by the Contractor, and all Exposure Monitoring shall follow pertinent NIOSH (Method 5503) or ASTM sampling methodologies.

9. Fluorescent Light Ballast: A device that electrically controls fluorescent light fixtures and includes a capacitor containing 0.1 kilograms (kg) or less of dielectric fluid.

10. Hazardous Waste Operations (HAZWOPER) Training: Training that meets the criteria outlined in the OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120). A minimum of 24-hour HAZWOPER training will be required for Work being performed under this Section. However, certain types of Work may require 40-hour HAZWOPER Training. All decisions regarding the specific HAZWOPER Training that will be required for each Work task shall be made by the Engineer.

11. High-Efficiency Particulate Air (HEPA) Filter: A filter designed to remove 99.97% of all particles greater than 0.3 micrometers (μm) in diameter. For the purpose of this Section, HEPA vacuum and local exhaust filtration equipment used by the Contractor shall meet the Standard for Safety High-Efficiency, Particulate, Air Filter Units (UL 586) developed by Underwriters Laboratories.

12. Homogenous Materials: PCB-Containing Materials which are similar in appearance, color, texture, and substrate type.

13. Hygiene Facilities: Facilities within the Physical Boundary of a work area that are set up to prevent cross contamination and are equipped with change areas and separate storage facilities for PPE and clean clothing.

Hygiene Facilities shall include adequately supplied hand washing station(s) (i.e., running water, soap, and clean towels) or shower(s) (hot and cold water that is controllable at the tap, soap, shampoo, and clean towels).

14. Organic Vapor Cartridge: A respirator filter typically containing 25 to 40 grams of sorption media such as activated charcoal.

15. OSHA Monitoring: (See definition of "Exposure Monitoring").

16. P-100 Filter: (See definition of: "High-Efficiency Particulate Air (HEPA) Filter").

17. PCB Awareness Training: Training for individuals that have the potential to be exposed to PCB-Containing Materials or PCB Wastes. This training shall include discussions of the following: (a) sources of PCBs; (b) current federal, state, and local regulations pertaining to PCBs (including 40 CFR 761) and other contaminants that may be disturbed during the Work; (c) the health effects of PCBs and other contaminant exposures; (d) state-of-the-art work practices, engineering controls, and procedures for Abatement, removal, construction/demolition, materials handling, housekeeping, and waste management activities that involve PCB-Containing Materials and PCB Wastes; (e) the use and maintenance of PPE and the use and maintenance of respirators in accordance with 29 CFR 1910.134; (f) medical surveillance programs; (g) requirements regarding warning signs, labeling, and Safety Data Sheets (SDSs) in accordance with 29 CFR 1910.1200; (h) responsibilities of the Competent Person.

18. PCB Bulk Product Waste: Waste derived from manufactured products containing PCBs in a non-liquid state, at any concentration where the concentration at the time of designation for disposal is greater than or equal to 50 ppm of PCBs.

19. PCB-Containing Material: Any material that contains, or is coated with, a detectable concentration of PCBs.

20. PCB Control Area: The area within the Physical Boundary where worker Hygiene Facilities are located and where all Work activities take place that involve the disturbance of PCB-Containing Materials and PCB Wastes.

21. PCB Hazardous Waste (per NYSDEC): All solid wastes containing PCB concentrations greater than or equal to 50 ppm. Refer to 6 NYCRR Part 371.4(e) for specific details and exceptions regarding the classification of PCB Wastes as "hazardous wastes" (listed waste B001-B007) in New York State.

22. PCB Waste (TSCA-regulated): Non-specific liquid or solid waste generated during the Abatement, removal, construction/demolition, handling, or cleanup of a PCB-Containing Material with a PCB concentration greater than or equal to 50 parts per million (ppm). PCB

Waste also includes any waste (including remediation waste, polyethylene sheeting and PPE) that has been in contact with a material that has a PCB concentration greater than or equal to 50 ppm, regardless of whether the waste itself has a PCB concentration of less than 50 ppm. PCB Wastes are subject to the disposal requirements set forth in Toxic Substances Control Act (TSCA) (40 CFR 761, Subpart D).

23. Perimeter Monitoring: (See definition of "Area Monitoring").

24. Permissible Exposure Limit (PEL): Defined by OSHA as individual exposure, without regard to the use of respirators, to a specific airborne concentration of a contaminant expressed in milligrams per cubic meter of air (mg/m3) calculated as an 8-hour Time-Weighted Average (TWA). Once a PEL is met or exceeded for a particular contaminant, the Contractor is responsible for meeting specific OSHA requirements, which may include worker Exposure Monitoring, the use of PPE including respiratory protection, the use of Hygiene Facilities, medical surveillance, or training for workers. The following PELs are pertinent to disturbance, removal, construction/demolition, and disposal activities associated with PCB-Containing Materials and PCB Wastes: (a) PCB Aroclor 1254 – 0.5 mg/m3 per 29 CFR 1910.1000, Table Z-1; (b) PCB Aroclor 1242 – 1.0 mg/m3 per 29 CFR 1910.1000, Table Z-1.

25. Personal Monitoring: (See definition of "Exposure Monitoring").

26. Physical Boundary: A physical barrier designated with ropes, "caution tape," or a partition that surrounds a work area in order to limit the entry of unauthorized personnel and delineate "clean areas" from areas that may meet or exceed an Action Level, PEL, or TLV.

27. PCBs: Any group of chlorinated isomers of biphenyl, formerly used in the form of a toxic, colorless, odorless, viscous liquid typically added to lubricants, heat-transfer fluids, and plasticizers.

28. Regulated Area: (See definition of "PCB Control Area").

29. Resource Conservation and Recovery Act (RCRA) Training: Training that meets the criteria outlined in 40 CFR 265.16. This training shall include site-specific discussions of the following: (a) hazardous waste identification; (b) waste storage container use and labeling; (c) waste storage area management; (d) personal health and safety, including fire safety; (e) manifesting and the off-site transportation of wastes; (f) procedures for using, inspecting, repairing, and replacing emergency equipment and monitoring equipment; (g) procedures for communicating with other employees and outside emergency response personnel; (h) responses to fires or explosions; (i) responses to leaks, spills, and potential groundwater contamination incidents; and (j) the shutdown of operations.

30. Small Capacitor: A device for accumulating and holding a charge of electricity and consisting of conducting surfaces separated by a dielectric fluid in a quantity less than 1.36 kg or three pounds. If the weight of the

dielectric fluid is unknown, it can be assumed that a Small Capacitor is a capacitor that has a total volume of less than 1,639 cubic centimeters (cm^3) or 100 cubic inches (in^3).

31. TLV: Threshold Limit Value

32. TWA: The average time over a given work period (e.g., an 8-hour workday) of a person's exposure to a chemical or agent. The average is determined by sampling for the chemical or agent throughout the time period.

33. Trigger Activities: Certain activities that involve a disturbance of PCB-Containing Materials or PCB Wastes. Depending upon whether the performance of these activities exceeds an Action Level, PEL or TLV, the requirements may include additional worker Exposure Monitoring, the use of PPE including respiratory protection, the use of Hygiene Facilities, medical surveillance, or training for workers. Examples of Trigger Activities include, but are not limited to, the following: abrasive blasting, welding, torch cutting/burning, heat gun usage, needle gunning/scaling, rivet busting, using a rotopeen, mechanical sanding/grinding, using mechanical shears, hand scraping/sanding, chemical stripping, and the manual demolition of PCB-Containing Materials.

B. Reference Standards

1. The Contractor shall comply with all applicable regulations, standards, and guidelines of federal, state, and local environmental and occupational safety and health agencies regarding PCB-Containing Materials and PCB Wastes. These regulations, standards, and guidelines include, but are not limited to the following:

   a. United States (U.S.) Department of Transportation (DOT):

      1) 49 CFR 171 - General Information, Regulations, and Definitions

      2) 49 CFR 172 – Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

      3) 49 CFR 173 – Shippers: General Requirements for Shipments and Packaging's

      4) 49 CFR 178 – Specifications for Packaging's

   b. United States Environmental Protection Agency (EPA):

      1) 40 CFR 50 – National Primary and Secondary Ambient Air Quality Standards

      2) 40 CFR 116 – Designation of Hazardous Substances

3) 40 CFR 117 – Determination of Reportable Quantities for Hazardous Substances

4) 40 CFR 260 – Hazardous Waste Management Systems: General

5) 40 CFR 261 – Identification and Listing of Hazardous Waste

6) 40 CFR 262 – Standards Applicable to Generators of Hazardous Waste

7) 40 CFR 263 – Standards Applicable to Transporters of Hazardous Waste

8) 40 CFR 264 – Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

9) 40 CFR 265 – Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

10) 40 CFR 268 – Land Disposal Restrictions

11) 40 CFR 302 – Designation, Reportable Quantities, and Notification

12) 40 CFR 761 – Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions

13) Method 8082A (SW-846) – Polychlorinated Biphenyls (PCBs) (soxhlet extraction method 3540) by Gas Chromatography

c. National Institute for Occupational Safety and Health (NIOSH):

1) Method 5503 – Polychlorobiphenyls

d. New York City Department of Environmental Protection (DEP):

1) Environmental Health and Safety Policies, Procedures and Guidelines – Vol. II, Spill Prevention, Environmental Release Reporting and Investigation;

2) Environmental Health and Safety Policies, Procedures and Guidelines – Vol. IV, Hazardous Waste Management;

3) Environmental Health and Safety Policies, Procedures and Guidelines – Vol. IV, PCB Management;

4) RCNY Title 15, Chapter 19 – Discharges of Wastewater and Other Materials to Public Sewers

e. New York City Department of Buildings (DOB) – Building Code (Chapter 33)

f. New York State Department of Environmental Conservation (NYSDEC):

1) 6 NYCRR 364 – Waste Transporter Permits

2) 6 NYCRR 370 – Hazardous Waste Management Regulations

3) 6 NYCRR 371 – Identification and Listing of Hazardous Waste

4) 6 NYCRR 372 – Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities

5) 6 NYCRR 373 – Hazardous Waste Management Facilities

6) 6 NYCRR 376 – Land Disposal Restrictions

7) 12 NYCRR 56 – Asbestos

g. Occupational Safety and Health Administration (OSHA):

1) 29 CFR 1910 – Occupational Safety and Health Standards

2) 29 CFR 1910.28 – Safety Requirements for Scaffolding

3) 29 CFR 1910.120 – Hazardous Waste Operations and Emergency Response

4) 29 CFR 1910.134 – Respiratory Protection Standard

5) 29 CFR 1910.1200 - Hazard Communication Standard

6) 29 CFR 1926 – Safety and Health Regulations for Construction

7) 29 CFR 1926.62 – Lead in Construction Standard

h. Society for Protective Coatings (SSPC):

1) SSPC Guide 6 - Guide for Containing Debris Generated During Paint Removal Operations

2) SSPC Guide 7 - Guide for the Disposal of Lead-Contaminated Surface Preparation Debris

3) SSPC SP 1, Solvent Cleaning

4) SSPC SP 2, Hand Tool Cleaning

5) SSPC SP 3, Power Tool Cleaning

6) SSPC SP 11, Power Tool Cleaning to Bare Metal

7) SSPC SP 13/ NACE No.6, Surface Preparation of Concrete

8) SSPC SP 15, Commercial Grade Power Tool Cleaning

i. Underwriters Laboratories, Inc. (UL):

1) UL 586 – Standard for Safety High Efficiency, Particulate, Air Filter Units.

1.05 DESCRIPTION

A. Commencement of Work: Five (5) business days prior to the proposed start of the work of this Section at each separate location, the Contractor shall notify the Engineer and the onsite safety staff. No Work may proceed at any location until authorized by the Engineer.

B. The Contractor shall coordinate any required equipment shutdowns with the Engineer prior to starting the Work.

C. Access Restrictions: The Contractor shall inform the Engineer of proposed access restrictions (i.e., areas or items of equipment which will not be accessible during the proposed Work) and give them estimated time frames (including specific dates) of such proposed access restrictions. The Contractor shall notify other contractors in advance of the disturbance, Abatement, removal, construction/demolition, and disposal Work included herein, to provide them with sufficient time for coordination of interrelated items that are included in their contracts and that must be performed before, after, or in conjunction with the Work included under this Section.

D. Unexpected Entry into a PCB Control Area: In the event that DEP personnel must enter a PCB Control Area for emergency reasons, the Contractor shall immediately stop Work and cleanup any loose debris, so as to permit the safe entry by DEP personnel. Any disturbance of paints/bitumastic coatings, dusts, materials, or wastes that may potentially generate airborne concentrations of contaminants equal to or above an OSHA Action Level shall not proceed until all DEP personnel have exited from the PCB Control Area.

E. Meetings: In addition to the pre-construction meeting and site walk-through, other meetings may be required or may be requested by the Engineer, including briefings to Site Operations personnel. Written documentation (i.e., “minutes”) of all meetings shall be generated by the Contractor, and copies shall be provided to the DEP within three (3) business days following each meeting.

1.06 QUALITY ASSURANCE

A. Scheduling: The Contractor shall coordinate and schedule all phases of the Work to be performed under this Section with the DEP, subcontractors, material suppliers, and other parties as necessary to ensure the proper execution of the Work.

B. Compliance: In addition to the detailed requirements of this Section, DEP EHS Policies and Procedures, and Section 01 35 27 – Environmental Health and Safety Requirements, the Contractor shall comply with all applicable regulations of federal, state, and local authorities pertaining to the disturbance, Abatement,

removal, construction/demolition, handling, storage, transportation, and disposal of PCB-Containing Materials and PCB Wastes. All matters regarding the interpretation of any regulations, standards, or policies shall be submitted to the Engineer for resolution before starting the Work. Where the requirements of this Section, DEP EHS Policies and Procedures, or federal, state, or local regulations conflict or vary, the most stringent requirements or regulations shall apply.

C. Rejection of Non-Complying Items: The DEP reserves the right to reject Contractor materials/tools/submittal items that are deemed inappropriate or unacceptable by the Engineer or DEP. Submittal items that may be deemed inappropriate or unacceptable include proposed TSDFs, vendors or subcontractors with previous regulatory citations/violations.

D. Suspect Material Characterization: To classify caulking or a paint or bitumastic coating as non-PCB containing, a paint chip/coating sample must be collected as a grab sample from the source. The sample shall be sent to an analytical laboratory meeting the requirements of this Section.

1. Suspect PCB-Containing Paints/Coatings: Although there are no certification requirements pertaining to an individual that collects paint chip samples in an industrial or commercial setting, this Section requires paint chip sampling to be performed by an individual who has successfully completed a PCB Awareness Training course (within the past year) as defined in this Section.

2. Suspect ACM: All caulking and bitumastic coatings are considered suspect ACM. Therefore, if a sample will be collected, the sampling shall be performed by a certified DEP Asbestos Investigator or NYSDOL Asbestos Inspector.

3. Estimate an approximate number of samples to adequately characterize painted/coated surfaces. Collect grab samples that include all layers of paint/coating from different areas randomly dispersed throughout the painted surface area. Grab samples are not to be composited.

4. PCB concentrations are based on the cumulative total of the nine (9) Aroclor cogeners (aka PCB compounds) analyzed by EPA Method SW 846-8082A (soxhlet extraction method 3540) by Gas Chromatography.

E. Qualifications:

1. The Contractor or their proposed PCB removal subcontractor shall have successfully completed at least two (2) projects of comparable scope and methodologies and shall document the following: (a) the name, address, and phone number of each facility where the work was performed; (b) the volume and type of each material that was abated/removed; (c) the specific methods of Abatement/removal used (including the tools, technologies, and engineering controls employed).

2. Competent Person:

a. When disturbing materials and wastes with PCB concentrations greater than or equal to 50 ppm, the Contractor shall have on staff and assigned to this Contract a Competent Person who has successfully completed:

1) 40-hr HAZWOPER Training;

2) PCB Awareness Training (annual), and RCRA Training courses as defined in this Section.

a) Each training course shall be current in accordance with the course and regulatory requirements.

b. The Competent Person shall have a minimum of two (2) years' experience with work involving PCBs, and shall have served as the Competent Person on at least three (3) projects of comparable scope and methodologies to the work being performed under this Section.

c. The Competent Person shall be on site during all PCB-related work activities. It should be noted that depending upon the specific contaminants present during the work, additional training for the Competent Person may be required.

3. PCB Waste Manager:

a. When disturbing materials and wastes with PCB concentrations greater than or equal to 50 ppm, the Contractor shall have on staff and assigned to this Contract a PCB Waste Manager who has successfully completed:

1) DOT Hazardous Materials Transportation Training;

2) RCRA Training course, completed within the past year in the form of either an initial course or a refresher course;

3) 24-hr HAZWOPER Training;

4) PCB Awareness Training (annual) as defined in this Section.

b. The PCB Waste Manager shall have a minimum of two (2) years experience on projects involving PCB Wastes. It is acceptable for an individual who meets the criteria of the Competent Person, to also serve as the PCB Waste Manager for this Contract as long as the individual fulfills all of the requirements of this paragraph.

4. PCB Worker:

a. When disturbing materials and wastes with PCB concentrations greater than or equal to 50 ppm, the Contractor shall have on staff and assigned to this Contract a sufficient number of PCB Workers who have successfully completed:

1) PCB Awareness Training course (annual) as defined in this Section.

b. Each PCB worker shall have a minimum of one (1) year of experience on projects involving PCBs and shall have worked on at least three (3) projects of comparable scope and methodologies to the work being performed under this Section.

5. Worker (low PCB concentrations):

a. When disturbing materials and wastes with PCB concentrations less than 50 ppm, the Contractor shall have on staff and assigned to this Contract a sufficient number of workers who have successfully completed:

1) PCB Awareness Training course (annual) as defined in this Section.

b. Until a negative exposure assessment has been established via Exposure Monitoring, workers must wear appropriate respiratory protection.

6. Air Monitor:

a. When disturbing any detectable concentration of PCBs, the Contractor shall have an Air Monitor assigned to this Contract who has successfully completed:

1) PCB Awareness Training course (annual) as defined in this Section.

b. The Air Monitor shall have a minimum of two (2) years experience in conducting Area Monitoring and Exposure Monitoring on projects involving PCBs.

c. It is acceptable for an individual who meets the qualification requirements for Competent Person or PCB Waste Manager to also serve as the Air Monitor for this Contract, as long as the individual satisfies all of the requirements of this paragraph.

1.07 SUBMITTALS

A. Thirty (30) business days prior to the Work of this Section or as directed by the Engineer, the Contractor shall submit the following to the Engineer:

1. PCB Inspection and Sampling Plan: The Contractor shall provide a PCB Inspection and Sampling Plan to identify suspect PCBs, not otherwise sampled during Design, and collect samples, as appropriate during the inspection. This plan shall include at a minimum:

a. At a minimum, the inspection shall be performed by an Environmental Professional, as defined in this Contract, who shall have PCB awareness training (annual), and OSHA 10-hr

certification, and shall have performed similar inspection work on at least three (3) projects of similar scope.

b. Credentials of the laboratory providing sample analysis, including current certification by the New York State Department of Health's Environmental Laboratory Approval Program (ELAP) and by the American Industrial Hygiene Association (AIHA).

c. Sample collection, analysis, and reporting protocol.

d. Health and safety protocol (Job Hazard Analysis) for all investigation activities.

2. PCB Inspection Report: The Contractor shall provide a PCB Inspection Report prepared by the Environmental Professional summarizing the results of all inspection activities, and as applicable, a sampling narrative, laboratory data packages, and inventory of all identified suspect and confirmed PCB-Containing Materials.

3. PCB Safe Work Practices: Each Contractor that will disturb PCB-Containing Materials with a PCB concentration less than 50 ppm during the course of Work to be performed under this Section shall submit detailed, project-specific PCB Safe Work Practices designed to protect their workers and control the spread of potential PCB contamination. Work requiring the development of PCB Safe Work Practices includes, but is not limited to, the mechanical disturbance of paints/coatings (e.g., drilling or sawing, or spot removal). The PCB Safe Work Practices shall be signed and dated by a CIH meeting the definition in this Section, and shall include the following elements:

a. Section on the procedures and methodologies that will be used to conduct Exposure Monitoring. Also, provide the name and qualifications (i.e., training and experience documentation) of the Air Monitor who shall, at a minimum, satisfy the qualification requirements set forth in this Section;

b. Section on housekeeping procedures to be used for maintaining clean work areas and clean Hygiene Facilities;

c. Task Analysis: Each task analysis shall include, but is not limited to, the following information: (a) the type of Work activity; (b) the tools/equipment that will be used and their respective decontamination procedures; (c) operation and maintenance practices and procedures that will be used for the tools/equipment (SSPC SP 1, 2, 3, 11, 13 and 15 as applicable); (d) the types of PCB-Containing Materials that may be disturbed when performing the activity; (e) the engineering controls that will be used to control the spread of contamination during the activity; (f) housekeeping procedures that will be used during the activity; (g) PPE and proposed respiratory protection that will be used for the activity;

d. Equipment and Supplies: Identify the equipment and supplies that will be used to perform the Work;

e. Rental Equipment Notification: If rental equipment is to be used during the Work, the Contractor shall notify the rental agency in writing concerning the intended use of the equipment;

f. SDSs: Provide SDSs for all chemical products to be used for the Work;

g. Medical Clearance for Respiratory Protection: For all activities that disturb PCB-Containing Materials with a PCB concentration less than 50 ppm, the Contractor shall provide a sufficient number of properly trained and experienced workers, each of whom shall: (a) have received a medical exam that included a Pulmonary Function Test (PFT) within the past year; (b) have received written medical clearance within the past year, by a licensed physician, to wear a respirator; (c) have received a qualitative or quantitative respirator fit-test for the specific respirator the employee will be using for this Work within the past year;

h. Employee Documentation: For all activities that may disturb PCB-Containing Materials with a PCB concentration less than 50 ppm, the Contractor shall provide a sufficient number of properly trained and experienced workers, each of whom shall: (a) have written proof of training (e.g., certificates) in accordance with the qualification requirements of this Section for workers and Air Monitors that will be used for the Work; (b) dates and written proof of respiratory clearance and a medical exam in accordance with this Article; (c) dates and written proof of a respirator fit-test in accordance with this Article.

4. PCB Management Plan: Each Contractor that will disturb PCB-Containing Materials with a concentration of PCBs greater than or equal to 50 ppm, and PCB Wastes during the course of Work to be performed under this Section shall submit a detailed, project-specific PCB Management Plan that addresses work procedures and equipment to be used during the disturbance, removal, handling, collection, and disposal of PCB-Containing Materials and PCB Wastes. Work requiring a PCB Management Plan includes, but is not limited to, Abatement, spot removal and construction/demolition activities. The PCB Management Plan shall be prepared in accordance with OSHA Construction Standards and all other pertinent federal, state, and local regulations, including DEP (RCNY Title 15, Chapter 1) or New York State Department of Labor (NYSDOL) (12 NYCRR 56) asbestos regulations, only if asbestos is present. In addition, the PCB Management Plan shall follow all DEP EHS Policies and Procedures (referenced in this Section) and shall be coordinated with the Engineer. The PCB Management Plan shall also be signed and dated by a CIH meeting the definition in this Section.

a. If the PCB-Containing Materials or PCB Wastes that will be disturbed also contain asbestos or lead, it is acceptable to integrate the PCB Management Plan elements into the relevant Asbestos Work Plan (required under Section 02 82 05 - Asbestos Management) or Lead Management Plan (required under Section 02 83 05 - Lead Management and SSPC Guide 7). PCB Management Plan elements that are integrated into an Asbestos Work Plan or Lead Management Plan must still satisfy all of the requirements of this Section. The PCB Management Plan (or relevant Asbestos Work Plan or Lead Management Plan) shall include the following elements:

1) PCB Control:

a) Drawings showing the location and details of the following: (a) each PCB Control Area; (b) each Hygiene Facility; (c) proposed electrical hookups; (d) proposed water hookups: (e) each waste storage area: (f) restroom areas; (g) areas designated for eating, drinking, and smoking;

b) Section on the interfacing of trades (i.e., other contractors) and the sequencing of PCB-Related Work;

c) Section on the collection, handling procedures, and disposal of PCB-Containing Materials with a PCB concentration equal to or greater than 50 ppm, and PCB Wastes (including the collection, filtering, and disposal of wastewater). If reusable equipment used during the Work will be in contact with PCB-Containing Materials or PCB Wastes, the Contractor shall submit an equipment decontamination procedure using a Performance-based Decontamination Fluid (PODF) in accordance with 40 CFR 761;

d) Section on the procedures and methodologies that will be used to conduct Exposure Monitoring and Area Monitoring. Also, provide the name and qualifications (i.e., training and experience documentation) of the Air Monitor who will be responsible for conducting the Air Monitoring activities. The Air Monitor shall at a minimum, satisfy the qualification requirements set forth in this Section;

e) Section on housekeeping procedures to be used for maintaining clean work areas and clean Hygiene Facilities;

f) Section on the specific methods and procedures of emissions control that will be used to ensure that airborne contaminant levels do not meet or exceed an OSHA PEL outside of each PCB Control Area;

g) Task Analysis: Each task analysis shall include, but is not limited to, the following information: (a) the type of Work activity; (b) the tools/equipment that will be used; (c) operation and maintenance practices and procedures that will be used for the tools/equipment; (d) the types of PCB-Containing Materials that may be disturbed or PCB Wastes that may be generated when performing the activity; (e) the engineering controls that will be used to control the spread of contamination during the activity; (f) the proposed crew size for the activity and individual employee responsibilities during the activity; (g) housekeeping procedures that will be used during the activity; (h) PPE and proposed respiratory protection that will be used for the activity;

h) Equipment and Supplies: Identify the equipment and supplies that will be used to perform the Work;

i) Rental Equipment Notification: If rental equipment is to be used during the Work, the Contractor shall notify the rental agency in writing concerning the intended use of the equipment.;

j) SDSs: Provide SDSs for all chemical products (including chemical stripping products and PODFs) to be used for the Work;

k) The name and qualifications (i.e., experience and training documentation) of the Competent Person who shall satisfy the qualification requirements set forth in this Section.

2) Waste Management:

a) The identification of PCB-Containing Materials with a PCB concentrations equal to or greater than 50 ppm, and PCB Wastes associated with the Work;

b) The estimated quantity of each waste stream (regulated and non-regulated) that will be generated and disposed of;

c) The name, address, 24-hour phone number, and current permit documentation for each TSDF indicating that the facility is approved by federal, state, and local regulatory agencies to receive PCB-Containing Materials with a PCB concentration equal to or greater than 50 ppm, and PCB Wastes. The documentation shall include an "acceptance letter" from each TSDF indicating its ability to accept the specific waste streams that will be generated during Work performed under this Section;

d) Current 6 NYCRR 364 permit documentation for the waste transporter that will transport PCB-Containing Materials with a PCB concentration equal to or greater than 50 ppm, and PCB Wastes from the work site to the TSDF.;

e) Spill prevention, containment, and cleanup contingency measures to be followed during a suspected PCB emissions/bulk material release or emergency situation.;

f) Section on the on-site handling, storage, removal, and disposal of waste materials, including but not limited to the following: (a) secondary containment system for each drum storage area; (b) description of the waste storage areas; (c) the methods and procedures that will be used to collect and containerize wastes on a daily basis; (d) types of containers; (e) the submittal of weekly regulated waste inspection and inventory records;

g) The name and qualifications (i.e., experience and training documentation) of the PCB Waste Manager.

b. A detailed schedule for the implementation of the PCB Management Plan elements, including starting and completion dates for the Work, and shall allow adequate time for cleanup, inspections, and Air Monitoring activities.

c. Medical Surveillance: For all activities that disturb PCB Containing Materials with PCB concentrations that are greater than or equal to 50 ppm, and PCB Wastes, the Contractor shall provide a sufficient number of properly trained and experienced workers,

each of whom shall: (a) have completed initial blood testing for PCBs; (b) have received a medical exam that included a PFT within the past year; (c) have received written medical clearance within the past year, by a licensed physician, to wear a respirator; (d) have received a qualitative or quantitative respirator fit-test within the past year for the specific respirator the employee will be using for this Work.

d. Employee Documentation: For all activities that take place within a PCB Control Area, each worker shall: (a) have resumes and training (e.g., certificates) for PCB workers, Competent Persons, PCB Waste Managers, and Air Monitors; (b) initial medical surveillance, dated within the past year, and proof of participation in the employer's ongoing medical surveillance program; (d) dates and written proof of respiratory clearance and a medical exam; (e) dates and written proof of a respirator fit-test.

e. A current (i.e., within the last month) signed and notarized statement disclosing all OSHA, EPA, and DOT citations/violations within the past three (3) years for the company performing the PCB Abatement.

5. Analytical Laboratory Qualifications for Analyzing Suspect PCB-Containing Materials and Wastes: Submit the name, address, and telephone number of each analytical laboratory selected to perform the analyses of waste samples (solid and liquid), air samples collected for Area Monitoring and Exposure Monitoring purposes, and paint/bitumastic coating samples collected to classify painted/coated surfaces, including. copies of current AIHA and ELAP certificates.

B. Field Reports and Recordkeeping: During all Work performed under this Section, the Contractor shall maintain and provide the following documentation:

1. Air Monitoring Documentation: All PCB Air Monitoring results and daily Air Monitoring reports shall be provided to the DEP within 24-hours from the date the samples are collected, including signed, complete COC documentation.

a. Each signed daily Air Monitoring report shall include, but not be limited to, the following information: (a) sample “start” and “stop” times; (b) flow rates (initial and final) for each sample; (c) the total volume of air collected for each sample; (d) sample location descriptions/sample location drawings/names of individuals being sampled; (e) types (i.e., makes and models) of sampling equipment used; (f) types of sample media (i.e., filters and cassettes) used; (g) the most recent calibration dates, along with the calibration results, for the sampling equipment used; (h) the name of the Air Monitor that conducted the Air Monitoring; (i) dates that the Air Monitoring was conducted; (j) work tasks being performed during

the Air Monitoring; (k) unique sample numbers used to identify each sample; and, (l) highlighting of all PEL exceedances.

2. Waste Documentation: Completed and signed waste manifests from TSDFs shall be provided to the DEP no later than thirty (30) calendar days of disposal. In addition, on-site waste storage areas shall be inspected weekly by the PCB Waste Manager.

   a. Each waste storage area inspection shall be coordinated with the Engineer, signed by the inspector, and shall be provided to the DEP within 24-hours of the inspection date. The report shall include: (a) the name of the inspector; (b) descriptions of waste streams; (c) types, quantities, and physical condition of waste containers;(d) proper labeling for each waste containers; (e) secondary containment systems being used; (f) storage area security method to prevent any unauthorized entry.

   b. In addition to performing weekly waste storage area inspections, the PCB Waste Manager shall also maintain an ongoing waste inventory, including: (a) specific dates that each waste container was added/removed from the waste storage area; (b) the full name (printed) and signature of the individual responsible for adding/removing each waste container from the waste storage area.

3. PCB Control Area Inspection Documentation: PCB Control Areas shall be inspected daily by the Competent Person.

   a. All signed reports shall be provided to the DEP within 24-hours after the inspection is completed. The content of these reports shall include: (a) the types of work being performed; (b) the names of the PCB workers, Competent Person, PCB Waste Manager, and Monitor on site, including company names; (c) the types of Air Monitoring, including the number of samples being collected; (d) any non-compliance issues observed, including the corrective actions that were taken to achieve compliance.

4. Contractor Project Record: The Contractor's Competent Person shall maintain a project record at the Work Site that shall be made available to the Engineer or DEP for review at any time and shall be submitted to the DEP within 24-hours after the completion of the Work.

   a. At a minimum, the Contractor Project Record shall contain the following information: (a) copies of training certificates for all individuals involved with the Work; (b) copies of all Air Monitoring results generated during the Work; (c) copies of all available caulking and paint chip/bitumastic coating sample analytical data and survey reports related to the Work; (d) copies of all daily sign-in sheets; (e) copies of all SDSs pertaining to all chemicals being used during the Work; (f) a copy of the Contractor's PCB Management Plan; (g) copies of all daily PCB

Control Area inspection records; (h) copies of all weekly waste storage area inspection records; (i) a copy of the waste inventory; (j) a copy of the Contractor's Hazard Communication (HAZCOM) program.

5. Daily Sign-In Sheets: The Contractor shall generate daily sign-in sheets for all individuals entering and exiting each PCB Control Area. The daily sign-in sheets shall be maintained by the Competent Person and shall be made available to the Engineer or DEP for review at any time during the Work. All daily sign-in sheets shall be submitted to the DEP within 24-hours after the completion of the Work.

   a. At a minimum, each daily sign-in sheet shall include: (a) the individual's printed name and signature; (b) company name; (c) the time of entry and exit from each PCB Control Area.

6. HAZCOM Program: The Contractor's HAZCOM program shall be made available to the Engineer or DEP for review at any time during the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Respirators: The Contractor shall select respirators approved by the NIOSH for use in areas where paints/bitumastic coatings, dusts, materials, or wastes containing contaminants may be disturbed. At a minimum, the Contractor shall provide each individual with a half-face, negative pressure, air purifying respirator equipped with HEPA/P-100 Filter cartridges and Organic Vapor Cartridges, until Exposure Monitoring results indicate that respiratory protection can be modified. The Contractor's CIH shall make all determinations regarding respiratory protection modifications that will be implemented for the Work. All modifications shall be in accordance with OSHA requirements, the Contractor's PCB Management Plan, and any relevant Asbestos Work Plan or Lead Management Plan associated with the Work.

B. PPE: The Contractor shall provide personnel who have a potential to be exposed to materials or wastes containing contaminants, with appropriate PPE as prescribed by the Contractor's CIH.

C. HEPA Filters: HEPA/P-100 Filters used in vacuuming equipment, power tools, and local exhaust equipment must meet or exceed any manufacturer's specifications and recommendations, as well as specifications presented in the Standard for Safety High Efficiency, Particulate, Air Filter Units (UL 586).

D. Waste Containers: Containers for the storage of all PCB Wastes shall be DOT-approved and shall be provided by the Contractor.

E. Abrasives: Mechanical paint/bitumastic coating removal equipment shall not use any products containing crystalline silica, and the equipment shall not utilize any non-recoverable materials or any cutting materials which introduce toxic or hazardous materials into the environment.

F. Chemical Strippers: The Contractor shall utilize an environmentally safe chemical paint stripping system, with demonstrated suitability and efficiency in preparing cast-in-place concrete, cement, and plaster surfaces that are free of any visible residues of paints/bitumastic coatings. The system shall include non-alkaline or alkaline strippers that provide the lowest possible level of toxicity consistent with the types of paints/bitumastic coatings to be removed. Neutralization products and procedures shall be provided for all alkaline stripping systems, no stripping system shall contain methylene chloride, and the stripping system shall be low in volatile organic compounds (VOCs).

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Hygiene Facilities: The Contractor shall provide functional Hygiene Facilities as defined in this Section that are appropriate for the types of Work to be performed under this Section. The Contractor shall ensure that employees do not leave a PCB Control Area wearing any potentially contaminated PPE. Using compressed air to dislodge dust from clothing/PPE shall be strictly prohibited. The Contractor shall collect, test, and properly dispose of all wastewater generated from Hygiene Facilities.

1. Handwash Stations: The Contractor shall provide functioning handwash stations on all projects that disturb PCB-Containing Materials with a PCB concentration equal to or greater than 50 ppm, or PCB Wastes. Handwash stations shall have running water at the tap, clean towels, and soap per 29

CFR 1926.51. Substituting "hand wipes" in place of soap and running water will not be acceptable.

2. Showers: The Contractor shall provide shower facilities for use by employees whose airborne exposure to PCBs is above an OSHA PEL. When shower facilities are necessary, employees are required to shower at the end of the work shift each day prior to leaving the PCB Control Area that they are working in.

B. Utilities: The temporary use of any on-site utilities shall be subject to the approval of the DEP. The Contractor shall furnish all water, hoses and water filtration devices needed for the Work as per 01 51 11 Temporary Water and Sanitary Services; as well as any temporary electrical hookups and temporary lighting to the PCB Control Area as per 01 51 30 Temporary Electrical System. All temporary lighting and temporary electrical service to a PCB Control Area shall be provided by the Contractor and shall be in weather-proof enclosures and be ground fault protected. Also, the Contractor shall supply all heating and ventilation equipment needed for the Work as per 01 51 12 Temporary Heat and Ventilation.

C. Signs: The Contractor shall post conspicuous warning signs at all approaches to work areas and waste storage areas. Signs shall comply with federal, state, and local regulations, including the requirements of OSHA. Signs shall not be removed until all Abatement, removal, and construction/demolition activities have been completed. At a minimum, each sign shall bear the following information in English and the predominant language that is spoken by the Contractor's employees if English is not spoken:

WARNING
PCB WORK AREA
POISON
NO SMOKING, EATING OR DRINKING

1. Each sign shall be appropriately modified to include additional warnings for other contaminants that are identified during Exposure Monitoring.

D. Physical Boundary Delineation: The Contractor shall clearly delineate each work area and waste storage area with a Physical Boundary as defined in this Section.

E. Work Area Preparation: The Contractor shall utilize HEPA-filtered vacuums, and wet methods during the initial cleaning of each work area. Prior to removal from each work area, all movable objects and mounted objects that can be removed shall be pre-cleaned using HEPA-vacuums and wet methods. Fixed objects that must remain within each work area shall be pre-cleaned using HEPA vacuums and wet methods, and subsequently covered with 6-mil polyethylene sheeting.

3.02 IMPLEMENTATION

A. Bulk Removal

1. Protection of Existing Work to Remain: All Work involving the disturbance of PCB-Containing Materials and PCB Wastes must be conducted without damage to, or contamination of equipment or surfaces within the work areas or other areas adjacent to the work areas. All such damage or contamination shall be immediately corrected and cleaned up by the Contractor at the Contractor's expense.

2. Prohibited Activities: Contractors shall not conduct activities that are prohibited by OSHA and EPA regulations. The following activities are prohibited, regardless of whether they are conducted subject to an exposure assessment and written compliance program: (a) burning-off paints/bitumastic coatings; (b) using heat guns operating above 1100° F; (c) dry machine sanding, grinding, or blasting paint without a HEPA vacuum exhaust tool; (d) uncontained hydroblasting or high-pressure washing; (e) welding painted/coated surfaces unless the paint/coating is removed at least 4-inches from area of heat application (per 29 CFR 1926.345(c)(1)), and local exhaust ventilation is used.

3. Test Patches: Prior to choosing the paint removal method(s) for paints/bitumastic coatings, the Contractor shall perform test patches on surfaces subject to Abatement or spot removal, to determine if the method(s) meet the requirements of this Section.

4. Mechanical Removal Equipment: The use of mechanical equipment to remove asbestos-containing caulking or bitumastic coatings will require compliance with DEP (RCNY Title 15, Chapter 1) or NYSDOL (12 NYCRR 56) asbestos regulations, including the use of a full containment enclosure under negative air pressure.

    a. When removing paints/bitumastic coatings from metal surfaces, the paints/bitumastic coatings must be removed to the extent that only the bare metal remains (i.e., no mill scale remains). In the case of substrates other than metal (e.g., concrete, brick, and block), paints/bitumastic coatings shall be removed from the surface of the substrate to the extent that flaking and peeling will not occur subsequent to the performance of the Work. Acceptance of the Work shall be contingent upon inspection of the substrate surfaces by the Engineer and must demonstrate the absence of residual paint/coating layers that can be physically measured, pried loose, or peeled away using a scraping device. The Contractor may only use products and tools meeting the performance specifications outlined below:

        1) The Contractor shall utilize a vacuum-assisted power tool system with demonstrated suitability and efficiency in preparing metal surfaces to the SSPC SP-11 standard, and with demonstrated effectiveness in maintaining PCB emissions below OSHA exposure limits during the disturbance of paints/bitumastic coatings. Such systems

may include dustless needle guns, dustless roto peens, and dustless right-angle grinders, all of which capture dust and debris at the cutting tool edge, and transport the material under vacuum conditions to an air-tight disposal container. Dustless needle guns shall only be utilized on metal surfaces.

2) The vacuum-assisted power tool system shall also be designed to permit the removal and replacement of collection containers under negative pressure in order to prevent the release of dusts. The system shall be equipped with an automatic “shut-off” in the event of vacuum failure.

3) Abrasive/recovery tools shall be monitored at all times by a device capable of determining recovery at the face of each tool, and capable of automatically disabling the tool in the event that recovery levels are insufficient. The monitor, at a minimum, shall have the following features: (a) a remote warning light; (b) an adjustable recovery set point; (c) automatic equipment disabling capabilities; (d) a sensing range of 0 5 pounds per square inch (psi); (e) solid state photohelic instrumentation; (f) remote sensing at the face of the tool.

4) The safe recovery point shall be calibrated each day before start-up, or each time a new tool or vacuum source is used. All manufacturer recommendations shall be followed with respect to the set up and use of the monitor, and the manufacturer's operations manual shall be kept on site at all times. A daily log shall be maintained by the Contractor, identifying all calibrations of recovery levels, as well as any “down time” as a result of insufficient recovery levels.

5) The cutting head of the vacuum-assisted power tool system that is used on flat surfaces shall be capable of cutting to within 1-1/2" of any inside corner, molding, or edge, and may include dustless roto peens or dustless needle guns. Tools for corners and moldings shall be specifically designed for that purpose, and conform to all inside corners, outside corners, curved, flat, and angled surfaces that are to be abated under this Section. These tools shall also maintain vacuum control at the Work surface/cutting head interface at all times. HEPA vacuum-shrouded needle guns may be used for non-flat surfaces in accordance with manufacturer recommendations. Vacuum-assisted finishing tools, such as right-angle grinders, may be used to achieve the SSPC SP 11 standard, but may not be used for primary removal.

6) Vacuum-assisted power tool systems meeting all of the specifications outlined herein, may be used pending the submittal of all required performance documentation, and their acceptance by the Engineer. Any tools which do not meet all of the specifications outlined herein, shall be removed from the project site immediately, and shall not be used for the Work to be performed under this Section.

5. Chemical Strippers: Acceptance of the Work shall be contingent upon inspection of the abated substrate surfaces by the Engineer and must demonstrate the absence of residual paint/bitumastic coating layers that can be physically measured, pried loose, or peeled away using a scraping device. The Contractor may only use products and paint stripping systems meeting the performance sections outlined below:

   a. The Contractor shall utilize a chemical paint stripping system with a demonstrated effectiveness in maintaining PCB emissions below OSHA exposure limits during the disturbance of paints/bitumastic coatings. The Contractor shall utilize a mechanical ventilation system during the Work that exhausts away from occupied areas. The application of all paint stripping systems shall be in accordance with manufacturer recommendations.

   b. The Contractor should note that more than one (1) product may be required to strip PCB-containing paints/bitumastic coatings. The use of multiple products shall be in accordance with work practices approved by the individual manufacturer of each chemical paint stripping compound.

   c. All chemical paint stripping products shall be presented to the Engineer for approval prior to the start of any Work to be performed under this Section. The manufacturer's labels on each container shall be intact and legible.

   d. Chemical paint stripping systems may be used pending the submittal of all required performance documentation, and its acceptance by the Engineer.

3.03 FIELD TESTING / QUALITY CONTROL

A. Air Monitoring

1. Exposure Monitoring: For Work involving the disturbance of any detectable concentration of PCBs, the Contractor shall collect personal air samples from employees who are anticipated to have the greatest risk of exposure, as determined by the Contractor's CIH or Competent Person. Personal air samples shall be collected during every work shift from at least one (1) employee that is representative of each type of work task that is being performed. Each personal air sample shall "run" for the employee's entire work shift in order to ensure that enough volume (of air) is collected, and an accurate 8-hour TWA can be calculated.

Documentation regarding the sample numbers, specific shift when the sampling was conducted, the work tasks that were sampled, the dates of sampling, the employee hours that were worked during the shift, and the total sampling times, shall accompany each laboratory COC form.

a. If PCB concentrations being disturbed are less than 50 ppm, Exposure Monitoring may be discontinued following a complete negative exposure assessment and approval from the Engineer and the Contractor's CIH. A negative exposure assessment is defined as current initial exposure monitoring using breathing zone air samples representing the 8-hour TWA exposure for each individual who are representative of each task being conducted. Following discontinuation of exposure monitoring, if there is a change to work practices, exposure monitoring shall again be performed until a second negative exposure assessment is conducted and analyzed.

2. Area Monitoring: If PCB concentrations being disturbed are greater than or equal to 50 ppm, the Contractor shall collect a minimum of two (2) area air samples outside of each PCB Control Area on a daily basis for the duration of the Abatement, removal, or construction/demolition Work, as well as any other Work involving the disturbance of PCB-Containing Materials or PCB Wastes. During sampling activities, all air sample filter cassettes shall be positioned approximately five to six feet above the ground (to simulate an individual's breathing zone) and shall not be placed immediately adjacent to obstructions (e.g., walls or columns) which may restrict the flow of air to the filter cassettes. Each air sample shall be analyzed for all contaminants identified during the exposure assessment. If area Air Monitoring indicates an emission level in excess of an OSHA PEL outside of a PCB Control Area, all Work in that area shall be stopped immediately. The Contractor shall then take immediate corrective actions to reduce emission levels to below the OSHA PEL(s), and the Contractor shall clean all adjacent areas that may have become contaminated due to the emissions. Documentation regarding the sample numbers, sample locations, the dates of sampling, the employee hours that were worked during the shift, and the total sampling times, shall accompany each laboratory COC form.

3. The Contractor shall submit all Air Monitoring results to the DEP within 24 hours after the air sample was collected.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Cleanup: The Contractor shall maintain all surfaces, including protective coverings (polyethylene sheeting) within each work area, free of accumulations of paint chips/coating debris, dusts, and wastes. Dry sweeping and using compressed air to cleanup a work area shall be strictly prohibited. HEPA-filtered vacuums and

wet methods shall be used to ensure that each work area remains free of visible paint chips/coating debris, dusts, and wastes. Perform work in accordance with SSPC Guide 6.

1. Equipment Decontamination: All reusable equipment (e.g., hand tools and power tools) that has been in contact with materials that have a PCB concentration greater than or equal to 50 ppm and PCB Wastes, shall be thoroughly decontaminated prior to being removed from the PCB Control Area in accordance with 40 CFR 761.79(c)(2)(i), which permits "swabbing surfaces that have contacted PCBs with a solvent." The solvent shall be a PODF as defined in 40 CFR 761.79(c)(3)(iv)(C) or (D). Used decontamination materials (e.g., rags used to swab equipment) shall be collected, stored, and disposed of in accordance with this Article.

B. Collection, Separation, and Containerization of Wastes: The Contractor shall collect, separate (by waste stream/waste type), and containerize PCB containing wastes (solid and liquid), debris, PPE, and containment materials on a daily basis in accordance with the PCB Safe Work Practices or PCB Management Plan.

1. If any source sample from a specific work area indicates that PCBs in paints/coatings are greater than or equal to 50 ppm, then all waste from that area will be characterized as TSCA-regulated waste. All waste streams must be segregated into separate drums and labeled with PCB waste labels, including out of service date (when PCB waste is first place in the drum) in addition to RCRA hazardous waste labels (pending analysis). This may include one or more drums for paint chips, chemical stripper waste, and HEPA filters associated with HEPA vacuums. Other waste such as PPE, rags and polyethylene sheeting from a specific work area may be comingled in drums separate from the drums containing paint chips, stripper waste and HEPA filters.

2. If all source samples from a specific work area indicate that PCBs in paints/coatings are less than 50 ppm, then all PPE, poly and paint/coating waste from that area will be characterized as PCB-containing non-hazardous or hazardous waste pending TCLP analysis of the eight (8) RCRA metals in the waste stream and should not be managed as C&D debris. Drums should be labeled with RCRA hazardous waste labels (pending analysis). All waste streams shall be segregated into separate drums. Paint chips and HEPA filters shall be drummed as one waste stream from each work area, and polyethylene sheeting, rags, paper towels and PPE from each work area will be drummed as a separate waste stream.

3. The Contractor shall store all wastes in DOT-approved container systems. All drums/containers shall be labeled, sealed and covered immediately after filling.

4. No water mixed with or contaminated by hazardous waste may be released onto the ground or into any drain or sewer. It should be noted that a discharge of more than 1 lb. of PCBs onto the ground or into the water

within a 24-hour period, shall be considered a violation of the Clean Water Act and shall be treated as a "reportable quantity" in accordance with 40 CFR 116, 40 CFR 117, and 40 CFR 302. Such a release shall be grounds for immediate termination of this Contract, and the Contractor shall be liable for any fines, penalties, or remediation costs.

5. The Contractor shall store non-hazardous wastes separately from hazardous wastes and TSCA-regulated wastes, shall provide all non-hazardous waste containers, and shall make all transportation and disposal arrangements for non-hazardous wastes in accordance with federal, state, and local regulations. TSCA-regulated PCB waste must be disposed within 180 days subject to the requirements of 40 CFR 761.65, in addition to any RCRA hazardous waste storage requirements (i.e., 90 days), as applicable.

C. Storage of Wastes: The Contractor shall ensure that all drummed wastes have secondary containment, and that each waste storage area has a Physical Boundary. In addition, the Contractor shall post weekly waste inspections and waste inventories in the regulated waste storage area, including the following emergency information: (a) contact details for the facility's Emergency Coordinator; (b) map indicating the location of fire extinguishers and spill control materials; (d) the telephone number for the fire department (unless the facility has a direct alarm).

D. Labeling: The Contractor shall affix warning labels to all waste drums/containers. Labels must be filled out completely at the point of generation when waste is first containerized. PCB labels shall be used to designate PCB waste, including out-of-service date, in addition to RCRA hazardous waste labels. At a minimum, all PCB and hazardous waste labels shall bear the following information in English:

CAUTION
CONTAINS PCBs
[Out-of-Service Date – when PCB waste is first placed in drum]
HAZARDOUS WASTE
FEDERAL LAW PROHIBITS IMPROPER DISPOSAL
HANDLE WITH CARE
[Generator Name, Address, and Telephone Number]
[Specific Contents of Container]
[EPA-Issued Generator Identification Number]
[EPA Waste Identification Number]
[Accumulation Start Date]

1. Since waste classification is pending analysis for RCRA/NYSDEC hazardous waste, the RCRA hazardous waste labels shall indicate "PCB/Hazardous Waste - Pending Analysis."

E. Sampling and Laboratory Analysis of PCB-Containing Wastes: For PCB Waste characterization, the PCB Waste Manager shall sample all potential PCB-

Containing Waste Streams in accordance with the TSCA (40 CFR 761). According to the EPA, characterizing PCB-containing waste streams (i.e., determining whether wastes are regulated or non-regulated under TSCA) shall be made based upon the total PCB concentration at the "source" (e.g., the paint/bitumastic coating) prior to any disturbance that may be initiated through Abatement, removal, or construction/demolition activities. Unlike hazardous waste determinations that are made under RCRA (40 CFR 260 and 40 CFR 261), sampling to determine whether a waste is TSCA-regulated shall not be made based on the sampling and analysis of mixed bulk waste materials/debris generated as a result of Abatement, removal, or construction/demolition activities. Instead, source materials for PCBs must be collected as grab samples and must not be composited during collection or analysis as that may reduce the concentration of PCBs detected. Rather, individual source samples shall be submitted for analysis to determine the highest concentration of PCBs contained in the source material or wastes.

1. PCB concentrations are based on the cumulative total of the nine (9) Aroclor congeners (aka PCB compounds) analyzed by EPA Methods SW 846-8082A (soxhlet extraction method 3540) by Gas Chromotography.

2. If PCB concentrations in paints/coatings are present greater than or equal to 50 ppm, all PCB-containing waste generated during paints/coatings disturbance will be classified as TSCA-regulated PCB waste. If PCB concentrations in paints/coatings are less than 50 ppm, all PCB-containing waste generated in the area will be classified as non-TSCA PCB-containing waste.

3. If it cannot be confirmed that the source of drummed waste (e.g., paints/coatings) is non-TSCA-regulated, or no source samples are available, or the soxhlet extraction method 3540 was not used for previous analyses, then four (4) biased worse-case grab samples shall be collected from the drum and each sample analyzed for Total PCBs. If any one grab sample result has a PCB concentration of equal to or greater than 50 ppm, the drummed waste shall be characterized as TSCA-regulated waste.

4. Waste materials/debris generated during Abatement, removal, or construction/demolition activities may be classified as RCRA or NYSDEC hazardous waste (6 NYCRR Part 370 and 6 NYCRR Part 371.4(e)) in addition to being TSCA-regulated. Therefore, wastes/debris must still be sampled and characterized prior to disposal. All waste samples shall be collected in the presence of the Engineer using the following procedure:

    a. Sampling of drummed waste will be biased for the worst-case (highest result) and will be based on inspection of drum contents. For drums with paint chips, with or without stripper waste, collect one grab sample for every quarter of the drum, from any hot spots (i.e., paint chips). As an example, if the drum is full, collect four grab samples, if the drum is half-full, collect two grab samples, and if the drum is one-tenth full, collect one sample. Grab samples

shall be composited into one (1) bulk composite sample. For drums with PPE, polyethylene sheeting, rags, and towels, collect up to four (4) grab samples with positive bias for paint chips or paint-related staining. As such, samples are likely to be collected from dust or chips at the bottom of the drum. Each grab sample shall be composited into one (1) bulk composite sample, labeled, and submitted to a laboratory. Composite samples shall undergo Toxicity Characteristic Leaching Procedure (TCLP) analysis for the eight (8) RCRA metals and Total PCBs to determine if waste is a NYSDEC hazardous waste (i.e., listed waste B007), and any additional parameters that are required by the specific TSDF being used. Furthermore, if the waste stream is associated with the use of a chemical paint stripping system, the Contractor shall have the laboratory analyze each sample for pH and any other RCRA characteristic that may fail due to the chemical composition of the waste.

b. One (1) representative wastewater sample shall be collected for laboratory analysis from each drum generated. Each sample shall be collected using appropriate field sampling equipment (e.g., a pipette or bailer), and shall be labeled and submitted to a laboratory that satisfies the requirements of this Section.

F. Sampling and Laboratory Analysis of PCB-Containing Demolition Debris: The Contractor shall collect representative bulk samples of anticipated demolition wastes to determine proper disposal. In addition to a total PCB analysis of the source materials (e.g., paints/bitumastic coatings), representative bulk samples shall be collected from painted/bitumastic-coated building materials for TCLP analysis for the eight (8) RCRA metals and Total PCBs to determine if waste is a NYSDEC listed hazardous waste (i.e., listed waste B007).

1. Scrap Metal Exemption for Recycling: Under 6 NYCRR Part 371.1(c)(7), painted scrap metal can be sent to a recycling facility, rather than be discarded as hazardous waste. In order for the DEP to submit a "c7 notification" to the NYSDEC and claim the "scrap metal exemption," the Contractor must first submit notification to their recycling facility indicating that PCBs are present on the scrap metal in concentrations less than 50 ppm. If concentrations are greater than or equal to 50 ppm, the scrap metal cannot be recycled and instead must be disposed of as a TSCA-regulated waste. If Lead or other heavy metals are detected in the paints/bitumastic coatings on the scrap metal, the Contractor shall also disclose this information to the recycling facility. The Contractor shall submit this documentation to the Engineer for approval prior to disposal.

G. Bulk demolition debris (e.g., painted concrete) that is sampled and determined to be non-RCRA-regulated and non-TSCA-regulated waste may be disposed of as construction and demolition (C&D) debris as per Section 01 74 20 – Construction Waste Management and Section 02 41 10 – Demolition and Removals.

H. Disposal of Wastes: The Contractor shall notify the DEP at least 14 business days prior to the removal of any waste drums/containers. All waste profiles for containerized wastes must be reviewed by the Engineer and signed by the DEP as the generator of the waste streams. As per 40 CFR Part 761.207, a Uniform Hazardous Waste Manifest shall be completed for TSCA-regulated and/or NYSDEC hazardous wastes. Wastes shall be disposed of to ensure that drums/containers do not remain on the job site for more than 90 calendar days from the initial "accumulation start date" on the label affixed to the drum/container. Containers that have reached their storage capacity shall not remain on site, and transportation arrangements shall be made for their immediate removal.

1. Small Capacitors and Fluorescent Light Ballasts: Small Capacitors and Fluorescent Light Ballasts are not classified as hazardous wastes under NYSDEC regulations (6 NYCRR 371.3(e)). However, these items are assumed to contain PCBs, and therefore must be disposed of as PCB Bulk Product Wastes unless marked "No PCBs" by the manufacturer. Small Capacitors and Fluorescent Light Ballasts that are not marked "No PCBs" or are leaking (regardless of PCB concentration), must be managed at one of the following facilities in accordance with 40 CFR 761.62(a): (a) in facilities using a TSCA-approved incinerator; (b) at a TSCA/RCRA-permitted landfill; (c) in facilities using an approved alternate method of destroying PCBs; (d) at a facility using an approved method of removing/decontaminating PCBs; (e) using a TSCA PCB Coordinated Approval issued by the EPA Regional Administrator.

I. Disposal Documentation: If asbestos or lead (as defined in Section 02 82 05 - Asbestos Management and Section 02 83 05 - Lead Management) were detected in the wastes, the Contractor shall also ensure that the TSDF is approved by federal, state, and local regulatory agencies to receive these wastes. Once all waste profiles have been completed, the Contractor shall provide the DEP with a "Letter of Acceptance" issued from the TSDF indicating that the wastes will be accepted, and a copy of the advance manifest. On the date of disposal, the Contractor shall submit one (1) copy of the completed manifest that has been signed and dated by the initial transporter in accordance with 6 NYCRR 372, 6 NYCRR 373, 40 CFR 262, 40 CFR 263 and 40 CFR 264, to the DEP for signature as Generator. All waste containing PCBs must be identified on the manifest, including out of service date for hazardous waste manifests. All hazardous waste documentation (e.g., waste profiles, manifests, and Land Disposal Restrictions (LDRs)) must be signed by a DEP employee as described in Section 01 35 45 - Hazardous Materials Control. Non-hazardous waste documentation may be signed by a DEP-designated alternate.

END OF SECTION

SECTION 02 84 10 – MERCURY MANAGEMENT
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section details the requirements for construction and demolition activities affecting materials containing mercury, attached to Section 01 35 45 - Hazardous Materials Control, specified herein, or required to complete the Work, including all Mercury and Mercury-Containing Equipment and Material identified and impacted by the Work. There are no known mercury-containing wastes or equipment.

B. When necessary, the Contractor shall perform the removal and recycling/disposal of additional materials containing mercury not specified herein.

C. All mercury-containing wastes generated during this Contract Work that qualify as Universal Wastes under federal, state, or local regulations, must be recycled (and not disposed of as hazardous wastes) regardless of the quantity of wastes generated.

D. The Contractor shall perform all Work under this Section without damaging or contaminating adjacent areas to where the Work is being performed. Where such areas are damaged or contaminated, as determined by DEP, the Contractor shall restore the areas to their original condition at no additional cost to the City.

E. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s), or allowance(s) as set forth in Section 01 27 00 – Measurements and Payment.

1.03 RELATED SECTIONS

A. Section 01 35 27 – Environmental Health and Safety Requirements

B. Section 01 35 45 – Hazardous Materials Control

1.04 REFERENCES

A. Definitions

1. Certified Industrial Hygienist (CIH): Refers to an individual employed by the Contractor or its Subcontractors who is currently certified by the American Board of Industrial Hygiene (ABIH).

2. Competent Person: Defined by OSHA as one who is capable of identifying existing and predictable hazards in the surroundings or working conditions, and who has authorization to take prompt corrective measures to eliminate them. Duties of the Competent Person include the following: (a) determining prior to the performance of the Work, what contaminants are present in the workplace; (b) establishing work areas and assuring that access to and from those areas is limited to authorized personnel; (c) assuring the adequacy of any employee exposure monitoring required by OSHA; (d) assuring that all employees exposed to airborne contaminant levels above Action Levels, Permissible Exposure Limits (PELs), or Recommended Exposure Limits (RELs) wear appropriate Personal Protective Equipment (PPE), respiratory protection, and are trained in the use of appropriate methods of exposure control for all of the contaminants present; (e) assuring that proper hygiene facilities are provided and that workers are trained to use those facilities; (f) assuring that engineering controls specific to the contaminants present are implemented, maintained in proper operating condition, and functioning properly

3. DOT Hazardous Materials Transportation Training: Training that meets the criteria outlined in 49 CFR 172.704. This training shall include discussions from 49 CFR 171 of the following: (a) hazardous materials tables within 49 CFR 172; (b) material packaging and labeling within 49 CFR 178; (c) shipping papers and placards within 49 CFR 173; (d) material loading and segregation within 49 CFR 173.

4. Hazardous Waste Operations (HAZWOPER) Training: Training that meets the criteria outlined in the OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120). Certain types of Work may require 24 or 40-hour HAZWOPER Training. All decisions regarding the specific HAZWOPER Training that will be required for each work task shall be made by the Engineer.

5. High-Efficiency Particulate Air (HEPA) Filter: A filter designed to remove 99.97% of all particles greater than 0.3 micrometers (μm) in diameter. HEPA vacuum equipment used by the Contractor shall meet the Standard for Safety High-Efficiency, Particulate, Air Filter Units (UL 586) developed by Underwriters Laboratories.

6. Mercury-Containing Equipment and Material: Material or equipment/device that contains a detectable amount of elemental mercury, inorganic mercury compounds, or organic mercury compounds. Mercury-Containing Materials may include, but are limited to, the following: batteries, light bulbs, thermometers, thermostats, barometers, manometers, temperature gauges, pressure gauges, and switches.

7. Mercury Awareness Training: Training for individuals that have the potential to be exposed to mercury-containing materials/equipment or mercury wastes. This training shall include discussions of the following: (a) sources of mercury; (b) current federal, state, and local regulations pertaining to mercury; (c) the health effects of mercury exposure; (d) state-of-the-art work practices, engineering controls, and procedures for removal, materials handling, waste management, housekeeping, and spills that involve mercury; (e) the use and maintenance of PPE and the use and maintenance of respirators in accordance with 29 CFR 1910.134; (f) requirements regarding warning signs, labeling, and Safety Data Sheets (SDSs) in accordance with 29 CFR 1910.1200; (g) responsibilities of the Competent Person.

8. Mercury Waste: Non-specific liquid or solid waste generated during the disturbance, removal, construction/demolition, handling, and cleanup of Mercury-Containing Equipment and Material.

9. P-100 Filter: (See definition of: "High-Efficiency Particulate Air (HEPA) Filter").

10. Physical Boundary: A physical barrier designated with ropes, red "do not enter tape," or a partition that surrounds a work area in order to limit the entry of unauthorized personnel.

11. Recommended Exposure Limit (REL): An exposure limit recommended by the NIOSH that can be expressed as a Time-Weighted Average (TWA), Ceiling Limit, or Short-Term Exposure Limit (STEL). Once an REL is met or exceeded for a particular contaminant, the Contractor is responsible for ensuring that workers receive appropriate exposure monitoring, PPE, including respiratory protection, hygiene facilities, medical surveillance, and training. The following REL is pertinent to removal, demolition, and disposal activities associated with Mercury-Containing Equipment and Materials and Mercury Wastes: (a) mercury – 0.05 mg/m^3 as a TWA for up to a ten (10) hour workday and a 40-hour work week, and a ceiling limit of 0.1 mg/m^3, as per DEP EHS Policies and Procedures - Vol. III, Mercury Management.

12. Resource Conservation and Recovery Act (RCRA) Training: Training that meets the criteria outlined in 40 CFR 265.16. This training shall include site-specific discussions of the following: (a) hazardous waste identification; (b) waste storage container use and labeling; (c) waste storage area management; (d) personal health and safety, including fire safety; (e) manifesting and the off-site transportation of wastes; (f) procedures for using, inspecting, repairing, and replacing emergency equipment and monitoring equipment; (g) procedures for communicating with other employees and outside emergency response personnel; (h) responses to fires or explosions; (i) responses to leaks, spills, and potential groundwater contamination incidents; (j) the shutdown of operations.

13. Time Weighted Average (TWA): The average time over a given work period (e.g., an eight (8) hour workday) of a person's exposure to a chemical or agent. The average is determined by sampling for the chemical or agent throughout the time period.

14. Universal Waste: Any Mercury-Containing Material and Equipment that meets the criteria outlined in the Standards for Universal Waste Management (40 CFR 273), the Standards for Universal Wastes (6 NYCRR 374-3), or the Mercury-Added Consumer Products Law (Chapter 145, Laws of New York, 2004). Per 40 CFR 273.4(b)(3), if the mercury is removed from Mercury-Containing Equipment/Material, the material can no longer be considered a Universal Waste and must be managed as a hazardous waste, or a determination must be made to characterize the material as non-hazardous.

B. Reference Standards

1. The Contractor shall comply with all applicable regulations, standards, and guidelines of federal, state, and local environmental and occupational safety and health agencies regarding Mercury-Containing Equipment and Material, and Mercury Wastes. These regulations, standards, and guidelines include, but are not limited to the following:

   a. United States (U.S.) Department of Transportation (DOT):

      1) 49 CFR 171 – General Information, Regulations, and Definitions;

      2) 49 CFR 172 – Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements;

      3) 49 CFR 173 – Shippers: General Requirements for Shipments and Packaging's;

      4) 49 CFR 178 – Specifications for Packaging's.

   b. U.S. Environmental Protection Agency (EPA):

      1) 40 CFR 273 – Standards for Universal Waste Management;

2) 40 CFR 302 – Designation, Reportable Quantities, and Notification.

c. New York City Department of Environmental Protection (DEP):

1) Environmental Health and Safety Policies and Procedures – Vol. II, Spill Prevention, Environmental Release Reporting and Investigation;

2) Environmental Health and Safety Policies and Procedures – Vol. III, Mercury Management;

3) Environmental Health and Safety Policies and Procedures – Vol. IV, Hazardous Waste Management;

4) Environmental Health and Safety Policies and Procedures – Vol. IV, Universal Waste Management;

5) 15 RCNY Chapter 19 – Discharges of Wastewater and Other Materials to Public Sewers.

d. New York City Department of Buildings (NYCDOB)

1) New York City Building Code.

e. New York State Department of Environmental Conservation (NYSDEC):

1) 6 NYCRR 364 – Waste Transporter Permits;

2) 6 NYCRR 370 – Hazardous Waste Management Regulations;

3) 6 NYCRR 371 – Identification and Listing of Hazardous Waste;

4) 6 NYCRR 372 – Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities;

5) 6 NYCRR 374 – Management of Specific Hazardous Waste;

6) 6 NYCRR 376 – Land Disposal Restrictions.

f. Chapter 145, Laws of New York, 2004 – Mercury-Added Consumer Products Law.

g. National Institute for Occupational Safety and Health (NIOSH):

1) NIOSH Pocket Guide to Chemical Hazards.

h. Occupational Safety and Health Administration (OSHA):

1) 29 CFR 1910 – Occupational Safety and Health Standards;

2) 29 CFR 1910.28 – Safety Requirements for Scaffolding;

3) 29 CFR 1910.120 – Hazardous Waste Operations and Emergency Response;

4) 29 CFR 1910.1200 – Hazard Communication Standard

5) 29 CFR 1926 – Safety and Health Regulations for Construction.

i. Underwriters Laboratories, Inc. (UL):

1) UL 586 – Standard for Safety High Efficiency, Particulate, Air Filter Units.

1.05 DESCRIPTION

A. Commencement of Work: Five (5) business days prior to the proposed start of Work at each separate location, the Contractor shall notify the Engineer and the onsite safety staff. No Work may proceed at any location until authorized by the Engineer.

B. The Contractor shall coordinate any required equipment shutdowns with the Engineer prior to starting the Work.

C. Access Restrictions: The Contractor shall inform the Engineer of proposed access restrictions (i.e., areas or items of equipment which will not be accessible during the Work) and give them estimated periods (including specific dates) of such proposed access restrictions. The Contractor shall not have exclusive rights to the work site and shall fully cooperate and coordinate this Work with the work of Other Contractors who may be on site.

D. Unexpected Entry into a Work Area: In the event that DEP personnel must enter a work area for emergency reasons, the Contractor shall immediately stop work and cleanup any loose debris, so as to permit the safe entry by DEP personnel. Any disturbance of Mercury-Containing Equipment and Material or Mercury Wastes shall not proceed until all DEP personnel have exited from the work area.

1.06 QUALITY ASSURANCE

A. Compliance: In addition to the detailed requirements of this Section, and DEP EHS Policies and Procedures, the Contractor shall comply with all applicable regulations of federal, state, and local authorities pertaining to the disturbance, removal, construction/demolition, handling, storage, transportation, and recycling/disposal of Mercury-Containing Equipment and Material and Mercury Wastes. All matters regarding the interpretation of any regulations, standards, or policies shall be submitted to the Engineer for resolution before starting the Work. Where the requirements of this Section, DEP EHS Policies and Procedures, or federal, state, or local regulations conflict or vary, the most stringent requirements or regulations shall apply.

1. Rejection of Non-Complying Items: The DEP reserves the right to reject items incorporated into the Work which fail to meet the specified minimum requirements. The DEP also reserves the right to reject Contractor submittal items (e.g., proposed TSDFs, vendors or subcontractors with previous regulatory citations/violations) that are deemed inappropriate or unacceptable by the Engineer or DEP. The DEP further reserves the right, and without prejudice to other recourse, to accept non-complying items subject to an adjustment in the Contract amount, as approved by the DEP.

B. Qualifications:

1. Competent Person:

a. The Contractor and/or Mercury Removal Company shall have on staff and assigned to this Contract a Competent Person, who shall be onsite during all mercury-related work activities, and who has successfully completed:

1) DOT Hazardous Materials Transportation Training;

2) HAZWOPER Training if required;

3) Mercury Awareness Training; and

4) RCRA Training courses as defined in this Section.

a) Each training course shall have been completed within the past year in the form of either an initial course or a refresher course.

b. The Competent Person shall have a minimum of two (2) years' experience with work involving mercury, including at least three (3) projects of comparable scope and methodologies.

2. Mercury Worker: Mercury workers shall have Mercury Awareness Training, completed within the past year.

1.07 SUBMITTALS

A. Thirty (30) business days prior to the Work of this Section or as directed by the Engineer, the Contractor shall submit the following to the Engineer:

1. Mercury Management Plan: . The Mercury management plan, signed and dated by a CIH, shall include the following elements:

1) Mercury Control:

a) Drawings showing the locations and details of each work area and each waste storage;

b) A detailed discussion regarding the interfacing of trades and the sequencing of Mercury-Related Work;

c) A detailed discussion on the implementation of proper precaution when Mercury-Containing Equipment (gauges, switches, flow meters, manometers, thermometers, flow regulators, laboratory equipment, lamps, etc.,) is removed to prevent release of elemental mercury onto or into connected equipment or appurtenances;

d) A detailed discussion regarding the collection, handling procedures, and recycling/disposal of Mercury-Containing Equipment and Material and Mercury Wastes;

e) A detailed discussion regarding "real-time" air monitoring for mercury vapor (e.g., using a Jerome® meter), including Action Levels, to be implemented during the Work, as applicable. Also, indicate how compliance with the Action Levels and the REL (per the DEP EHS Policy and Procedure for Mercury Management) will be determined, and who will be responsible for ensuring that compliance with the Action Levels and REL is maintained. At a minimum, Action Levels shall be established for the following situations: (a) the removal of broken/leaking Mercury-Containing Equipment and Material; (b) the implementation of engineering controls and safe work practices; (c) upgrades/downgrades in levels of PPE; (d) work stoppage or the emergency evacuation of on-site personnel;

f) A detailed discussion regarding housekeeping procedures to be used for maintaining clean work areas;

g) A detailed task analysis for each work activity including, but is not limited to, the following information: (a) the type of work activity; (b) the tools/equipment/supplies that will be used; (c) the types of Mercury-Containing Equipment and Material that may be disturbed, or Mercury Wastes that may be generated when performing the activity; (d) the engineering controls that will be used to control the spread of contamination during the activity; (e) the proposed crew size for the activity and individual employee responsibilities during the activity; (f) housekeeping procedures that will be used during the activity; (g) PPE that will be used for the removal of both intact and broken (leaking) Mercury-Containing Equipment, and the decontamination protocol when handling removal of broken (leaking) Mercury-Containing Equipment;

h) SDSs: Provide SDSs for all chemical products to be used during the Work.

b. Waste Management:

1) The identification of Mercury-Containing Equipment and Material and Mercury Wastes (as defined in 40 CFR 116, 40 CFR 260, 40 CFR 261, 6 NYCRR 370 and 6 NYCRR 371) associated with the Work;

2) The estimated quantity of each waste stream that will be generated and recycled/disposed of as per 40 CFR 302;

3) The name, address, phone number (24-hour), and permit documentation for each recycling facility/TSDF, indicating that the facility is approved by federal (40 CFR 264 and 40 CFR 265), state (6 NYCRR 373), and local regulatory agencies to receive Mercury-Containing Equipment and Material and Mercury Wastes;

4) Current Waste Transporter 6 NYCRR 364 and 40 CFR 263 permit documentation;

5) Spill prevention, containment, and cleanup contingency measures, to be followed during a suspected mercury emissions/bulk material release or emergency situation, in accordance with this Section, including 15 RCNY Chapter 19;

6) A detailed discussion of the on-site handling, storage, removal, and recycling/disposal of waste materials, including but not limited to the following:; (a) the methods of demarcation that will be used to identify the waste storage area; (b) the method of collection and containerization of wastes on a daily basis; (c) the types of containers (d) the posting of weekly regulated waste inspection and inventory records.

c. A detailed schedule for the implementation, start date, and completion date of the Mercury Management Plan elements.

d. The name, qualifications (i.e., experience and training documentation), and resume of the Competent Person.

e. Employee Documentation: The Contractor shall provide a sufficient number of properly trained and experienced workers, each of whom shall: (a) have written proof of training (e.g., certificates) in accordance with the qualification requirements of this Section for Mercury workers.

f. A current (i.e., within the last month) signed and notarized statement disclosing all of the OSHA, EPA, and DOT citations/violations within the past three (3) years.

B. Field Reports and Recordkeeping: During all Work performed under this Section, the Contractor shall maintain and provide the following documentation:

1. Recycled Materials/Waste Documentation: Completed and signed waste manifests from recycling facilities/TSDFs shall be provided to the DEP within ten (10) business days of disposal. In addition, on-site waste storage areas shall be inspected weekly by the Competent Person.

a. Each weekly waste storage area inspection report shall be provided to the DEP within 24-hours of the inspection date. The content of these reports shall include, but is not limited to, the following information: (a) the name of the inspector; (b) descriptions of waste streams; (c) waste container type, quantity, and condition; (d) recycling/disposal time limit (i.e., 365 days or 90 days, respectively; (e) proper label type; (f) secondary containment system; (g) storage area security method to prevent any unauthorized entry.

b. In addition to performing weekly waste storage area inspections, the Competent Person shall maintain an ongoing waste inventory that includes, but is not limited to, the following information: (a) specific dates that each waste container was added/removed from the waste storage area; (b) the full name (printed) and signature of the individual responsible for adding/removing each waste container from the waste storage area.

2. Contractor Project Record: The Contractor Project Record shall be made available to the Engineer or DEP for review at any time during the Work, and shall be submitted to the DEP within 24-hours after the completion of the Work.

a. At a minimum, the Contractor Project Record shall contain the following information: (a) copies of training certificates for all individuals involved with the Work; (b) copies of all Mercury-Containing Equipment and Material inventory reports relating to the Work; (c) copies of all daily worker sign-in sheets as required in this Section; (d) copies of all SDSs pertaining to all chemicals being used during the Work; (e) related Drawings; (f) a copy of the Contractor's Mercury Management Plan; (g) copies of all weekly waste storage area inspection records; (h) and a copy of the waste inventory.

3. Daily Sign-In Sheets: The Contractor shall generate daily sign-in sheets for all individuals entering and exiting each work area for the duration of the Work.

4. HAZCOM Program: The Contractor's HAZCOM program shall be made available to the Engineer or DEP for review at any time during the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. PPE: The Contractor shall provide personnel who have a potential to be exposed to Mercury-Containing Equipment and Material or Mercury Wastes, with appropriate PPE as prescribed by the Contractor's CIH.

B. Waste Containers: Containers for the storage of all recyclable materials and wastes shall be DOT-approved and shall be provided by the Contractor.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Utilities: The temporary use of any on-site utilities shall be subject to the approval of DEP. The Contractor shall furnish all water and hoses, water filtration devices, and heating equipment, as well as any temporary hookups. In addition, all temporary lighting and temporary electrical service to a work area shall be provided by the Contractor, and shall be in weatherproof enclosures and be ground fault protected.

B. Signs: The Contractor shall post conspicuous warning signs at all approaches to work areas and waste storage areas. Signs shall not be removed until all removal and construction/demolition activities have been completed. At a minimum, each sign shall bear the following information in English and the predominant language that is spoken by the Contractor's employees if English is not spoken:

WARNING
MERCURY WORK AREA
POISON
NO SMOKING, EATING OR DRINKING

C. Physical Boundary Delineation: The Contractor shall clearly delineate each work area and waste storage area with a Physical Boundary as defined in this Section.

D. Removal

1. Work Area Containment Measures: To prevent potential contamination, the Contractor shall place 6-mil polyethylene sheeting on the floor beneath

Mercury-Containing Equipment and Material that are being removed. Any containment materials that become contaminated during the Work shall not be reused, and shall be properly containerized and disposed of in accordance with this Section.

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Cleanup: The Contractor shall maintain all surfaces, including protective coverings (polyethylene sheeting) within each work area, free of accumulations of debris, dusts, and wastes. The Contractor shall perform housekeeping activities, using HEPA-filtered vacuums and wet methods, daily throughout each work shift and at the end of each work shift, to prevent any accumulation of debris, dusts, and wastes in the work areas. Using compressed air to cleanup a work area shall be strictly prohibited.

B. Collection, Separation, and Containerization of Wastes: The Contractor shall collect, separate (by waste stream/waste type), and containerize Mercury Wastes (solid and liquid), debris, PPE, and containment materials on a daily basis.

1. The Contractor shall store all wastes in DOT-approved container systems. All drums/containers shall be sealed and covered immediately after filling, and each drum/container will have a label affixed to it in accordance with this Article. All labels shall remain intact and legible at all times.

2. No water mixed with or contaminated by mercury may be released onto the ground or into any drain or sewer. It should be noted that a discharge of more than 1 lb. of mercury onto the ground or into the water within a 24-hour period, shall be considered a violation of the Clean Water Act and shall be treated as a “reportable quantity” in accordance with 40 CFR 117. Such a release shall be grounds for immediate termination of this Contract and the Contractor shall be liable for any fines, penalties, or remediation costs.

3. Any quantity of Elemental Mercury that is released or spilled must be immediately reported to DEP. Reporting to NYSDEC Spill Hotline is required for a release of one pound (approximately two tablespoons) or more.

C. Storage of Wastes: The Contractor shall ensure that all drummed wastes are stored in a secondary containment system, and that each waste storage area is demarcated with a Physical Boundary. In addition, the Contractor shall post weekly waste inspections and waste inventories in the hazardous waste storage area, including the following emergency information in accordance with DEP’s EHS Policies and

Procedures: (a) the name and telephone number of the facility's Emergency Coordinator; (b) the location of fire extinguishers and fire alarms; (c) the location of spill control materials; (d) the telephone number for the fire department (unless the facility has a direct alarm).

D. Labeling: The Contractor shall affix warning labels to all recycling/waste drums and containers. Labels shall comply with the requirements of federal, state, and local regulations, including EPA and DOT requirements. At a minimum, all labels shall bear the following information in English:

[Generator Name, Address, and Telephone Number]
[Specific Contents of Container]
[Accumulation Start Date]
[Accumulation End Date]

1. If necessary (i.e., if waste is to be disposed of as hazardous waste rather than Universal Waste), also include the following information on the label:

HAZARDOUS WASTE
FEDERAL LAW PROHIBITS IMPROPER DISPOSAL
HANDLE WITH CARE
[EPA-Issued Generator Identification Number]
[EPA Waste Identification Number]

E. Characterization of Wastes: Mercury-Containing Equipment and Material to be removed under the Work of this Section shall be recycled in accordance with the EPA's Standards for Universal Waste Management (40 CFR 273), the NYSDEC's Standards for Universal Wastes (6 NYCRR 374-3), and the NYSDEC's Mercury-Added Consumer Products Law (Chapter 145, Laws of New York, 2004). If a material is not regulated as a Universal Waste, the material shall be considered a hazardous waste, and shall be disposed of in accordance with RCRA requirements.

F. Disposal of Wastes: Hazardous wastes shall be disposed of to ensure that drums/containers do not remain on the job site for more than 90 calendar days from the initial "accumulation start date". Universal Wastes shall not remain on the job site for more than one (1) year from the initial "accumulation start date". Containers that have reached their storage capacity shall not remain on site and transportation arrangements shall be made for their immediate removal.

G. Disposal Documentation: Once all waste profiles have been completed and signed by DEP, the Contractor shall provide DEP with a "Letter of Acceptance" issued by the TSDF indicating that the wastes will be accepted, and a copy of the advance manifest. On the date of disposal, the Contractor shall submit one (1) copy of the completed manifest, that has been signed and dated by the initial transporter in accordance with 6 NYCRR 372 and 40 CFR 262, to the DEP for signature as Generator. All hazardous waste documentation (e.g., waste profiles, manifests and Land Disposal Restrictions (LDRs)) must be signed by a DEP employee as

described in Section 01 35 45- Hazardous Materials Control. Non-hazardous waste documentation may be signed by a DEP-designated alternate.

END OF SECTION

SECTION 03 01 30.71 – REHABILITATION OF CAST-IN-PLACE CONCRETE
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish all labor, materials, equipment and appliances required for the complete execution of concrete rehabilitation to existing structures as indicated on the Contract Drawings, determined by field survey directed by the Engineer and in accordance with the requirements specified herein.

B. Principal items of Work include:

1. The Contractor shall determine by field survey, in conjunction with the Engineer, the extent of concrete to be repaired, stabilized and resurfaced. Areas to be replaced or modified by new work shall not be included. Report of field survey shall be submitted by the Contractor to the Engineer for review and approval prior to starting work.

2. Preparation for repairing, stabilizing and resurfacing exterior and interior cast-in-place concrete floors, walls, ceilings, platforms, steps and the like.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 35 63 – Sustainability Certification Project Requirements.

B. Section 07 90 00 - Joint Protection

1.04 REFERENCES

A. Definitions

1. Environmental Product Declaration - A third-party-verified International Organization for Standardization (ISO) Series 14025 Type III declaration that quantifies environmental information on the life cycle of a product to enable comparisons between products fulfilling the same function.

B. Reference Standards

1. ASTM C33 – Concrete Aggregates.

2. ASTM C881 – Epoxy-Resin Base Bonding System for Concrete.

3. ACI 503.4 – Standard Specification for Repairing Concrete with Epoxy Mortars.

4. ISO 14025 – Environmental labels and declarations - Type III environmental declarations

5. ACI 562-21 – Assessment, Repair, and Rehabilitation of Existing Concrete Structures

1.05 DESCRIPTION

A. Services of Manufacturer’s Representatives

1. The Contractor shall provide the services of a qualified manufacturer's technical representative who shall instruct the Contractor's personnel in the mixing, proper use and application of the epoxy, polyurethane, polymer-modified and cement-based compounds.

2. The manufacturers' representative shall provide written certification that materials have been mixed and applied properly and surfaces to receive these products have been prepared properly, all in conformance with manufacturer's requirements.

3. The onsite time required for the manufacturer's representative to achieve a successful installation shall be at the expense of the Contractor. The manufacturer's representative shall sign in and out at the office of the Resident Engineer and provide written verification of the areas he has approved on each day he is at the project.

1.06 QUALITY ASSURANCE

A. The Contractor shall furnish the name of all subcontractors which he proposes to use for this work including necessary evidence and/or experience records to ascertain their qualifications in the application of epoxy, polyurethane, polymer-modified and cement-based compounds.

B. Approved applicator qualifications shall include:

1. A minimum of five years of experience in applying epoxy, polyurethane and polymer-modified and cement-based compounds similar to those specified in this Section.

2. A letter from the manufacturer of the specified materials, on the manufacturer's letterhead, signed by an officer of the company, stating that the subcontractor/applicator has been trained in the proper techniques for the preparation of the surface, and proper methods for mixing, placing, curing, and caring of the manufacturer's products. This letter shall further state that the subcontractor/applicator is on the manufacturer's approved list of contractors.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Proposed methods and corresponding area to be repaired.

2. Samples of all materials proposed to be used.

3. Material certifications and technical data sheets on all grouts, mortars, chemical resins, sealers, aggregates and repair products specified.

4. Name, address and detailed qualifications of firm to which the Contractor intends to award the work under this Section.

B. Sustainability Submittals:

1. Environmental Product Declarations

a. The Contractor shall provide product-specific type III Environmental Product Declaration (EPD) conforming to ISO 14025, 14044.

2. Envision Submittals

a. The Contractor shall report information pertaining to the sustainable procurement, regional sourcing, and/or recycled content of new materials to be procured during the Work, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall coordinate with its vendor on sustainable product requirements as stipulated by the Contractor's approved New Materials Sustainable Implementation Plan, in accordance with Section 01 35 63 – Sustainability Certification

Project Requirements. The Contractor shall submit vendor shop drawings for review by the Engineer that clearly illustrate the vendor is meeting the requirements as approved in the Contractor's New Materials Sustainable Implementation Plan.

1.08 DELIVERY, STORAGE, AND HANDLING

A. All materials shall be delivered in original unopened and undamaged cartons or packing bearing the name of manufacturer.

B. Cementitious materials shall be stored in waterproof locations to prevent intrusion of moisture and other damage from the elements. Containers showing evidence of damage will be rejected.

C. Aggregates shall be stored in separate bins to prevent mixing with foreign particles.

D. Any materials that have hardened, partially set, become caked and/or been contaminated or deteriorated shall be rejected.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The epoxy bonding agent resin shall be:

1. Sika Armatec 110 as manufactured by Sika Corp. Lyndhurst, NJ;
2. CR 246 as manufactured by Sto Concrete Restoration Division, Atlanta, GA;
3. Duralbond as manufactured by Tamms Industries Co., Kirkland, IL;
4. Or an approved equal.

B. Anti-corrosion coating material shall be:

1. Sika Armatec 110 as manufactured by Sika Corp., Lyndhurst, NJ;
2. CR 246 manufactured by Sto Concrete Restoration Division, Atlanta, GA;
3. Or an approved equal.

C. Epoxy crack repair binder shall be:

1. Sikadur 35-Hi-Mod LV as manufactured by Sika Corp., Lyndhurst, NJ;

2. CR 633 Epoxy Binder as manufactured by Sto Concrete Restoration Division, Atlanta, GA;
3. Duralcrete LV as manufactured by Tamms Industries, Kirkland, IL;
4. Or an approved equal.

D. Hydrophilic injection grout shall be:
1. Hydro-Active Flex LV as manufactured by De Neef Construction Chemicals, Houston, TX;
2. Prime Flex 900 LV as manufactured by Prime Resins, Conyers, GA;
3. Scotch Seal 5600 Chemical Grout as manufactured by 3M Construction Markets, St. Paul, MN;
4. Or an approved equal.

E. Spall repair mortar for use in horizontal applications not requiring formwork shall be:
1. Sikatop 122 Plus as manufactured by Sika Corp., Lyndhurst, NJ;
2. CR 700 as manufactured by Sto Concrete Restoration Division, Atlanta, GA;
3. Duraltop Fast Set as manufactured by Tamms Industries, Kirkland, IL;
4. Or an approved equal.

F. Spall repair mortar for use in vertical applications not requiring formwork shall be:
1. Sikatop 123 Plus as manufactured by Sika Corp., Lyndhurst, NJ;
2. CR 702 as manufactured by Sto Concrete Restoration Division, Atlanta, GA;
3. Duraltop Gel as manufactured by Tamms Industries, Kirkland, IL;
4. Or an approved equal.

2.02 MATERIALS / EQUIPMENT

A. Water
1. The water used for mixing concrete repair products shall be clear, potable and free of deleterious substances.

B. Aggregate
1. All aggregates shall conform to ASTM C33 and the requirements listed below:
a. Pea Gravel: Pea gravel shall meet the gradation of New York State size #9 and meet all material requirements specified in Section 703 for coarse aggregate as described by the New York State Department of Transportation Standard Specifications and shall be

clean and free from deleterious matter. Pea gravel shall contain no limestone.

C. Epoxy Bonding Agent

1. Epoxy bonding agent shall conform to ASTM C881 Type I, II, IV or V; Grade 2 for epoxy resin adhesives, depending on the application. The class of epoxy bonding agent shall be suitable for all ambient and substrate temperatures.

D. Anti-Corrosion Coating

1. Anti-corrosion coating shall be a two-component, polymer-modified cementitious material.

E. Epoxy Crack Repair Binder

1. Epoxy crack repair binder shall be a two-component, 100 percent solids, high-modulus, low viscosity epoxy adhesive designed for structural repair.

F. Flexible Polyurethane Hydrophilic Injection Grout Crack Repair Material

1. Flexible polyurethane crack repair material shall be a one-component, water-activated polyurethane hydrophilic injection grout capable of 700 percent expansion. Polyurethane grout shall form a tough flexible foam seal that is impenetrable to water.

G. Spall Repairs Mortar Not Requiring Formwork

1. Spall repairs not requiring formwork shall be repaired using a two-component, polymer-modified cementitious mortar and shall have a minimum 28-day compressive strength of 7,000 psi.

H. Sealant

1. Sealant shall be a two-component polyurethane sealant as specified in Section 07 90 00 – Joint Protection. Primers and bond breakers shall conform to the sealant manufacturer's recommendations.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. General Requirements

1. All exterior Work shall be performed during dry weather and appropriate temperature conditions in accordance with the manufacturer's recommendations. All unfinished work shall be protected during inclement weather with tarpaulins or heavy gage polyethylene sheeting.
2. All Work in spaces within structures shall be performed at temperature and conditions suitable for proper curing in accordance with the manufacturer's recommendations.
3. Concrete rehabilitation Work shall be coordinated and sequenced by the Contractor. Scaling, broken, loose and disintegrating materials shall be removed by use of hand tools or power driven saws, down to solid unyielding material.
4. Scaling, broken, loose and disintegrating materials shall be removed by use of hand tools or power driven saws, down to solid unyielding material.
5. All surfaces shall be thoroughly cleaned of efflorescence, oils, grease and other objectionable material in area to be repaired in accordance with the manufacturer's recommendations.

B. Epoxy Bonding Agent

1. As directed by the Engineer, an epoxy bonding agent shall be used to adhere fresh concrete to existing concrete. Existing concrete surfaces shall be roughened prior to application of bonding agent. Concrete surface shall be clean and sound, free of all foreign particles and laitance. Repair material shall be placed while bonding agent is still tacky. If bonding agent cures prior to placement of repair material, bonding agent shall be reapplied.
2. Repairing concrete with epoxy mortars shall conform to all the requirements of ACI 503.4, and as specified herein.

C. Anti-corrosion Coating

1. Reinforcing steel cut or exposed during alteration and/or repair operations shall be sandblasted, cleaned and coated with an anti-corrosive coating.
2. Coating shall thoroughly cover all exposed parts of the steel and shall be applied according to manufacturer's recommendations.

D. Epoxy Crack repair

1. Cracks 1/4-Inch and Narrower: As directed by the Engineer, all existing structural cracks 1/4-inch or narrower to be repaired shall be pressure injected an epoxy crack repair binder into the prepared crack. Crack surface shall be sealed and injection ports installed per manufacturer's recommendations.
    a. Holes drilled for injection ports shall not cut rebar. If rebar is encountered during drilling, the hole shall be abandoned and relocated, and the abandoned hole shall be patched immediately with non-shrink grout flush with the surface of the existing concrete.

b. Once the surface sealing material has cured, inject crack with epoxy crack repair binder using pressure injection equipment as directed by the manufacturer.

2. Cracks wider than 1/4-Inch: As directed by the Engineer, all existing structural cracks wider than 1/4 inch to be repaired shall be gravity fed an epoxy crack repair binder into the prepared crack.

a. Concrete surface shall be routed to form a minimum 1/4 inch wide by 1/4 inch deep V-notch and the crack cleaned to remove all loose and foreign particles. Crack shall be filled with clean, dry sand and then epoxy crack repair binder poured into V-notch, completely filling crack.

b. As binder penetrates into crack, additional binder shall be applied to the V-notch.

E. Flexible Polyurethane Crack Repair

1. As directed by the Engineer, all existing, leaking cracks 1/4 inch and narrower to be repaired shall be pressure injected with a waterproof hydrophilic injection grout into the prepared crack. Crack surface shall be sealed and injection ports installed per manufacturer's recommendations.

2. Holes drilled for injection ports shall not cut rebar. If rebar is encountered during drilling, the hole shall be abandoned and relocated, and the abandoned hole shall be patched immediately with non-shrink grout flush with the surface of the existing concrete.

3. Once the surface sealing material has cured, inject crack with waterproof hydrophilic injection grout using pressure injection equipment as directed by the manufacturer.

F. Spall Repair

1. As directed by the Engineer, all voids or spalled areas to be repaired shall be chipped back a minimum of 1/8-inch to sound concrete and the area cleaned and repaired to original dimensions with spall repair patching material according to manufacturer's recommendations.

2. All patching shall provide a final finished surface which is flat, level and even with the existing concrete surface. Repair mortar shall not be feathered to meet existing concrete surface.

3. Final patching on horizontal surfaces shall receive a finish consistent with the finish on the existing structure.

G. Curing

1. All repair materials utilized shall be cured in strict accordance with manufacturer recommendations.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Pumps and hoses used for crack repair shall be completely flushed. A sharp sided tool such as a putty knife or trowel shall be used to remove excess material from walls, floors, etc. Material shall be cured before removing.

B. The uncured polyurethane chemical grout shall be cleaned from tools with an approved solvent. The cured polyurethane chemical grout can only be removed mechanically.

C. The uncured polymer-modified Portland cement mortar shall be cleaned from tools with water. The cured polymer-modified Portland cement mortar can only be removed mechanically.

D. Excess materials caused by work under this Section shall be cleaned from existing surfaces by the use of power sanders and the surfaces shall be vacuumed clean and readied to receive final cleaning and finishing specified in other Sections. All cracks shall be sanded and shall lie in the same plane as adjacent surfaces.

E. Misplaced sealants shall be removed using methods and materials recommended by the manufacturers, and the finished work and work area shall be left in a neat and clean condition.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 03 10 00 - CONCRETE FORMING AND ACCESSORIES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Work specified in this Section consists of designing, furnishing materials for, fabricating, erecting, and removing formwork, falsework and shoring for cast-in-place concrete as indicated on the Contract Drawings, specified herein and needed for a complete installation.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 03 30 10 - Low Carbon Cast-in-Place Concrete

B. Section 03 35 00 - Concrete Finishing

1.04 REFERENCES

A. Definitions

1. Environmental Product Declaration - A third-party-verified International Organization for Standardization (ISO) Series 14025 Type III declaration that quantifies environmental information on the life cycle of a product to enable comparisons between products fulfilling the same function.

B. Reference Standards

1. ACI 117 – Standard Tolerances for Concrete Construction and Materials
2. ACI 303 – Guide to Cast-in-Place Architectural Concrete Practice
3. ACI 347 – Guide to Formwork for Concrete
4. ACI SP-4 – Formwork for Concrete
5. American Plywood Association (APA): APA Grade - Trademark
6. ISO 14025 – Environmental labels and declarations - Type III environmental declarations
7. New York City Building Code
8. Western Wood Products Association (WWPA): Western Lumber Product Use Manual

1.05 DESCRIPTION

1. Formwork materials shall be protected before, during and after erection to insure acceptable finished concrete Work. In-place materials and other operations of work in connection with concrete pours shall be protected.
2. In the event of damage to erected forms, necessary repairs or replacements prior to concrete pours shall be performed at no expense to the City.
3. The Contractor shall allow sufficient time, as determined by the Engineer from the approved schedule, between erection of forms and placing of concrete for the various trades to properly install their Work.
4. External or superimposed loads, lateral or vertical, shall not be applied on casting concrete until concrete has developed specified 28-day compressive strength and reached the minimum curing age required by Section 03 30 10- Low Carbon Cast-in-Place Concrete.
5. Stay-in-place forms are not permitted unless otherwise shown on the Contract Drawings or approved by the Engineer.

B. Design of Formwork:

1. Formwork shall be designed and constructed in compliance with ACI SP-4.

2. The Contractor shall assume responsibility for the design, engineering and construction of formwork. Forms shall be designed to produce concrete members identical in shape, lines and dimensions to members shown on the Contract Drawings.

3. The formwork shall be designed for the loads and lateral pressures in accordance with ACI 347 and wind loads as specified by the New York City Building Code.

4. Construction and control joints, openings, offsets, keyways, recesses, moldings, chamfers, blocking, screeds, bulkheads, waterstops, anchorages, inserts, and other features shall be provided as required.

5. Formwork shall be designed to be readily removable without impact, shock, or damage to 'green' concrete surfaces and adjacent materials.

6. The maximum deflection of facing materials reflected in concrete surfaces exposed to view shall be 1/240 of the span between structural members. The formwork shall be cambered to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete and due to construction loads.

7. Formwork surface materials shall meet the requirements of Section 03 35 00 - Concrete Finishing.

1.06 QUALITY ASSURANCE

A. Unless otherwise noted on the Contract Drawings, formwork shall be constructed so that the concrete surfaces will conform to the tolerance limits as given in ACI 117.

B. Shop Drawings approvals shall be obtained before custom fabrication is started and before delivery of materials to the Site.

C. Work of this Section shall be coordinated with the work of other trades so that construction is not delayed.

D. Formwork erection procedures and health and safety of the work force shall be the responsibility of the Contractor. The requirements of authorities having jurisdiction shall be complied with.

E. Errors of detailing and fabrication and the correct fit of the formwork shall be the responsibility of the Contractor.

F. Materials, fabrications and workmanship found defective shall be promptly removed and replaced and new acceptable work shall be provided in accordance with Contract requirements at no additional expense to the City.

G. Design of formwork layout, spans, fastenings, joints, and framed openings shall be under the direct supervision of a Professional Engineer, who is licensed and registered in the State of New York with minimum of 10 years of experience in structural design of formwork.

1.07 SUBMITTALS

A. Shop Drawings submitted for approval of the Engineer shall include, but not be limited to, the following data:

1. Design of all field-constructed and prefabricated formwork. The Contractor shall submit drawings and calculations signed and sealed by a professional engineer licensed in the State of New York for form designs and re-shoring.

2. For each type of form required, material type, material thickness, finish, and a dimensional cross-sectional profile.

3. Details of erection, including various connections, layouts of form units placement directions, anchoring and support details, attachment of accessories, each condition requiring enclosures, cut opening, special jointing, and other accessories as required to complete the work.

B. Manufacturer's specifications and installation instructions for each type of required formwork and accessory shall be submitted. These include each type of sheeting, chamfer strips, form facing materials, form ties, form liners, rustication strips, form release agent, dovetail anchor slots, form coating material, form caulking, and similar items.

C. Plan for Reshoring: When reshoring is permitted or required, the operations shall be planned in advance and in accordance with acceptable procedures and the requirements of this Section.

1. The Contractor shall submit as a part of the shop drawings a Plan for Reshoring prepared and sealed by a New York State registered professional engineer.

D. Sustainability Submittals:

1. Environmental Product Declarations

a. The Contractor shall provide product-specific type III Environmental Product Declaration (EPD) conforming to ISO 14025, 14044.

2. Envision Submittals

a. The Contractor shall report information pertaining to the sustainable procurement, regional sourcing, and/or recycled content of new materials to be procured during the Work, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall coordinate with its vendor on sustainable product requirements as stipulated by the Contractor’s approved New Materials Sustainable Implementation Plan, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall submit vendor shop drawings for review by the Engineer that clearly illustrate the vendor

is meeting the requirements as approved in the Contractor's New Materials Sustainable Implementation Plan.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered to the site in an undamaged condition and at such intervals as will avoid delay in the work.

B. Material shall be stored and protected in a clean, properly drained location. Material shall be kept off the ground under a weather-tight covering permitting good air circulation. Formwork materials shall be stored on dry wood sleepers, pallets, platforms or other appropriate supports which have slope for positive drainage. Materials shall be protected from distortion, excessive stresses, corrosion and other damage. Materials shall not be stored on the structure in a manner that might cause distortion or damage to the supporting structure. The maximum uniform distributed storage load shall not exceed 20 pounds per square foot.

C. Material shall be handled safely in a manner that will prevent distortion or other damage. Care shall be exercised at all times to avoid damage through careless handling during unloading, storing and erecting. Panels shall be supported by using strong backs while lifting panels in a horizontal position.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. A-2 Cone Snap-in Form Tie shall be as manufactured by:

1. Dayton Superior.
2. Williams Form Engineering Corp.
3. Symons Corp.
4. Or approved equal.

B. Form caulking shall be as manufactured by:

1. Series 1200 Construction Caulking; GE Silicones/Momentive Performance Materials, Inc., Waterford, NY.
2. Dow Corning 999-A; Dow Corning Co., Auburn, MI.

3. Or approved equal.

C. Form release agent shall be as manufactured by:

1. Specco F-100; Specco Industries, Inc., Lemont, IL.
2. Debond Form Coating; L&M Construction Chemicals, Inc., Omaha, NE.
3. Magic Kote; Symons Corporation, Des Plaines, IL.
4. Or approved equal.

D. Form film shall be as manufactured by:

1. Symons Corporation, Des Plaines, IL.
2. Or approved equal.

E. Rustications shall be as manufactured by:

1. Symons Corporation, Des Plaines, IL.
2. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Lumber

1. Only stress-grade lumber shall be provided. Form framing, sheathing and shoring shall conform to WWPA Western Lumber Product Use Manual.
2. For lumber in contact with concrete, the lumber shall be provided with dressed or tongue-and groove edges on at least the side contacting the concrete, unless otherwise indicated on the Contract Drawings.

B. Plywood

1. Only grade-marked plywood conforming to APA shall be provided.
2. B-B Plyform, Exterior Class 1 or 2, or High Density Overlay (HDO) form plywood, Class 1 or 2 conforming to U.S. Product Standard PS-1 shall be provided.
3. Thickness shall be as required to maintain alignment and surface smoothness, but not less than 5/8 inch thick.

C. Steel Forms

1. Commercial grade sheets not less than 16 gage shall be provided.
2. Steel forms in rust-free condition shall be maintained by use of steel wool and light grinding, followed by coats of the specified release agent.
3. Stock material that is free from warps, bends, kinks, cracks, and rust or other matter that could stain the concrete shall be provided.
4. Panels shall be fabricated in conformance with the approved submittals.

5. Outward facing surfaces shall be reinforced as required to prevent warpage and deformation during concrete placement.

D. Form Ties

1. Commercially manufactured type form ties, hangers, and clamps of such type that, after removal of the forms, metal will not be closer than concrete cover as indicated on the Contract Drawings from concrete surface shall be provided. Non-fabricated wire ties will not be permitted.

2. A cone-shaped, snap-in type form tie suitable for the intended use with a working load as required and an integral hot forged head shall be provided.

3. Ties with swaged washers or other suitable devices to prevent seepage of fluid along the ties shall be provided. Ties shall be left in place. She-bolt with water seals shall be provided.

4. Form ties for all liquid-retaining structures shall have waterstop at mid-thickness of wall.

5. Lugs, cones, washers, or other devices which do not leave holes or depressions greater than 1-inch in diameter shall be provided.

E. Chamfer Strips

1. 3/4 inch by 3/4 inch triangular fillets shall be provided, all of which shall be milled from clear, straight-grain pine, surfaced each side, or all of which shall be extruded vinyl type with or without nailing flange unless otherwise indicated on the Contract Drawings.

F. Dovetail Anchor Slots

1. Dovetail anchor slots manufactured from 22 gage, electro-galvanized steel with removable felt or polyurethane filler shall be provided, where indicated on the Contract Drawings.

G. Shop Fabricated Form

1. Forms shall be fabricated in accordance with the approved submittals.

2. Forms shall be maintained clean, smooth, and free from imperfections and warpage.

3. Locate joints as indicated on the approved Shop Drawings.

   a. Form panels shall be arranged in symmetrical patterns conforming to the general lines of the structure.

   b. Except when otherwise indicated on the Contract Drawings, panels on vertical surface shall be oriented with the long dimension horizontal joints level and continuous.

c. Form panels on each side of the panel joint shall be precisely aligned by means of fasteners common to both panels, to result in a continuous, unbroken concrete surface.

d. Largest stock size practicable shall be provided.

e. Between form joints, areas less than the stock size of the form liner material shall be lined with a single piece of liner material.

H. Form Caulking

1. Form caulking shall be a one-component, gun-grade silicone sealant that is capable of producing flush, watertight and non-absorbent surfaces and joints. Sealant shall be compatible with the type of forming material and concrete ingredients used.

I. Form Release Agent

1. Form release agent shall be a VOC compliant commercial formulation form-coating compound that will not bind with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede wetting of surfaces to be cured with water or curing compounds. Form release agent shall be a nonreactive type as approved by ANSI/NSF standard 61.

J. Form Film

1. Form film shall conform to the requirements of form release agent above.

a. Thinner shall be provided as recommended by manufacturer of the form film.

K. Rustications

1. Rustications shall be provided as specified herein and/or shown on the Contract Drawings.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Field Measurements

1. Prior to commencement of the Work, existing dimensions, elevations, locations and conditions applicable to the Work shall be field verified.

Variances and discrepancies from the Contract Drawings and potential interferences shall be reported promptly to the Engineer.

2. Sufficient field measurements shall be taken prior to preparation of Shop Drawings and fabrication of construction materials, where possible, to ensure proper fitting of the work. However, job progress shall not be delayed. The Contractor shall allow for adjustments and fittings wherever the taking of field measurements before fabrication may not be possible or might delay the work.

3. Actual field-verified conditions may require modifications to the fabrication and/or erection details as indicated on the Contract Drawings. The Work shall be performed to meet actual field conditions encountered.

B. Preparation

1. The Contractor shall examine the areas and conditions under which the Work of this Section is to be performed. Conditions detrimental to the proper and timely completion of the Work shall be corrected. Work shall not proceed until unsatisfactory conditions have been corrected. Prior to placement of concrete, forms shall be inspected for cleanliness and accuracy of alignment.

2. Where different levels are indicated for wall footings, the footings shall be stepped. Unless otherwise indicated on the Contract Drawings, steps in wall footings shall not be of greater height than the thickness of the footings and steps shall not lap less than 6 inches. No form shall be set at the back of such steps and where earth has slumped off in such locations it shall be cut back to a vertical plane just before the concrete is placed.

3.02 IMPLEMENTATION

A. Erection and Installation

1. Forms shall be constructed in accordance with ACI 347 to required dimensions, plumb, straight and mortar tight, and all joints and seams shall be made mortar-tight. Forms shall be substantial, properly braced, and tied together to maintain position and shape and to resist all pressures to which they may be subject. Unless otherwise noted on the Contract Drawings, formwork shall be constructed so that the concrete surfaces will conform to the tolerance limits in ACI 117.

2. The size and spacing of studs and wales shall be determined by the nature of the work and the height to which concrete is placed. Forms shall be made adequate to produce true, smooth surfaces.

3. Forms shall be supplied for repeated use in sufficient number to ensure the required rate of progress. Forms shall be cleaned and inspected

immediately prior to depositing concrete. Deformed, broken or defective forms shall be removed from the work.

4. Joints shall be snug and tight and shall occur only at the designated locations. Construction and control joints other than those shown on the Contract Drawings shall be approved by the Engineer. Horizontal joints shall be level, and vertical joints shall be plumb. Joints shall be made perpendicular to the main reinforcement except where otherwise indicated on the Contract Drawings.

5. Temporary openings shall be provided where interior area of formwork is inaccessible for cleanout or inspection before concrete placement, and for placement of concrete. Temporary openings shall be securely braced and set tightly to forms to prevent the loss of concrete mortar. Temporary openings shall be located on forms in locations as inconspicuous as possible consistent with the requirements of the work.

6. Openings shall be provided in concrete formwork of the correct size and in the proper location to accommodate other operations of construction work in the project. Expansion joint material, waterstops, and other embedded items to be built into forms shall be accurately placed and securely supported against displacement. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable material to prevent the entry of concrete into the voids.

7. Edge forms or bulkheads and intermediate screed strips for slabs shall be set to obtain required elevations and contours in the finished slab surface.

8. Forms shall be set sufficiently to prevent joints in wood forms from opening prior to concrete pour.

9. Cutting form ties back from the face of the concrete shall not be permitted.

10. Formwork shall be observed continuously while concrete is being placed to see there are no deviations from desired elevation, alignment, plumbness and camber. If, during casting, weakness develops and the formwork shows settlement, deflection or distortion, the Work shall be stopped, improperly cast concrete shall be removed and the formwork shall be reconstructed to perform properly.

    a. Forms for columns, beams, girders, walls and window openings shall be erected in accordance with ACI 117, with a maximum camber of 3/4-inch in 20 feet. Column sides shall be clamped with metal column clamps, or equal, spaced according to manufacturer's recommendation. Exposed external angles of columns, beams, girders and walls, except where specially shown on the Contract Drawings shall be provided with 3/4-inch bevel

strips securely nailed on all concrete formwork including concrete encasement of structural steel shapes.

11. Form release agents shall be applied in accordance with manufacturer's instructions and as specified herein:

    a. Form contact surfaces shall be coated with form release agent compound before reinforcement is placed. Excess form release agent material shall not be allowed to accumulate in the forms or to come into contact with surfaces which are required to be bonded to fresh concrete such as concrete reinforcement and embedded items.

    b. Steel forms shall be coated with non-staining, rust-preventive form oil or otherwise shall be protected against rusting. Rust-stained steel surfaces in contact with concrete shall not be used.

12. Excess form coating material shall not be allowed to accumulate in the forms.

13. Form coatings shall not be allowed to come in contact with construction joints or reinforcing steel.

14. Runways for moving equipment shall be provided with struts or legs and supported directly on the formwork or structural member without resting on the reinforcing steel.

15. Wood forms shall be constructed for wall openings to facilitate loosening and to counteract swelling of the forms.

16. All sleeves, inserts, anchors, and embedded items required for adjoining work or for support of joining work shall be placed prior to concreting.

B. Reshoring

1. During reshoring the concrete in beams, slabs, columns, or any other structural members shall not be loaded with combined dead and construction loads in excess of the loads permitted by the Engineer for the developed concrete compressive strength at the time of reshoring.

2. Reshores shall be placed after stripping operations are complete but in no case later than the end of the working day on which stripping occurs.

3. Reshoring for the purpose of early form removal shall be performed so that at no time will large areas of new construction be required to support their own weight. While reshoring is under way, no live loads shall be permitted on the new construction. Reshores shall be tightened to carry their required loads but they shall not be overtightened so that the new construction is overstressed. Reshores shall remain in place until the

concrete has reached its specified 28-day strength, unless otherwise noted on the Contract Drawings.

4. For floors supporting shores under newly placed concrete, the original supporting shores or reshores shall be left in place. The shoring or reshoring system shall have a capacity sufficient to resist the anticipated loads and in all cases shall have a capacity equal to at least one-half of the capacity of the shoring system above. Reshores shall be located directly under the floors supporting shores unless other locations are permitted or shown on the Contract Drawings.

5. In multi-story buildings reshoring shall be extended over a sufficient number of stories to distribute the weight of newly placed concrete, forms, and construction live loads so the design superimposed loads of the floors supporting shores are not exceeded.

C. Removal of Forms and Ties

1. Forms shall be removed in accordance with ACI 347 recommendations without damage to concrete and in a manner to ensure complete safety to the structure. Forms, form ties and bracing shall not be removed without specific permission of the Contractor's Registered Professional Engineer.

2. Top forms on sloping surfaces of concrete shall be removed as soon as removal operations will not allow the concrete to sag. Any needed repairs or treatment required on sloping surfaces shall be performed at once and shall be followed immediately with the specified curing.

3. Upon removal of forms, the Engineer shall be notified in order that a review of the newly stripped surfaces may be made before patching.

4. Wood forms for wall openings shall be loosened without causing damage to the concrete. The face of concrete shall not be pried against. Only wooden wedges shall be used.

5. Whenever the formwork is removed during the curing period, the exposed concrete shall be cured in accordance with one of the methods specified in Section 03 30 10 – Low Carbon Cast-in-Place Concrete.

6. In general, forms shall not be removed until the concrete has hardened sufficiently to safely support its own load, plus any superimposed load that might be placed thereon. As a minimum the forms shall be left in place for length of time specified below. These times represent cumulative days, not necessarily consecutive, during which the air surrounding the concrete is above 50 degrees F.

	Min Time (days)	Min Strength (psi)
1. Curbs and Walks	2	1500
2. Columns	2	2000
3. Side forms for girders and beams	2	2000
4. Walls	2	2000
5. Bottom forms of slabs:		
a. Under 20 feet clear span	7	3000
b. Over 20 feet clear span	10	3500
6. Bottom forms of beams and girders:		
a. Under 10 feet clear span	7	3000
b. 10 to 20 feet clear span	14	3500
c. Over 20 feet clear span	21	4000

a. These times shall be increased if the concrete temperature following placement is permitted to drop below 50 degrees F.

7. Care shall be taken in removing forms, wales, shorings, supports and form ties to avoid spalling or marring the concrete. Rubbed finish, if required, and such patching as may be necessary shall be started immediately after removal.

D. Re-Use of Forms

1. Forms for re-use shall meet requirements for new forms with respect to effect on cast-in-place concrete appearance and structural stability.

2. Re-use of forms shall in no way delay or change the concrete placement schedule as compared to the schedule obtainable if all forms were new (in the case of wood forms) of if the total required forms were available (in the case of metal forms).

3. Formwork shall be cleaned and re-oiled prior to re-use. Plywood forms shall not be re-used if unused holes from form ties exist from a previous use. High density overlay plywood panels shall be thoroughly cleaned and lightly recoated before each additional use. Wood forms shall not be used more than three times.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Protection

1. During installation, the forms shall not be used as a storage platform nor as a working platform until the forms have been permanently fastened in position.

2. The surface of installed forms shall not be overloaded.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish and install all reinforcing steel as indicated on the Contract Drawings including all labor, materials, hardware, equipment, transportation, and services required for fabricating, cutting, bending, fastening and any special work and supplies necessary to hold the reinforcing steel in place and protect it from injury and corrosion in accordance with the requirements of this Section and needed for a complete installation as approved by the Engineer.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 03 30 00 - Cast-In-Place Concrete

1.04 REFERENCES

A. Definitions

1. Environmental Product Declaration - A third-party-verified International Organization for Standardization (ISO) Series 14025 Type III declaration that quantifies environmental information on the life cycle of a product to enable comparisons between products fulfilling the same function.

B. Reference Standards

1.	ACI 315	-	Manual of Standard Practice for Detailing Reinforced Concrete Structures
2.	ACI 318	-	Building Code Requirements for Reinforced Concrete
3.	ACI SP66	-	Detailing Manual
4.	ACI 350	-	Code Requirements for Environmental Engineering Concrete Structures and Commentary
5.	AWS D1.4	-	Structural Welding Code - Reinforcing Steel
6.	ASTM A82	-	Steel Wire, Plain, for Concrete Reinforcement
7.	ASTM A 1064	-	Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
8.	ASTM A496	-	Steel Wire, Deformed, for Concrete Reinforcement.
9.	ASTM A497	-	Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
10.	ASTM A615	-	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
11.	ASTM A616	-	Rail-Steel Deformed and Plain Bars for Concrete Reinforcement
12.	ASTM A617	-	Axle-Steel Deformed and Plain Bars for Concrete Reinforcement
13.	ASTM A706	-	Low-Alloy Steel Deformed Bars for Concrete Reinforcement

14.	CRSI DA4	-	Concrete Reinforcing Steel Institute Manual of Standard Practice
15.	ISO 14025	-	Environmental labels and declarations - Type III environmental declarations

1.05 DESCRIPTION

A. Placing drawings showing all dimensions necessary for fabrication and placing of the reinforcing steel and accessories without reference to the project drawings shall be submitted for approval. Approval shall be obtained from the Engineer before fabrication.

B. Details of concrete reinforcement not covered in the Contract shall be in accordance with ACI 315, ACI 318, ACI 350 and CRSI DA4.

C. When it is found necessary to move reinforcement beyond the specified placing tolerances to avoid interference with other reinforcement, conduits, or embedded items, a submittal showing the resulting arrangement of reinforcement shall be submitted to the Engineer for approval.

D. All reinforcement, at the time concrete is placed, shall be free of mud, oil or other materials that may adversely affect or reduce the bond. Reinforcement with rust, mill scale or a combination of both shall be considered satisfactory provided the minimum dimensions, weight and height of deformation of a hand-wire-brushed test specimen are not less than the applicable ASTM specification requirement.

E. All splices shall be as indicated on the Contract Documents unless otherwise permitted by the Engineer. Mechanical connections that provide a minimum of 125 percent of the yield strength of the reinforcing bars may be used when permitted by the Engineer.

F. Temperature Reinforcing

1. Unless otherwise shown on the Contract Drawings or in the absence of the concrete temperature reinforcing being shown:

a. The minimum cross sectional area of horizontal and vertical concrete temperature reinforcing in walls shall be 0.0033 times the gross concrete area.

b. The minimum cross sectional area of temperature reinforcing perpendicular to the principal reinforcing in slabs shall be 0.0020 times the gross concrete area.

2. Temperature reinforcing shall not be spaced further apart than five times the slab or wall thickness, nor more than 18 inches.

1.06 QUALITY ASSURANCE

All reinforcement shall be supported and fastened before concrete is placed and shall be secured against displacement within the tolerances permitted in this Section.

1.07 SUBMITTALS

A. The Contractor shall submit placing drawings, Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not limited to:

1. Detailed placement and shop fabrication drawings, prepared in accordance with ACI 315 and ACI SP66 shall be furnished for all concrete reinforcing. These drawings shall be made to such a scale as to clearly show joint locations, openings, and the arrangement, layout, bending, assembly diagrams, bar schedules, spacing, lapping and splicing of the bars.

2. Certified copies of mill reports shall accompany all deliveries of reinforcing steel.

3. Description of the reinforcing steel manufacturer's marking pattern.

4. Description of proposed supports for each type of reinforcing.

B. The Contractor shall also include the following:

1. Requests to relocate any bars that cause interferences or that cause placing tolerances to be violated.

2. Request to use splices not shown on the Contract Drawings.

3. Request to use mechanical couplers along with manufacturer's literature on mechanical couplers with instructions for installation, and certified test reports on the couplers' capacity.

4. Request and procedure to field bend or straighten partially embedded reinforcing.

C. Sustainability Submittals:

1. Environmental Product Declarations

a. The Contractor shall provide product-specific type III Environmental Product Declaration (EPD) conforming to ISO 14025, 14044.

2. Envision Submittals

a. The Contractor shall report information pertaining to the sustainable procurement, regional sourcing, and/or recycled content of new materials to be procured during the Work, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall coordinate with its vendor on sustainable product requirements as stipulated by the Contractor’s approved New Materials Sustainable Implementation Plan, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall submit vendor shop drawings for review by the Engineer that clearly

illustrate the vendor is meeting the requirements as approved in the Contractor's New Materials Sustainable Implementation Plan.

1.08 DELIVERY, STORAGE, AND HANDLING

A. All reinforcing shall be neatly bundled and tagged for placement when delivered to the job site. Bundles shall be properly identified for coordination with mill test reports.

B. Reinforcing steel shall be stored above ground on platforms or other supports and shall be protected from the weather at all times by suitable covering. It shall be stored in an orderly manner and plainly marked to facilitate identification.

C. Reinforcing steel shall at all times be protected from conditions conducive to corrosion until concrete is placed around it.

D. The surfaces of all reinforcing steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar and other foreign substances immediately before the concrete is placed. Where there is delay in depositing concrete, reinforcing shall be re-inspected and if necessary re-cleaned.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Dowel Adhesive System

1. The adhesive system shall be:

a. HIT HY-150 Injection Adhesive Anchor System as manufactured by Hilti, Inc., Plano, TX.

b. Epcon System as manufactured by ITW Ramset/Redhead, Glendale Heights, IL.

c. Sikadur Injection Gel as manufactured by Sika Corp., Lyndhurst, NY.

d. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Reinforcement

1. Reinforcing Steel:

a. All reinforcing steel shall be deformed except spirals and welded wire fabric, which may be plain bars. Reinforcement shall be the grades required by the Contract Documents and shall conform to one of the following specifications:

1) ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

2) ASTM A616 - Rail-Steel Deformed and Plain Bars for Concrete Reinforcement (including supplementary requirements S1).

3) ASTM A617 - Axle-Steel Deformed and Plain Bars for Concrete Reinforcement.

4) ASTM A706 - Low-Alloy Steel Deformed Bars for Concrete Reinforcement.

5) Wire or wire fabric with a specified yield strength fy exceeding 60,000 psi shall have the stress fy corresponding to a strain of 0.35 percent.

6) Reinforcing steel shall conform to the applicable requirements of Sections 03 30 00 – Cast-in-Place Concrete and the New York City Building Code.

2. Wire:

a. Wire shall be smooth or deformed wire as indicated in the Contract Documents.

1) Smooth wire shall conform to ASTM A82.

2) Deformed wire shall conform to ASTM A496, size D4 and larger.

3. Welded Wire Fabric:

a. Welded wire fabric shall be fabricated from smooth or deformed wire and shall conform to the wire size and wire spacing required or indicated on the Contract Documents. Welded wire fabric shall conform to one of the following specifications:

1) Plain wire fabric ASTM 1064, except welded intersections shall be spaced not farther apart than 12 inches in the direction of the principal reinforcement.

2) Deformed wire fabric ASTM A497, except welded intersections shall be spaced not farther apart than 16 inches in the direction of the principal reinforcement.

B. Wire Bar Supports

1. Unless noted otherwise on the Contract Drawings, wire bar supports shall be in accordance with Class 1, maximum protection or Class 2, moderate protection in Chapter 3 of CRSI DA4.

C. Dowel Adhesive System

1. Where shown on the Contract Drawings, reinforcing bars anchored into hardened concrete with a dowel adhesive system shall use a two-component adhesive mix which shall be injected with a static mixing nozzle following manufacturer's instructions.

2. The embedment depth of the bar shall be per manufacturer's recommendations, so as to provide a minimum allowable bond strength that is equal to 125 percent of the yield strength of the bar, unless noted otherwise on the Contract Drawings.

3. The adhesive system shall be as specified in this Section:

4. The Engineer's approval is required for use of this system in locations other than those shown on the Contract Drawings.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Welding

1. When required or permitted, all welding of reinforcing bars shall conform to ANSI/AWS D1.4. Unless otherwise permitted by the Engineer in writing, welding of reinforcement is prohibited.

2. Welding of wire to wire, and of wire or welded wire fabric to reinforcing bars or structural steels, shall conform to applicable provisions of ANSI/AWS D1.4 and any supplementary requirements specified by the Supervising Engineer for Concrete Construction for the particular application.

B. Fabrication

1. All reinforcement shall be bent cold unless otherwise permitted by the Engineer.

2. Fabricating and Placing Tolerances:

3. Reinforcing bars shall be fabricated in accordance with the standard fabricating tolerances in Figures 4 and 5 of ACI 315. Tolerances shall not permit a reduction in cover.

4. Placing Tolerances for Reinforcement:

Item	Tolerances, Inches
1. Clear distance:	
a. To formed soffit	-1/4
b. To other formed surfaces	±1/4
2. Minimum spacing between bars:	-1/4
3. Clear distance from unformed surface to top reinforcement:	

Item	Tolerances, Inches
a. Members 8 inches deep or less	±1/4
b. Members more than 8 inches deep but less than 24 inches deep	-1/4, +1/2
c. Members 24 inches deep or greater	1/4, +1
4. Uniform spacing of bars, but the required number of bars shall not be reduced:	±2
5. Uniform spacing of stirrups and ties, but the number of stirrups and ties shall not be reduced:	±1
6. Longitudinal locations of bends◦ and ends of reinforcement:	
a. General	±2
b. Discontinuous ends of members	±1/2
7. Length of bar laps:	1-1/2
8. Embedded length:	
a. For bar sizes No. 3 through 11	-1
b. For bar sizes No. 14 and 18	-2

5. When it is necessary to move bars to avoid interference with other reinforcement, conduits or embedded items exceeding the specified placing tolerances, the resulting arrangement of bars shall be subject to approval of the Engineer.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Testing

1. The Contractor shall provide samples from each load of reinforcing steel delivered in a quantity as directed by the Engineer for testing.

2. In addition,, the Contractor shall provide samples of each type of welded splice used in the work in a quantity and of dimensions as directed by the Engineer for testing. At the discretion of the Engineer, radiographic testing of direct butt-welded splices will be performed. The Contractor shall provide assistance necessary to facilitate testing. The Contractor shall repair any weld which fails to meet the requirements of AWS D1.4.

3. The testing will be performed by QA/QC consultant employed and paid by the City to ensure that reinforcing steel and welded splice comply with the technical requirements of the Contract.

4. The Contractor shall be charged by the City for the cost of any additional tests and investigation on work performed which does not meet the specifications.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Placing

1. Minimum concrete cover for reinforcement, except for extremely corrosive atmosphere, other severe exposures or fire protection shall be as follows unless indicated otherwise on the Contract Documents.

2. Minimum Concrete Cover for Reinforcement:

Item	Minimum Cover, Inches
1. Slabs and Joists:	
a. Top and bottom bars for dry conditions:	
1) No. 11 bars and smaller	3/4
2) No. 14 and No. 18 bars	1-1/2
b. Bars in formed concrete surfaces exposed to water or weather, and over or in contact with sewage and for bottoms bearing on work mat, or slabs supporting earth cover:	2
2. Beams and Columns:	
a. For dry conditions:	
1) Stirrups, spirals and ties	1-1/2
2) Principal reinforcement	2
b. Exposed to earth, water, sewage or weather:	2
1) Stirrups and ties	2-1/2
2) Principal reinforcement	
3. Walls:	
a. For dry conditions:	
1) No. 11 bars and smaller	3/4
2) No. 14 and No. 18 bars	1-1/2
b. Formed concrete surfaces exposed to earth, water, sewage, weather or in contact with ground	2

Item	Minimum Cover, Inches
4. Footings and Base Slabs:	
a. At formed sides and ends and bottoms bearing on concrete work mat	2
b. At unformed surfaces and bottoms in contact with earth	3
c. Top of footings	Same as slabs
d. Over top of piles	2

3. Reinforcement supported from formwork shall rest on bar supports made of concrete, metal, plastic or other acceptable materials. Where the concrete surface will be exposed to the weather in the finished structure, the portions of all bar supports within 1/2 inch of the concrete surface shall be non-corrosive or protected against corrosion.

4. Welded wire fabric for slabs on grade shall extend to within 2 inches of the concrete edge. Welded wire fabric may extend through the contraction joints. Welded wire fabric shall be adequately supported during placing of concrete to assure proper positioning in the slab.

5. Bending or straightening of bars partially embedded in concrete shall not be permitted except when specifically approved by the Engineer. Bending and preheating shall be in accordance with the requirements of this Section.

B. Bending of Bars

1. Minimum Inside Bend Diameters:

a. The minimum inside bend diameters shall conform to the following requirements unless otherwise permitted by the Engineer.

Bar Size	Minimum Diameter
No. 3 through 8	6 bar diameters
No. 9, 10, 11	8 bar diameters
No. 14 and 18	10 bar diameters

2. The beginning of the bend shall not be closer to the concrete surface than the minimum diameter of bend. Preheating, if required, shall be in accordance with the requirements of the Section. The following requirements shall be adhered to for individual bar sizes:

Bar Size	BEND REQUIREMENTS
No. 3 through No. 5	Bars may be cold bent the first time. Cold bend bars only when temperature is above 32 degrees Fahrenheit. Preheating is required for subsequent straightening or bending.
No. 6 and larger	Preheating is required.

C. Preheating of Bars

1. Preheating prior to bending or straightening, when required, shall be in accordance with the following requirements:

   a. The preheat shall be applied to a length of bar equal to at least 5 bar diameters each way from the center of the bend except that preheat shall not extend below the surface of the concrete. The temperature of the bar at the concrete interface shall not exceed 500 degrees Fahrenheit.

   b. The preheat temperature shall be 1100 to 1200 degrees Fahrenheit.

   c. The preheat temperature shall be maintained until bending or straightening is complete.

   d. The preheat temperature shall be measured by temperature measurement crayons, contact pyrometer or other acceptable method.

   e. Heated bars shall not be artificially cooled until the material temperature is less than 600 degrees Fahrenheit.

2. Preheating may be applied by any method which does not harm the bar material or cause damage to the concrete.

D. Splicing

1. Reinforcing bar splices shall only be used at locations shown on the Contract Drawings. When it is necessary to splice reinforcing at points other than where shown, the character of the splice shall be approved by the Engineer.

2. The length of lap for reinforcing bars, unless otherwise shown on the Contract Drawings shall be in accordance with ACI 318 for a class B splice.

3. Laps of welded wire fabric shall be in accordance with ACI 318. Adjoining sheets shall be securely tied together with No. 14 tie wire, one tie for each 2 running feet. Wires shall be staggered and tied in such a manner that they cannot slip.

4. Mechanical and welded splices shall be used only where shown on the Contract Drawings or when approved by the Engineer.

5. Couplers which are located at a joint face shall be a type which can be set either flush or recessed from the face as shown on the Contract Drawings. The couplers shall be sealed during concrete placement to completely eliminate concrete or cement paste from entering. After the concrete is placed, couplers intended for future connections shall be plugged and sealed to prevent any contact with water or other corrosive materials. Threaded couplers shall be plugged with plastic plugs which have an 0-ring seal.

E. Dowel Adhesive System Installation

1. The installation of the dowels shall be done in strict conformance with the manufacturer's recommendations. The dowels shall be supported in the correct position until the adhesive sets and gains enough strength to prevent any dislocation.

2. At least 25 percent of the dowels to be installed shall be proof tested to 1.33 times the allowable load specified by the manufacturer of the adhesive-injection system.

3. If the dowels are required to have a hook at the end to be embedded in the new work, an approved mechanical coupler shall be provided at a convenient distance from the face of existing concrete to facilitate the testing.

F. Miscellaneous Installation Requirements

1. Exposed Reinforcement:

a. Reinforcement left exposed for the bonding of future construction shall be effectively protected from corrosion by encasement in cement mortar or by other temporary covering as approved by the Engineer.

2. Field Cutting of Reinforcement:

a. Reinforcement shall not be cut in the field except when specifically permitted by the Engineer in writing.

3. Reinforcement Through Expansion Joint:

a. Reinforcement or other embedded metal items bonded to the concrete shall not be continuous through any joint intended as an expansion joint. Dowels bonded on only one side of a joint and waterstops may extend through the joint.

3.03 FIELD TESTING / QUALITY CONTROL

A. Inspection

1. No concrete shall be deposited until the Supervising Engineer for Concrete Construction or his approved representative has inspected the placing of

the reinforcing steel and has given permission to place the concrete. Concrete placed in violation of this provision may be rejected with subsequent removal by the Contractor.

2. The Contractor shall advise the Engineer of his intentions to place concrete and shall allow him adequate time to inspect all reinforcing steel before concrete is placed.

3. The Contractor shall advise the Engineer of his intentions to place grout in masonry walls and shall allow him adequate time to inspect all reinforcing steel before grout is placed.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. The Work specified in this Section consists of providing all labor, materials, equipment, supervising, testing and incidentals necessary to furnish and install cast-in-place concrete as indicated on the Contract Drawings and as specified herein.

B. Work includes producing concrete consisting of Portland cement, fine and coarse aggregate, water and approved admixtures; proportioned, mixed, transported, placed, finished and cured as specified. Work shall also include:

1. Providing openings in concrete as required to accommodate Work under this and other Sections.

2. Building into the concrete all items such as sleeves, frames, anchor bolts and inserts required to accommodate the Work.

C. This Section covers cast-in-place structural concrete for use in buildings and structures and miscellaneous cast-in-place concrete.

D. This Section covers the requirements of Executive Order 23 for low carbon concrete and clean construction practices.

E. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 03 10 00 - Concrete Forming and Accessories

B. Section 03 21 00 - Reinforcing Steel

C. Section 03 32 00 - Joints in Concrete

D. Section 03 35 00 - Concrete Finishing

E. Section 03 60 00 - Grouting

1.04 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO M 182 Specification for Burlap Cloth Made From Jute or Kenaf and Cotton Mats

2. AASHTO TP 23 Proposed Standard Method of Test for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying

3. AASHTO T 318 Proposed Standard Method of Test for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying

B. American Concrete Institute (ACI):

1. ACI CT-18 ACI Concrete Terminology

2. ACI 117 Specification for Tolerances for Concrete Construction and Materials and Commentary

3. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete

4. ACI 214R Guide to Evaluation of Strength Test Results of Concrete

5. ACI 301 Specifications for Concrete Construction

6. ACI 302.1R Guide to Concrete Floor and Slab Construction

7. ACI 304R Guide for Measuring, Mixing, Transporting and Placing Concrete

8. ACI 305R Guide to Hot Weather Concreting
9. ACI 306R Guide to Cold Weather Concreting
10. ACI 308.1 Specification for Curing Concrete
11. ACI 309R Guide for Consolidation of Concrete
12. ACI 311.4R Guide for Concrete Inspection
13. ACI 318 Building Code Requirements for Structural Concrete and Commentary on Building Code Requirements for Structural Concrete
14. ACI 350 Code Requirements for Environmental Engineering Concrete Structures and Commentary
15. ACI 347R Guide to Formwork for Concrete
16. ACI MNL-2 ACI Manual of Concrete Inspection
17. ACI MNL-15 Field Reference Manual: Standard Specifications for Structural Concrete ACI 301 with selected ACI references.

C. American National Standards Institute/National Science Foundation (ANSI/NSF) Standard 61 - "Drinking Water System Components - Health Effect"

D. American Society for Testing and Materials (ASTM)

1. ASTM C 31 Standard Practice for Making and Curing Concrete Test Specimens in the Field
2. ASTM C 33 Standard Specification for Concrete Aggregates
3. ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
4. ASTM C40 Standard Test Method for Organic Impurities in Fine Aggregates for Concrete
5. ASTM C 42 Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
6. ASTM C 88 Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
7. ASTM C 94 Standard Specification for Ready-Mixed Concrete
8. ASTM C 109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
9. ASTM C 138 Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
10. ASTM C 143 Standard Test Method for Slump of Hydraulic Cement Concrete

11. ASTM C 150 Standard Specification for Portland Cement
12. ASTM C 157 Standard Test Method for Length Change of Hardened Hydraulic-Cement, Mortar, and Concrete
13. ASTM C 171 Standard Specification for Sheet Materials for Curing Concrete
14. ASTM C 172 Standard Practice for Sampling Freshly Mixed Concrete
15. ASTM C 173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
16. ASTM C 227 Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations
17. ASTM C 231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
18. ASTM C 260 Standard Specification for Air-Entraining Admixtures for Concrete
19. ASTM C 295 Standard Guide for Petrographic Examination of Aggregates for Concrete
20. ASTM C 309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
21. ASTM C 311 Test Method for Sampling & Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
22. ASTM C 387 Standard Specification for Packaged, Dry Combined Materials for Mortar and Concrete and High Strength Mortar
23. ASTM C 470 Standard Specification for Molds for Forming Concrete Test Cylinders Vertically
24. ASTM C 494 Standard Specification for Chemical Admixtures for Concrete
25. ASTM C 595 Standard Specification for Blended Hydraulic Cements
26. ASTM C 618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
27. ASTM C 881 Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
28. ASTM C 882 Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear

29. ASTM C 989 Standard Specification for Slag Cement for Use in Concrete and Mortars
30. ASTM C 1064 Standard Test Method for Temperature of Freshly Hydraulic-Cement Concrete
31. ASTM C 1077 Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
32. ASTM C 1141 Specification for Admixtures for Shotcrete
33. ASTM C 1157 Standard Performance Specification for Hydraulic Cement
34. ASTM C 1240 Standard Specification for Silica Fume Used in Cementitious Mixtures
35. ASTM C 1260 Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
36. ASTM C1293 Standard Test Method for Determination of Length Change of Concrete due to Alkali-Silica Reaction
37. ASTM C 1398 Test Method for Laboratory Determination of time of Setting of Hydraulic-Cement Mortars Containing Additives for Shotcrete by the Use of Gillmore Needles
38. ASTM C 1480 Packaged, Pre-Blended, Dry, Combined Materials for Use in Wet or Dry Shotcrete Application
39. ASTM C 1567 Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
40. ASTM C1602 Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
41. ASTM E 329 Standard Specification for Agencies Engaged in the Construction Inspection Testing of Special Inspection

E. The Building Code of the City of New York (NYCBC)

F. Concrete Plant Manufacturer's Bureau (CPMB) - "Concrete Plant Standards."

G. Concrete Reinforcing Steel Institute (CRSI):

1. CRSI – "Manual of Standard Practice"
2. CRSI – "Placing Reinforcing Bars"

H. International Organization for Standardization (ISO)

1. ISO Series 14025 Type III - Environmental labels and declarations — Type III environmental declarations

I. National Ready Mixed Concrete Association (NRMCA)

J. New York State Department of Transportation (NYS DOT) - Standard Specifications

K. Portland Cement Association (PCA) – "The Design and Control of Concrete Mixtures"

L. Definitions

1. Environmental Product Declaration - A third-party-verified International Organization for Standardization (ISO) Series 14025 Type III declaration that quantifies environmental information on the life cycle of a product to enable comparisons between products fulfilling the same function.

2. Inspection Requirements – Special Inspections requirements of the New York City Building Code as defined in NYCBC 1704.4 shall apply to all applicable materials and construction.

3. Normal Weight Concrete - Concrete for which density is not a controlling attribute, made with aggregates of types covered by ASTM C 33, and usually having unit weights in the range of 135 to 160 lbs. per cubic foot.

4. Supervising Engineer for Concrete Construction - Professional Engineer designated by the Commissioner, who will be responsible for coordination of Special Inspections and Buildings Form TR1: Technical Report Statement of Responsibility. The Supervising Engineer for Concrete Construction may or may not be the Resident Engineer. The Supervising Engineer for Concrete Construction shall undertake all responsibilities outlined in Article 28 and NYCBC 1704.4 Special Inspections of the New York Building Code.

5. Other technical words and terms used in this Section are defined in ACI CT-18.

1.05 DESCRIPTION

A. Classes of Concrete:

1. Class 25 - use for lean concrete.

a. Class of concrete as recommended by NYCDOT specification for sidewalks, headers and curb.

2. Class 45 - use for all concrete unless indicated otherwise.

3. Class 45F - use as an alternate to Class 45 for:

a. Foundations

b. Walls greater than or equal to 18inches in thickness

4. Class 45PG – use for non-structural applications.
    a. Class of concrete recommended for driveways and patios

B. Work in Connection with other disciplines:

1. All sleeves, inserts, anchors and embedded items required for adjoining work or for its support shall be placed prior to concreting. No concrete shall be deposited until the Resident Engineer or his authorized representative has inspected the placement of the embedded items and the reinforcing bars and has given his permission to place the concrete.
2. All Work related to the concrete or must be supported by it, shall be coordinated with the work of this Section, including but not limited to the introduction or furnishing of embedded items prior to concrete placement.
3. Electrical conduits, junction boxes or pipes shall be placed prior to concreting. The Contractor shall coordinate the placement of such items of work in order that they are installed in accordance with all requirements of the New York City Building Code. The Contractor shall protect such installations to the extent that they are not displaced or damaged during concrete placement.
4. Openings in slabs shall be provided for pipes, conduits and the like required for the work of others where indicated on the Contract Drawings or for which directions are given prior to placing concrete. When work of others is completed, the excess part of the respective openings shall be completely closed up to the pipe sleeve and/or inserts to match the adjoining work.
5. Sleeves for miscellaneous metalwork, castings, pipes and anchors furnished shall be set true and to proper alignment in the concrete as indicated on the Contract Drawings or required by the manufacturer's templates.
6. Voids in embedments shall be filled temporarily with readily removable material to prevent entry of concrete into the void.

1.06 QUALITY ASSURANCE

A. General:

1. Work performed under this Section shall comply with the applicable provisions and recommendations in Article 1.04 - References of this Section.
2. The Contractor shall employ, at its own expense, a testing laboratory experienced in the design and testing of concrete materials and mixes. This laboratory shall be responsible for all concrete mix design and trial batch testing.

a. Unless otherwise approved, all mix designs shall be run in the presence of DEP designated personnel.

3. Testing agencies that perform testing services on concrete shall meet the requirements of ASTM E 329 and be licensed by the New York City Department of Buildings.

4. Testing laboratory shall have been inspected within the last 2 years by the Cement and Concrete Reference Laboratory (CCRL) of the National Institute of Standards and Technology for testing concrete aggregates and for the preparation and testing of concrete trial batches with or without admixtures. The laboratory shall provide documentation indicating how any deficiencies in the latest CCRL inspection report have been corrected.

5. Testing and inspection shall be conducted in accordance with the requirements of ASTM C 1077 and other applicable standards.

6. Prior to performing any Work, the qualifications of the proposed testing agency shall be submitted for review and acceptance by the DEP.

7. Tests of concrete required by this Section shall be made by an ACI Concrete Field Testing Technician Grade 1 or equivalent. Equivalent certification programs shall include requirements for written and performance examinations as stipulated in ACI publication CP1.

8. Prior to approval, all testing of proposed materials and mix designs including trial batch and shrinkage testing shall be at the Contractor's expense.

9. Concrete materials and operations will be tested and inspected by the Supervising Engineer for Concrete Construction or his authorized representative as the work progresses. Failure to detect defective work or material shall not in any way prevent later rejection when a defect is discovered nor shall it obligate the Engineer for final acceptance.

10. Materials and installed Work may require testing and retesting, as directed by Engineer, at any time during the progress of the Work. Contractor shall allow free access to material stockpiles and facilities at all times. Tests not specifically indicated to be done at Owner's expense, including the retesting of rejected materials and installed Work, shall be done at Contractor's expense.

B. Laboratory Trial Batch:

1. Each concrete mix specified shall be verified by a laboratory trial batch, unless indicated otherwise. Each trial batch shall also be witnessed by a DEP representative.

2. Each trial batch shall be reported on DEP's Mix Design Submittal (MDS) forms and shall include the following testing:
   a. Aggregate gradation for fine and coarse aggregates.
   b. Combined aggregate gradation including total percentage of each aggregate size retained on each sieve.
   c. Fly ash testing to verify meeting specified properties, unless certification by an independent testing laboratory is provided by the fly ash supplier.
   d. Slump.
   e. Air content.
   f. Compressive strength based on 3 cylinders tested at 7 days and 3 cylinders tested at 28 days (6 cylinders minimum.)
   g. Shrinkage test, as specified herein, for Class 45 concrete.
3. Each trial batch shall provide the following information:
   a. Project identification name and number.
      1) Specified strength f'c.
      2) Name of the concrete producer supplying materials.
      3) Name of the Design Trial Lab.
   b. Date of trial.
   c. Complete identification of aggregate source of supply.
   d. Tests of aggregates for compliance with specified requirements.
   e. Scale weight of each aggregate.
   f. Absorbed water in each aggregate.
   g. Brand, type and composition of cement.
   h. Brand, type and amount of each admixture.
   i. Amounts of water used in trial mixes.
   j. Proportions of each material per cubic yard.
   k. Gross weight and yield per cubic yard of trial mixtures.
   l. Measured slump.
   m. Measured air content.
   n. Shrinkage test results where required and as specified herein.
   o. A minimum of three (3) trial runs with different water/cement ratios shall be performed for each mix design proposed.

p. Compressive strength developed at 7 days and 28 days, and if required, 56 days or longer. A minimum of three (3) test cylinders shall be cast for each 7-day, 28-day and/or 56-day test for each trial run.

4. The requirement for a trial batch may be waived if the required test information has been provided in a previous laboratory trial batch run on the identical mix design within the previous twelve (12) months and the history of the concrete mix field results are acceptable to the Supervising Engineer for Construction. The same brand, type, source and supplier of all materials must have been used.

5. On the day of the trial test, the laboratory shall provide to the DEP witness a 1-2 lb. neat cement sample for delivery to the DEP Laboratory for chemical composition analysis, for fly ash and slag and cement.

C. Shrinkage Test:

1. Drying shrinkage tests, as specified herein, shall be performed with every trial batch test.

2. Drying shrinkage specimens shall be 4-inch by 4-inch by 11-inch prisms with an effective gage length of 10 inches, fabricated, cured, dried and measured in accordance with ASTM C 157 modified as follows: Specimens shall be removed from molds at an age of 23 $\pm$1 hours after trial batching, shall be placed immediately in water at 70 degrees F $\pm$3 degrees F for at least 30 minutes, and shall be measured within 30 minutes thereafter to determine original length and then submerged in saturated lime water at 73 degrees F $\pm$3 degrees F. Measurement to determine expansion expressed as a percentage of original length shall be made at age 7 days. This length at age 7 days shall be the base length for drying shrinkage calculations ("0" days drying age). Specimens then shall be stored immediately in a humidity control room maintained at 73 degrees F $\pm$3 degrees F and 50 percent $\pm$4 percent relative humidity for the remainder of the test. Measurements to determine shrinkage expressed as percentage of base length shall be made and reported separately for 7, 14, 21, and 28 days of drying after initial 7 days of moist curing.

3. The drying shrinkage deformation of each specimen shall be computed as the difference between the base length (at "0" days drying age) and the length after drying at each test age. The average drying shrinkage deformation of the specimens shall be computed to the nearest 0.0001 inch at each test age. If the drying shrinkage of any specimen departs from the average of that test age by more than 0.0004-inch, the results obtained from that specimen shall be disregarded. Results of the shrinkage test shall be reported to the nearest 0.001 percent of shrinkage.

Compression test specimens shall be taken in each case from the same concrete used for preparing drying shrinkage specimens. These tests shall be considered a part of the normal compression tests for the project. Allowable shrinkage limitations shall be as specified in Part 2, herein.

1.07 SUBMITTALS

A. General:

1. A new mix design shall be submitted to the Engineer for approval. Prior to changing the brand, type, size or source of cementitious materials, aggregates, water, ice or admixtures, new historical field strength test data, data from new trial mixtures or evidence which indicates that the change will not adversely affect the relevant properties of the concrete shall be submitted. Proposed mix proportions and all related data, in a format acceptable to the Engineer, shall be submitted to the Engineer for review six (6) weeks before the start of any concreting operations. The complete mix design shall include all components of concrete, including admixtures. Mix designs shall be prepared, signed and sealed by a Professional Engineer licensed in the State of New York.

2. Materials, equipment and aggregates approved by the Materials Bureau of the New York State Department of Transportation (NYSDOT), in the most recent NYSDOT approved lists mentioned below, are acceptable for use without a detailed submission. Submittal is required stating the particular material, equipment or aggregate source to be used with approval identification number, and/or page number.

   a. Materials and Equipment NYSDOT Approved Materials List

   b. Approved List Sources of Fine and Coarse Aggregates

B. Certifications:

1. All materials used in the manufacture of concrete shall be accompanied by a certificate from the manufacturer or fabricator or supplier indicating test results of current production stockpiles or shipments.

2. Submit notarized certification of conformance to referenced standards when requested by Engineer.

3. All mix designs shall be accompanied by an Environmental Product Declaration (EPD) in compliance with Article 2.03.

C. Delivery Tickets:

1. The Contractor shall submit to the Engineer a copy of the delivery ticket for each load of concrete delivered to the Site. Delivery tickets shall contain all information specified in ASTM C94 Section 14.1.

2. Provide batch tickets for each batch of job-site mixed concrete as specified.

D. Submit samples of materials as specified and as otherwise may be requested by the Engineer, including names, sources, and descriptions.

E. Shop Drawings:

1. Manufacturer's specifications with application and installation instructions for proprietary materials and items, including admixtures and bonding agents.

2. All information pertinent to a concrete plant to be erected at the site as required by the CPMB Publication "Concrete Plant Standards of the Concrete Plant Manufacturers Bureau."

3. Detailed description of conveying equipment.

4. Detailed description of concrete placement methods.

5. Proposed procedures for bonding new concrete work to existing including manufacturer's information on proposed bonding agents.

6. Proposed normal procedures for protection and curing of concrete including manufacturer's literature for proposed curing compounds.

7. Proposed special procedures for protection of concrete under wet weather placement conditions.

8. Proposed special procedures for protection and curing of concrete under hot and cold weather conditions.

9. Proposed method of measuring concrete surface temperature changes.

10. Detailed procedures and materials for repair of defective concrete.

11. Detailed procedures for removing stains, rust, efflorescence, and surface deposits.

12. Materials and procedures to be used to plug tie holes, other than for Portland cement mortar.

13. Proposed methods to measure concrete compressive strength by means other than field cured cylinders for termination of curing, such as maturity, penetration resistance, pulse velocity, rebound hammer, or pullout strength.

14. The following information, if ready-mixed concrete is used.

a. Identification of Ready-Mixed Concrete Supplier including the plant location and all pertinent information required by the CPMB Publication "Concrete Plant Standards of the Plant Manufacturers Bureau."

b. Locations of sources of materials for cement, fine and coarse aggregates, and water, and the brands and types of admixtures to be used.

c. Physical capacity of mixing plant.

d. Trucking facilities available.

e. Estimated average amount which can be produced and delivered to the site during a normal 8-hour day, excluding the output to other customers.

15. Requests and Notifications:

a. Request to use the volumetric batching method.

b. Request for acceptance of preplacement activities: This request is to ensure that the pre-placement activities are complete and have been properly inspected. The Contractor shall sign-off on a Concrete Placement Card indicating that the Work is complete and is ready for placement. A sample of the required Concrete Placement Card is attached at the end of this Section. The Supervising Engineer for Concrete Construction will sign-off on the items to be inspected but this does not relieve the Contractor from coordinating the concrete placement properly and meeting all requirements of the Contract. The Contractor shall submit the completed Concrete Placement Card to the Supervising Engineer for Concrete Construction in accordance with Article 3.01, Paragraph B - Preparation for Concrete of this Section, and with sufficient time to obtain receipt of authorization from DEP to place concrete in conformance with the latest DEP concrete placing guidelines.

c. Advance notification of forthcoming placement including arrangements to coordinate tests and inspection.

d. Requests to exceed the ASTM C 94 required time of discharge.

F. Test and Inspection Reports:

1. Information on types, classes, procedures, names and plant locations for cementitious materials; types, pit or quarry locations, producers' names, gradations and properties required by ASTM C 33 for aggregates; types, brand names, producers' names for admixtures; and source of supply for water and ice.

2. Except for admixtures and water, test results not more than 90 days old confirming the conformance of all concrete materials with applicable specifications.

3. Testing agencies shall submit the results of all tests and inspections performed during the course of the work to the Supervising Engineer for Concrete Construction. Reports from the Testing Agency shall be on forms acceptable to the Supervising Engineer for Concrete Inspection.

4. Submit copies of laboratory test reports for concrete cylinders, materials and mix design tests. Engineer's review will be for information only. Production of concrete to comply with the specified requirements is the responsibility of the Contractor.

5. A complete record of the date and details of each concrete placement including the exact location thereof and the date of removal of forms. This record shall be coordinated with and in addition to that maintained by the Supervising Engineer for concrete inspection.

6. Mixture Proportions:

   a. Mixture proportions conforming to the requirements of the New York City Administrative Building Code and this Section for water/cement ratio, cement content, slump, maximum size of coarse aggregate, air content, admixtures, and chloride concentration, as well as compressive strength.

   b. Method and test data used to establish proportions.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Cement shall be stored in weather tight buildings, bins or silos which will provide protection from dampness and contamination and will minimize warehouse set.

B. Aggregate stockpiles shall be arranged and used in a manner to avoid excessive segregation or contamination with other materials or with any other sizes of like aggregates. To insure that this condition is met, any test for determining conformance to requirements for cleanliness and grading shall be performed on samples secured from the aggregates at the point of batching. Frozen or partially frozen particles shall not be used.

C. Stockpiles of natural sand shall be allowed to drain freely to minimize variations in moisture content throughout the stockpile.

D. Admixtures shall be stored in such a manner as to avoid contamination, evaporation or damage. For those used in the form of suspensions or non-stable solutions, suitable agitating equipment shall be provided to assure uniform distribution of the ingredients. Liquid admixtures shall be protected from freezing and other temperature changes which would adversely affect their characteristics. All admixture containers shall be clearly marked with paint as to their content and dosage.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cementitious Materials

1. Silica fume shall be one of the following:

a. MasterLife SF100 as manufactured by Master Builders Solutions, Beachwood, OH;

b. Force 10,000 D as manufactured by GCP Applied Technologies, Cambridge, MA.;

c. Sikacrete 950 DP as manufactured by Sika Corp., Lyndhurst, NJ;

d. Eucon MSA as manufactured by the Euclid Chemical Company, Cleveland, OH;

e. Or approved equal.

B. Concrete Admixtures:

1. Shrinkage reducing admixtures shall be one of the following:

a. Eclipse as manufactured by GCP Applied Technologies, Cambridge, MA;

b. MasterLife SRA 035 and MasterLife CRA 007, as manufactured by Master Builders Solutions, Beachwood, OH;

c. Or approved equal.

2. Corrosion inhibiting admixture shall be one of the following:

a. DCI or DCI-S, as manufactured by GCP Applied Technologies, Cambridge, MA;

b. MasterLife CI 30 as manufactured by Master Builders Solutions, Beachwood, OH;

c. Eucon CIA, as manufactured by Euclid Chemical Company, Cleveland, OH;

d. Or approved equal.

C. Concrete bonding agent

1. Two component epoxy-resin bonding agent shall be one of the following:

a. Sikadur 32, Hi Mod LPL, as manufactured Sika Corp., Lyndhurst, NJ;

b. Dural LPL MV as manufactured by the Euclid Chemical Company, Cleveland, OH;

c. Pro-Poxy 200 as manufactured by Dayton-Superior, Miamisburg, OH;

d. FX-752 as manufactured by Simpson Strong-Tie, Pleasanton, CA;

e. Or approved equal.

2. Three component epoxy modified cementitious bonding agent shall be one of the following:

a. Sika Armatec 110 EpoCem, as manufactured by Sika Corporation.

b. Or approved equal.

D. Finishing Aids:

1. Evaporation retardant shall be one of the following:

a. MasterKure ER 50, as manufactured by Master Builders Solutions, Beachwood, OH;

b. Eucobar, as manufactured by Euclid Chemical Company, Cleveland, OH;

c. SikaFilm, as manufactured by Sika Corp., Lyndhurst, NJ;

d. Or approved equal.

E. Curing and Protection Materials:

1. Curing compounds shall be one of the following:

a. Super Aqua Cure VOX, as manufactured by Euclid Chemical Company, Cleveland, OH;

b. Sealtight 1100, as manufactured by W.R. Meadows, Inc., Hampshire, IL;

c. MasterKure, as manufactured by Master Builders Solutions, Shakopee, MN;

d. Or approved equal.

2. Temperature Monitoring Equipment:

a. IQT-Meter or IQM-Meter as manufactured by James Instruments Inc., Chicago, IL;

b. Or approved equal.

F. Crack Injection Materials:

1. Epoxy:

a. Epoxies for injection shall be one of the following:

1) Sikadur 35, Hi Mod L.V. and Sikadur 31, Hi-Mod Gel, as manufactured by Sika Corp., Lyndhurst, NJ;

2) Dural Injection Gel, as manufactured by Euclid Chemical Company, Cleveland, OH;

3) Or approved equal.

2. Hydrophilic Resin:

a. Hydrophilic resins shall be one of the following:

1) Sika Inject 215, as manufactured by Sika Corp., Lyndhurst, NJ;

2) Or approved equal.

G. Concrete Repair Materials:

1. Concrete repair mortar shall be one of the following:

a. Five Star Structural Concrete, as manufactured by Five Star Products, Inc., Shelton, CT;

b. SikaTop 122 Plus, SikaTop 123 Plus, SikaTop 111 Plus, or Sikacem 133, as manufactured by Sika Corp., Lyndhurst, NJ;

c. MasterEmaco S 488CI or S 466-CI, as manufactured by Master Builders Solutions, Shakopee, MN;

d. Verticoat or Verticoat Supreme, as manufactured by the Euclid Chemical Company, Cleveland, OH;

e. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Materials listed in this Section apply to all concrete unless specified otherwise in the Contract.

B. Cementitious Materials

1. Cement:
   a. Portland cement, ASTM C 150, Type II; or blended hydraulic cement, ASTM C595 Type IP (MS). Cement type used shall be appropriate for site exposures.
      1) NYCBC 1904.4
   b. Portland cement shall be produced by an acceptable, recognized manufacturer. The cement shall be produced by one plant only per mix design. Alternate cement sources may be used provided that a mix design has been accepted and a trial batch verifying performance has been made.
   c. Cement which has deteriorated because of improper storage or handling shall be rejected.
2. Fly Ash and Natural Pozzolans:
   a. Fly ash mineral admixture, when used, shall meet the requirements of ASTM C 618 Class F, except as follows:
      1) The loss on ignition shall be a maximum of 4%.
      2) The maximum percent of sulfur trioxide (SO_3) shall be 4.0.
   b. Natural pozzolan mineral admixture, when used, shall meet the requirements of ASTM C 618 Class N.
3. Ground Granulated Blast Furnace Slag:
   a. Ground granulated blast furnace slag (GGBF) mineral admixture, when used, shall meet the requirements of ASTM C 989, Grade 100 or better.
   b. GGBF slag will be permitted as a substitute for fly ash or natural pozzolans, at no additional cost to the City, in the event that Class F Fly Ash or Class N natural pozzolans are not available. The slag substitution shall be in the same proportions and percentages of the total cementitious material as indicated for Fly Ash. A higher percentage of GGBF slag of the total cementitious material in concrete shall be permitted as approved by the Engineer to suit the project needs.
   c. Laboratory trial batches will be tested to determine compliance with strength requirements, times of setting, slump, slump loss, and shrinkage characteristics.
4. Silica Fume:

a. Silica fume mineral admixture shall be the dry compacted or slurry form and shall meet the requirements of ASTM C 1240. Silica Fume shall be considered to be a cementitious material. Application rate shall be 7 percent by weight of cement, unless indicated otherwise.

5. Ground Glass Pozzolan:

a. Ground glass pozzolan (GGP), when used, shall meet the requirements of ASTM C 1866 and ASTM C618 Class N.

b. To be used only for non-environmental engineering concrete structure concrete (e.g. concrete pavement, sidewalks, ductbank, concrete fill, building façade panels, etc) and not in concrete contacting process, ground or reservoir water.

c. GGP will be permitted only where accompanied by Class F Fly Ash, GGBS, or other Class N Natural Pozzolans in the mix to create a ternary mix.

d. Provide SCM replacement in accordance with maximum 3.0 pcy alkali loading and ASR Prevention Level Y in accordance with ASTM C1778 to mitigate alkali-silica reactivity for the high alkalies in GGP.

e. Cement alkali content for mixes including GGP shall not exceed 1.0 Na2Oeq.

C. Aggregate

1. Coarse and fine aggregates shall meet the requirements of ASTM C 33 with the requirements of Table 3, Class 4S. Soundness shall be tested using magnesium sulfate. Abrasion resistance shall be tested using the Los Angeles Abrasion Test. For testing requirements, concrete shall be assumed to be subject to abrasion.

2. Do not use aggregates containing soluble salts or other substances such as iron sulfides, pyrite, marcasite, ochre, or other materials that can cause stains on exposed concrete surfaces. Marine dredged aggregates shall not be used.

3. The loading, storing, unloading, and batching of aggregates shall be done in such a manner as to prevent segregation, intermingling, or the inclusion of foreign materials. All aggregates shall remain in free drainage storage until a stable moisture content is attained prior to placement in the batching plant bins. Each size of coarse aggregate and the fine aggregate shall be kept in separate hoppers or bins. All aggregates shall be delivered to the batching plant bins by a belt conveyor or other approved means; and the operation thereof shall be controlled so as to prevent the mixing of the sizes and kinds of

aggregates with each other. Any mixture of fine and coarse aggregates or of the two sizes of coarse aggregate in the batching plant bins or prior thereto shall be cause for rejection of such materials, and the affected bin or bins shall be emptied and inspected prior to refilling with the correctly graded aggregate.

4. Fine Aggregates:

   a. Fine aggregate shall be composed of clean, sharp, hard, strong, durable, insoluble, uncoated, natural sand free from loam, clay lumps or other deleterious substances.

   b. Dune sand, bank run sand and manufactured sand are not acceptable.

   c. Sand having FM less than 2.40 or greater than 3.00 shall not be allowed.

   d. Fine aggregate shall meet the requirements of ASTM C 33 except that loss when tested for soundness using magnesium sulfate shall not exceed 12 percent.

5. Coarse Aggregates:

   a. Coarse aggregate shall be crushed stone processed from natural rock or stone and shall consist of clean, hard, strong, durable, insoluble, unweathered, and uncoated pieces of uniform quality throughout; and shall be free from such alkali, decomposed minerals, organic material, clay, mica, schist, or other foreign matter that will render it unsuitable.

   b. Use of slag and pit or bank run gravel is not permitted.

   c. Coarse aggregate gradations shall be as specified in Table 1 - Concrete Mix Requirements and shall meet the requirements of ASTM C 33. All aggregate gradations listed for each concrete class shall be used.

   d. Coarse aggregate shall meet the requirements of ASTM C 33, Table 3, Class 4S, with the following additional requirements.

      1) Clay lumps shall not exceed 1.0 percent by weight of coarse aggregate.

      2) Shale and other soft particles shall not exceed 3.0 percent by weight of coarse aggregate.

      3) Thin, elongated, or laminated particles shall not exceed 3.0 percent by weight of coarse aggregate.

      4) Loss when tested for soundness using magnesium sulfate shall not exceed 12 percent.

e. Coarse aggregate for Lightweight Concrete shall conform to ASTM C 330 and shall meet the gradation requirements for ¾" to No. 4.

f. Nominal maximum size of coarse aggregate shall be not larger than:

1) 1/5 the narrowest dimension between sides of forms, nor

2) 1/3 the depth of slabs, nor

3) 3/4 the maximum clear spacing between individual reinforcing bars or wires, bundles of bars, individual tendons, bundled tendons or ducts.

g. The requirements of Article 2.02, Paragraph C.5.f, shall not apply if, in the judgment of the Engineer, workability and methods of construction are such that concrete can be placed without honeycombs or voids.

6. Combined Aggregate:

a. Aggregate gradations shall be determined during trial batch testing and shall be based upon the combined gradation and particle distribution in the mixture of coarse and fine aggregates.

b. Fine aggregate and coarse aggregate sizes specified shall be combined to produce a workable and cohesive concrete mix that is appropriate for its specific application. Coarse aggregate contents shall be based on Table 6.3.3 of ACI 211.1. Adjust the content required for pumping applications as specified in ACI 211.1.

c. The total quantity of fine aggregate shall be not more than 45 percent nor less than 32.5 percent by weight of the total aggregate for Normal Weight Concrete. Using a total quantity of fine aggregate which does not meet this specified range shall only be acceptable when approved by the Engineer. The total quantity of fine aggregate shall be not more than 45 percent nor less than 32.5 percent by weight of the total aggregate for Normal Weight Concrete. Using a total quantity of fine aggregate which does not meet this specified range shall only be acceptable when approved by the Engineer

d. Gradations of combined aggregate shall be plotted and submitted on:

1) A combined grading chart (percent passing versus sieve size).

2) An aggregate Particle Distribution Chart (percent retained versus sieve size).

D. Concrete Admixtures

1. Provide admixtures produced by established reputable manufacturers, and use in compliance with the manufacturer's printed instructions. All admixtures shall be compatible and by a single manufacturer capable of providing qualified field service representation. Do not use admixtures which have not been incorporated and tested in the accepted mixes, unless otherwise authorized in writing by Engineer.

2. Air entraining admixtures shall conform to the NYS DOT Materials Bureau approved list and ASTM C 260.

3. Normal range or midrange water reducing admixture shall be in conformance with ASTM C 494 Type A, and comply with the NYS DOT Materials Bureau approved list.

4. High-Range Water Reducing Admixture:

   a. High range water reducer shall conform to ASTM C 494, Type F or G and comply with the NYS DOT Materials Bureau approved list.

   b. The high range water-reducing admixture shall be accurately measured and added at the batch plant facility. The Contractor may redose the concrete no more than 2 times with the high range water reducer at the site, provided that a calibrated dispenser system and containers of high range water reducer sealed and labeled by the manufacturer are used.

5. Set Controlling Admixture:

   a. Set controlling admixture shall be either with or without water-reducing properties.

   b. Where the air temperature at the time of placement is expected to be consistently over 90 degrees Fahrenheit, a water-reducing set controlled admixture conforming to ASTM C 494, Type D and the NYS DOT Materials Bureau approved list.

   c. Where the air temperature at the time of placement is expected to be consistently under 40 degrees Fahrenheit, except for mass concrete placement, a non-corrosive, non-chloride accelerator conforming to ASTM C 494, Type C and the NYS DOT Materials Bureau approved list shall be used.

6. Shrinkage Reducing Admixture:

a. A shrinkage-reducing admixture is permitted to be used in the mix design where necessary to meet specified shrinkage limitations provided that specified strength requirements are met and there is no reduction in sulfate resistance and no increase in permeability.

7. Corrosion Inhibiting Admixture:

a. Corrosion inhibiting admixture shall be a calcium nitrite solution containing a minimum of 30 percent calcium nitrite.

b. The quantity of mix water shall be adjusted to account for the water portion of the calcium nitrite solution.

c. As the calcium nitrite solution accelerates setting time, retarding admixtures shall be provided as needed, unless the admixture has been formulated to not accelerate setting.

8. Calcium chloride, admixtures containing thiocyanate, or admixtures containing more than 0.05 percent chloride ions shall not be used.

9. Crystalline Waterproofing, added crystalline based permeability reducing admixture. Crystalline waterproofing admixture use appropriate manufacturer's product for specific contract work.

E. Water

1. Water for concrete, mortar, and grout shall be clean and free from objectionable mineral salts and from injurious amounts of oils, acids, alkalis, organic materials, or other substances that may be deleterious to concrete or steel. Water shall meet the requirements of ASTM C 94.

F. Bonding Agent

1. Provide a two component epoxy-resin bonding agent conforming to ASTM C 881.

2. Provide three component epoxy modified cementitious bonding agent where two component bonding agent does not provide sufficient open time.

G. Finishing Aids

1. Evaporation Retardant:

a. Evaporation retardant shall be a material which seals the surface of plastic concrete to prevent moisture loss. The material shall be able to be worked into the concrete surface by subsequent finishing operations with no adverse effect on finishing effort and no discoloration of the finished concrete.

H. Curing and Protection Materials

1. Absorptive covers shall consist of burlap cloth made from jute or kenaf, weighing approximately 10 ounces per square yard and complying with AASHTO M 182, Class 3.
2. Curing mats shall be heavy carpets or cotton mats, quilted at 4 inches on center. Curing mats shall weigh a minimum of 12 ounces per square yard when dry.
3. Moisture retaining covers shall conform to ASTM C 171 and consist of one of the following materials.
    a. Waterproof paper.
    b. Polyethylene film.
    c. White burlap-polyethylene sheet.
4. Curing compounds shall conform to the requirements of ASTM C 309 Type 1-D (water retention requirements):
    a. Provide fugitive dye when requested by Engineer.
5. Insulation Blankets:
    a. Closed cell flexible foam sheet material such as polystyrene or urethane. Foam sheet material which is capable of being bent 90 degrees without breaking or tearing shall be provided at corners. The foam insulation blankets shall be 1/2-inch thick.
    b. Quilted, flexible insulation blankets that retain their insulating value when wet and which retard the evaporation of water.
6. Temperature Monitoring Equipment:
    a. Thermocouples or thermistors shall be as manufactured by James Instruments Inc. or equal. They shall be suitable for embedment in concrete and capable of registering temperatures within the accuracy of 0.5 degrees Fahrenheit over a minimum temperature range of 20 to 200 degrees Fahrenheit.
    b. Temperature monitoring and recording equipment shall consist of rechargeable battery-powered recording thermometers with microprocessors The equipment shall be capable of taking and recording temperature readings at each temperature sensor at preset time intervals. The thermometer units shall be compatible with the temperature sensors used, shall have a non-volatile memory capacity of at least 120 readings per sensor, and shall be designed to be connected to a battery-powered compatible printer unit. Time periods shall be able to be set over a minimum range of 10 to 60 minutes. The thermometer unit shall be designed and constructed for construction conditions. Sufficient

thermometer units shall be provided to take readings from all temperature sensors plus one additional backup unit for every ten units in service. One printer unit shall be provided for every 20 thermometer units with sufficient paper supply to record all readings taken.

I. Crack Injection Materials

1. Epoxy:

a. Epoxy for injection shall be a low viscosity, high modulus moisture insensitive type.

2. Hydrophilic Resin:

a. Hydrophilic resin shall be an acrylic-ester based resin with a maximum viscosity of 50 cps. It shall cure into a flexible rubber-like material which has the potential for unrestrained increase in volume in excess of 100 percent in the presence of water.

J. Concrete Repair Materials

1. Concrete repair mortar shall be a prepackaged polymer-modified cementitious repair mortar with the following minimum properties:

a. Compressive strength at one day: 2000 psi (ASTM C 109).

b. Compressive strength at 28 days: 6000 psi (ASTM C 109).

c. Bond strength at 28 days: 1800 psi (ASTM C 882 modified).

2. Cement mortar shall consist of a mix of 1 part cement to 1 1/2 parts sand with sufficient water to form a trowelable consistency. Minimum compressive strength at 28 days shall be 4000 psi. Where required to match the color of adjacent concrete surfaces, white portland cement shall be blended with standard portland cement so that, when dry, the patching mortar shall match the color of the surrounding concrete.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Proportioning and Mixing

1. Prepare concrete design mixes subject to the limitations listed in Table 1 and specified herein so as to create a homogeneous mix and a concrete which meets the specified strength requirements and, of equal importance, provides a concrete which is water tight and durable against deterioration and abrasion. The mix design shall produce a concrete of a consistency which can be placed so as to meet the required finished appearance. The minimum cement necessary to produce the required strength shall be used. This Section applies to concrete mixes using ½ inch and larger nominal maximum aggregate. For mixes using smaller aggregate sizes, see Section 03 60 00 - Grouting. The mix design shall

be submitted using the Mix Design Submittal Form at the end of this Section.

2. Global Warming Potential Limits

   a. Submit an EPD for ready-mix concrete, for approval by the Engineer.

      1) If an EPD for a concrete mix is available, the value given for the Global Warming Potential (GWP) of a mix will be the A1 GWP listed on the EPD.

         a) All ready-mix concrete supplied to the construction site shall be delivered with an EPD. Failure to submit an EPD will exclude the mix from being used.

         b) EPDs shall be submitted using the project Web-Based Project Management Information System in accordance with Section 01 31 25 - Web-Based Project Management Information System. EPDs shall be submitted together with the relevant material submittal for approval by the Engineer.

3. Air Content:

   a. All concrete shall be air entrained unless indicated otherwise.

   b. Air content for Normal Weight Concrete shall be as follows:

Nominal Maximum Aggregate Size (in.)	Total Air Content, percent by Volume (+/- 1.5%)
1/2	7
3/4	6
1	6
1-1/2	5.5

4. Slump:

   a. Slump for all concrete shall be 3 +/- 1 inches, unless indicated otherwise.

   b. Where high range water reducing admixture is used, the specified water-cementitious material ratio shall be reduced by

0.02 and concrete shall be proportioned for no higher than 3-inch slump. The slump after addition of the high range water reducing admixture shall not exceed 8 inches when measured at the point of placement.

c. A tolerance of up to 2 inch above the maximum indicated slump shall be allowed for one batch in any five consecutive batches tested provided that it can be demonstrated that the specified water-cementitious material ratio is not exceeded.

5. Shrinkage Limitation:

a. The maximum concrete shrinkage for specimens cast in the laboratory from the trial batch, as measured at 21-day drying age or at 28-day drying age shall be 0.039 percent or 0.045 percent, respectively. The Contractor shall only use a mix design for construction that has first met the trial batch shrinkage requirements.

b. If the trial batch results fail to meet the shrinkage limitation, the mix shall be redesigned to reduce shrinkage. Alternately, the Contractor may use a higher shrinkage mix when acceptable to the Engineer, provided that the amount of shrinkage reinforcement in the structures is increased as determined by the Engineer to resist the higher levels of shrinkage stresses. The additional reinforcing shall be provided at the Contractor's expense.

6. The percentage of mortar in the concrete mix shall not exceed 60 percent for Class 50, 45 and 45F concrete. Exceeding this specified mortar percentage shall only be acceptable when approved by the Engineer.

7. Proportioning: Concrete proportions shall be determined in accordance with the provisions of Sections 1905.2.1 through 1905.2.3 of the NYCBC.

a. Proportions of materials for concrete shall be established to provide

1) The proportioning of ingredients shall produce a mixture that will provide workability and consistency to permit concrete to be worked readily into the corners and angles of the forms and around reinforcement by the methods of placing and consolidation employed on the work, but without permitting the materials to segregate or excessive bleeding. Yield of all mixes as designed shall not exceed 27.2 cu.ft./cu.yd.

2) Resistance to special exposures is required by NYCBC Section 1904.

3) Conformance with the strength test requirements of Sections 1905.6

b. Concrete is to meet the durability requirements of Section 1904 of NYCBC.

c. Where different materials are to be used for different portions of proposed work, each combination shall be evaluated.

d. Concrete proportions shall be established in accordance with NYCBC Section 1905.3 or Section 1905.4 and shall comply with the applicable requirements of Section 1904.

1) NYCBC Section 1905.3 - Proportioning on the basis of field experience/or trial mixtures. Concrete proportioning determined on the basis of field experience or trial mixtures shall be done in accordance with ACI 318, Section 5.3. If the required f'_c is obtained for trial batch mixed prior to the date specified, the trial mix design may be approved. All mixes shall be approved by the Engineer prior to construction.

2) NYCBC Section 1905.4 - Proportioning without field experience. Concrete proportioning determined without field experience or trial mixtures shall be done in accordance with ACI 318, Section 5.4. This method of proportioning shall not be permitted for load-carrying structural concrete or concrete mix proportions that are required to conform to NYCBC Section 1904.

e. Proportioning on the basis of field experience and/or trial mixtures using a mix design employing the same ingredients proposed for use, and used successfully on a previous project, or projects, may be used provided the following are submitted by a licensed concrete testing laboratory and approved by the Design Engineer of record in conformance with NYCBC 1905.3 and ACI 318 Section 5.3.

1) The name and location of the plant from which the concrete will be batched.

2) The concrete mix design including detailed data and analysis of the ingredients proposed for use as specified herein.

3) Reports for at least 30 (thirty) consecutive tests of 7 day and 28 day concrete strength tests of the proposed mix

made during the previous twelve months of concrete batched and delivered from the same plant that is to furnish this job. These data shall include an evaluation in accordance with ACI 214R to determine the average strengths, moving averages and the coefficients of variation. In addition, the results of a minimum of 3 shrinkage tests for this mix made during the previous twelve months and using the same materials to be used on this project.

4) Reports of compliance tests of fine and coarse aggregates made during the above tests.

f. Average strength reduction. As data becomes available during construction, it is permissible to reduce the amount by which the average compressive strength (f'_c) is required to exceed the specified value of f'_c in accordance with ACI 318, Section 5.5

g. Evaluation and acceptance of concrete. The criteria for evaluation and acceptance of concrete shall be as specified in NYCBC Sections 1905.6.3.3 through 1905.6.5.5.

h. Qualified technicians. Concrete frequency and testing shall be tested in accordance with the requirements of NYCBC Section 1905.6.2 thru 1905.6.5.5. An agency shall perform tests on fresh concrete at the job site, prepare specimens required for curing under field conditions, prepare specimens required for testing in the laboratory and record the temperature of the fresh concrete when preparing specimens for strength tests. All field sampling and testing, including the testing of aggregates, concrete mixes, and strength testing of specimens, shall be subject to special inspection by an approved agency. All testing laboratories shall be approved testing agencies and shall employ qualified special inspectors to perform all required laboratory tests. Test results from the testing laboratory shall be promptly distributed by the Contractor to the concrete producer and the Engineer.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Inspection

1. The Contractor and its installer shall examine the substrate and the conditions under which Work is to be performed and notify Engineer in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.

B. Preparation for Concrete

1. All reinforcement, installation of waterstop, positioning of embedded items, and condition of formwork shall be inspected and approved by the Supervising Engineer for Concrete Construction prior to concrete placement. Contractor shall provide written notice of intention to place concrete a minimum of one (1) working day prior to placement.

2. The Contractor shall provide the following preparation before placing of concrete.

   a. Hardened concrete and foreign materials shall be removed from the inner surfaces of the conveying equipment.

   b. Formwork shall have been completed in conformance with Section 03 10 00 - Concrete Forming and Accessories; ice and standing water shall have been removed; reinforcement shall have been secured in place in conformance with Section 03 21 00 - Reinforcing Steel; expansion joint material, anchors and other embedded items shall have been positioned. Concrete shall not be placed on frozen ground.

   c. Subgrade shall be watered sufficiently to achieve surface saturated density of subgrade materials.

   d. Soft spots in subgrade shall be removed and replaced with approved backfill materials.

   e. No concrete shall be placed until the entire preparation has been approved by the Supervising Engineer for Concrete Construction or his authorized representative.

   f. When high ambient temperatures necessitate protection of concrete immediately after placing or finishing, make provisions in advance of concrete placement for windbreaks, shading, fogging, sprinkling, ponding, or wet covering with a light-colored material.

   g. During cold weather, make provisions in advance of concrete placement to maintain the temperature of the concrete above 55ºF. Use heating, covering or other means adequate to maintain the required temperature without injury to concrete due to concentration of heat. Do not use combustion heaters during the

first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases containing carbon dioxide.

3.02 IMPLEMENTATION

A. Mixing and Transporting Concrete

1. General:

a. The Contractor shall provide the production of concrete which includes batching, mixing, delivering, and discharging of concrete according to the following requirements.

2. Ready-Mixed Concrete:

a. Ready-Mixed concrete shall be batched, mixed and transported in accordance with the appropriate sections of "Specifications for Ready-Mixed Concrete" (ASTM C 94 or ASTM C685). Follow the detailed recommendations given in Guide for Measuring, Mixing, Transporting, and Placing Concrete (ACI 304R), where applicable.

b. Each truck mixer or agitator shall have attached thereto in a prominent place a metal plate issued by the Truck Mixer's Manufacturer's Bureau by the manufacturer complying with Section 11.1.2 of ASTM C 94 for that truck mixer and the limitations thereon shall be strictly adhered to.

c. Ready-mixed concrete shall only be batched in plants which meet the following:

1) Concrete plants shall be certified by the National Ready Mixed Concrete Association (NRMCA) and shall comply with the rules of the department.

2) Upon written application by the producer, accompanied by a detailed report on how the facilities compare with the standards of the NRMCA, the above requirements may be waived, in writing by the Engineer.

3) If the detailed report mentioned above is issued by the testing agency which will perform the inspection of the batching and mixing of the concrete and indicates that satisfactory quality concrete can be produced by the plant in question, based on prior job performance records, then the above requirement will be waived, in writing, by the Supervising Engineer for Concrete Construction.

d. Approval of plants as outlined above is subject to the continuous checking and acceptance by the Commissioner or his duly authorized representative.

e. Only plants meeting the requirements for certification of the NRMCA for automatic batching and automatic recording will be permitted.

1) If at any time automatic proportioning or recording instruments become inoperative, the plant may be allowed to batch concrete manually or operate with manual recording for a period of not more than 48 working hours from the time of breakdown.

2) If at the end of 48 working hours, the plant is still not in operating order, the following shall be complied with:

a) DEP shall be contacted and an independent inspector, other than the regular plant inspector shall be assigned to each batching operation at the plant, at no additional cost to the City.

b) Additional inspectors shall observe and record the weight of each component of the batch.

c) The manually recorded batch weights shall appear on a ticket presented to inspection personnel at the project site.

f. Concrete producers shall have their plants inspected quarterly by NYSDOT.

g. Concrete producers shall have their scales and trucks certified quarterly by NYSDOT.

3. Batch Mixing at Site:

a. The concrete shall be produced in a plant conforming to the requirements of the "Concrete Plant Standards" of the Concrete Plant Manufacturer's Bureau and ACI 318, Section 5.8.3. Prior to erection of such plant at the site, the Contractor shall submit to the Supervising Engineer for Concrete Construction, for approval, all pertinent data relative to the plant.

b. All components of the plant must bear the proper rating plates issued by the Concrete Plant Manufacturers Bureau and the limitations thereon shall be strictly adhered to.

c. On job site plants for jobs requiring less than 1000 cubic yards of structural concrete or a job site plant that would operate for less than 30 working days duration, the requirements of Article

3.02 Paragraph A.2.e. for automatic batching and automatic recording will be waived. If at any time automatic proportioning devices or recording instruments become inoperative, follow the provisions of Article 3.02, Paragraphs A.2.e.1 and A.2.e.2.

d. The batch shall be so charged into mixer that some water will enter in advance of the cement and aggregates. Water shall continue to flow for a period which may extend to the end of the first 25 percent of the specified mixing time. Controls shall be provided to insure that the batch cannot be discharged until the required mixing time has elapsed. When concrete of normal weight is specified, controls shall be provided to insure that no additional water may be added during mixing. The entire batch shall be discharged before the mixer is recharged.

e. Each batch of 2 cu.yd. or less shall be mixed for not less than 1 1/2 minutes. The mixing time shall be increased 15 seconds for each additional cubic yard or fraction thereof. Shorter mixing time may be permitted provided performance tests made in accordance with ASTM C 94 indicate that the time is sufficient to produce uniform concrete. At least three quarters of the required mixing time shall take place after the last of the mixing water has been added. The interior of the mixer shall be free of accumulations that will interfere with mixing action. Replace mixer blades when they have lost 10 percent of their original weight.

f. When small quantities of concrete are produced on the site, measure solid materials by weight, and liquid or paste materials by weight or by volume. Mix all materials in a mechanical mixer. If packaged dry combined materials are used, they shall conform to the requirements of ASTM C 387, and shall be capable of satisfying the requirements of this Standard Specification.

4. Control of Admixtures:

a. Air entraining and chemical admixtures shall be charged into the mixture as a solution and shall be dispensed by an automatic dispenser or similar measuring device. The accuracy of measurement of any admixture shall be within ±3 percent. Admixtures shall be charged into the mixer in such manner as not to come into direct contact with the cement.

b. Two or more admixtures may be used in the same concrete provided such admixtures are added separately during the batching sequence and provided further that evidence is

submitted to show that the admixtures used in that combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.

c. All admixtures shall be added prior to mixing.

5. Tempering and Control of Mixing Water:

a. Concrete shall be mixed only at the mix plants or at the job site. Concrete shall be mixed in quantities not to exceed immediate job placement requirements.

b. The addition of any water to the mix while the truck is en route from plant to job site is strictly prohibited. Mixing in transit is strictly prohibited. Agitating in transit is permitted, but shall be kept to a minimum.

c. When concrete arrives at the point of delivery with a slump below that which will result in the specified slump at the point of placement and is unsuitable for placing at that slump, the slump may be adjusted to the specified value by adding water if all the water required in the accepted mixture proportions has not been added at the start of mixing and if permitted by the Engineer. Addition of water shall be in accordance with ASTM C 94. Neither the specified water-cement ratio nor slump shall be exceeded. Do not make slump adjustments after 15 percent of the batch has been unloaded. Do not add water to concrete containing a plasticizing or a high range water reducing admixture. Do not add water to concrete in delivery equipment not acceptable for mixing. Measure air content of air-entrained concrete, after slump adjustment, to verify compliance to specified requirements.

d. Each increment of water added at the job site must be incorporated by additional mixing by turning the drum not less than 30 revolutions. The addition of the increments of water and the start of the mixing procedures shall not be commenced earlier than one-half hour prior to the beginning of discharge. From the time the batch or load has been mixed to the specified slump, no further water shall be added to the concrete.

e. Discharge of the concrete shall be completed within the limits set out in the following table. Time and drum revolution limits shall be measured from the introduction of any mixing water to the cement and aggregates or the introduction of the cement to the aggregates (ribbon loading).

CONCRETE DISCHARGE REQUIREMENTS	
Concrete Temperature	**Limit**
Over 90 degrees F	Concrete shall be removed from site and discarded
85° to 90 degrees F	1 hour or 300 revolutions, whichever comes first
80° to 85 degrees F	1 hour 15 minutes or 300 revolutions, whichever comes first
70° to 80 degrees F	1 hour 30 minutes or 300 revolutions, whichever comes first
Below 70 degrees F	2 hours or 300 revolutions, whichever comes first

6. Weather Conditions:

   a. Cold Weather:

      1) To maintain the temperature of the concrete above the minimum placing temperature required by Article 3.02, Paragraph B.4.c, the as-mixed temperature shall not be less than 55 degrees F when the mean temperature falls below 40 degrees F. Follow the detailed recommendations given in "Cold Weather Concreting" (ACI 306R), where applicable.

      2) If water or aggregate has been heated above 100 degrees F, the water shall be combined with the aggregate in the mixer before cement is added. Cement shall not be added to mixtures of water and aggregate when the temperature of the mixture is greater than 90 degrees F.

   b. Hot Weather:

      1) The ingredients shall be cooled before mixing if necessary to maintain the temperature of the concrete below the maximum placing temperature required by Article 3.02, Paragraph B.4.c. The temperature of the concrete at initial discharge shall not exceed 85 degrees F. Follow the detailed recommendations given in "Hot Weather Concreting" (ACI 305R), where applicable.

   c. Under special circumstances, and with written approval of the Supervising Engineer for Concrete Construction, the above provisions as to the initial discharge temperature of the concrete may be modified.

d. Accelerators or retarders may be used with the approval of the Supervising Engineer for Concrete Construction. When permitted, they shall be used in accordance with "Hot Weather Concreting" (ACI 305R).

7. Mixing Small Quantities of Concrete:

a. Only when permitted by the Supervising Engineer for Concrete Construction, small quantities of concrete may be mixed either by a small manually controlled portable mixer or by hand. In such cases, volumetric measurement of aggregates will be permitted.

b. Concrete shall be hand mixed on a watertight platform. Cement and aggregates shall first be mixed dry until a uniform color is obtained. Water shall then be added and the entire mass turned over at least six times, or until the mixture is uniform and of the required consistency. Not more than one-half cubic yard of concrete shall be hand mixed in any batch.

B. Concrete Placement

1. General:

a. The Contractor shall provide concrete placement including preparation before placing, conveying, depositing, consolidation, weather protection, bonding, underwater concreting, and placing of grout and mortar according to the following requirements.

2. Conveying:

a. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent separation or loss of ingredients and in a manner which will assure that the required quality of the concrete is obtained. Follow the detailed recommendations given in ACI 304R, where applicable.

b. Conveying equipment shall be of size and design to insure a continuous flow of concrete at the delivery end and shall be approved. Conveying equipment and operations shall conform to the following requirements:

1) Conveying equipment shall contain no aluminum components.

2) Truck mixers, agitators, and non-agitating units and their manner of operation shall conform to the applicable requirements of Article 3.02.A.

3) Belt conveyors shall be horizontal or at a slope which will not cause segregation or loss. Protect concrete to minimize drying and effects of temperature rise. Use an acceptable discharge hopper at the discharge end to prevent segregation. Do not allow mortar to adhere to the return length of the belt.

4) Chutes shall be metal or metal-lined having rounded bottoms and shall have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long and chutes not meeting the slope requirements may be used provided they discharge into a hopper before distribution.

5) Pump equipment shall be of suitable kind and adequate pumping capacity and shall be subject to approval by the Supervising Engineer for Concrete Construction. Placement shall be controlled so that segregation does not occur in the discharged concrete. Test cylinders for strength and tests for slump, temperature, and air content shall be made on samples of concrete taken at point of discharge from the pump line.

6) The provisions of Article 3.02, Paragraph B.2.b.4 shall apply to placement methods delivering concrete through lines using pneumatic air pressure.

7) The provisions of Article 3.02, Paragraphs B.2.b.4 and B.2.b.5 are not applicable to gunned mortar applications.

3. Depositing:

a. Concrete shall be deposited continuously, or in lifts not to exceed 18 inches in thickness such that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, construction joints shall be located at points as provided for in the drawings or as approved. Placing shall be carried on at such a rate that the concrete which is being integrated with fresh concrete is still plastic. Concrete which has partially hardened or has been contaminated by foreign materials shall not be deposited. Temporary spreaders in forms shall be removed when the concrete placing has reached an elevation rendering their service unnecessary. They may remain embedded in the concrete only if made of metal or concrete and if prior approval has been

obtained. Detailed recommendations are given in ACI 304R, where applicable.

b. Placing of concrete in supported elements shall not be started until the concrete previously placed in columns and walls is no longer plastic and has been in place at least two hours.

c. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Concrete shall not be subjected to any procedure which will cause segregation.

d. Place concrete for beams, girders, brackets, column capitals, haunches, and drop panels at the same time as concrete for slabs.

e. Where a surface mortar is to be the basis of the finish, the coarse aggregate shall be worked back from the forms with a suitable tool so as to bring a full surface of mortar against the form, without the formation of excessive surface voids. All concrete shall be consolidated by internal vibration, spading, rodding, or forking so that the concrete is thoroughly worked around the reinforcement, around embedded items and into corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting or planes of weakness. Use internal vibrators of the largest size and power that can properly be used in the Work. Over-vibrating and use of vibrators to transport concrete within forms shall not be allowed. Vibrators shall be inserted and withdrawn at many points, approximately 18 in. apart. At each insertion, the duration shall be sufficient to consolidate the concrete but not sufficient to cause segregation, generally from 5 to 15 sec. duration. A spare vibrator shall be kept on the job site during all concrete placing operations. Follow the detailed recommendations given in of ACI 309R, where applicable. Workers shall be experienced in use of the vibrators.

    1) External vibration shall only be used when explicitly permitted by the Supervising Engineer for Concrete Construction. Vibrating operations shall be continuous throughout the entire section where concrete is being deposited. Vibrators shall be clamped to the studs or wales or in pairs so that while one is vibrating the other can be shifted to insure constant vibration. External vibration shall conform to the requirements of ACI 309R.

f. Self-Supporting Floors and Roofs:

1) Reinforced Concrete Beams and Girders shall be cast monolithically with adjoining arches.

4. Protection, Weather, Placing and Preparation of Forms:

a. Concrete placed during rain, sleet or snow, or when the mean daily temperature falls below 40 degrees F or is expected to be below 40 degrees F during placing or within 24 hours thereafter or rises above 90 degrees F shall be adequately protected as provided in Article 3.02, Paragraph C. and approval for placement shall be obtained from the Supervising Engineer for Concrete Construction.

b. Rainwater shall not be allowed to increase the mixing water nor to damage the surface finish.

c. Placing temperature:

1) When the mean daily temperature falls below 40 degrees F, the minimum temperature of concrete as placed shall be 50 degrees F. Follow the detailed recommendations given in "Cold Weather Concreting" (ACI 306R), and in accordance with NYCBC Section 1905.12, where applicable.

2) Concrete deposited in hot weather shall have a placing temperature which will not cause difficulty from loss of slump, flash set, or cold joints. The temperature of the concrete preferably should be less than 80 degrees F and shall not exceed 90 degrees F unless permitted by the Supervising Engineer for Concrete Construction. Loss of slump, flash set, or cold joints due to the temperature of the concrete as placed will not be acceptable. When the temperature of the steel is greater than 120 degrees F, fog the steel forms and the reinforcement with water just prior to placing the concrete. Follow the detailed recommendations given in "Hot Weather Concreting" (ACI 305R) and in accordance with NYCBC Section 1905.13, where applicable.

d. Placing:

1) Adequate skilled personnel and equipment shall be available to handle and place the concrete immediately upon delivery.

2) Dry surfaces shall be wet down before commencing placement of concrete.

3) Temperature of surfaces to receive concrete (earth, forms, reinforcing steel, etc.), should approximate the temperature of the concrete being placed.

4) Evaporation rate of water from freshly placed concrete should be held to a minimum by:

   a) Shading of operations.

   b) Reducing air circulation in area of operations.

   c) Maintaining fog spray during operations.

5) Cold Joints shall be avoided. This can be accomplished by:

   a) Providing adequate skilled personnel to handle and place the concrete immediately after its delivery to the forms at an acceptable temperature.

   b) Placing in layers thin enough and areas small enough so that vibration or working of the concrete will insure complete union of adjacent layers.

   c) Lengthening of setting time by use of approved water reducing retarders.

   d) Placing a bulkhead at a suitable point where placement is stopped temporarily.

6) Loss of slump shall be kept at a minimum. This can be accomplished by:

   a) Minimum lapse of time between mixing and placing.

   b) Avoiding delays in batch mixing and truck dispatching.

   c) Job conditions and equipment (chutes, access runs, etc.) being organized to prevent additional mixing.

   d) Use of approved water reducing retarders.

e. Preparation of forms:

1) All forms or surfaces (subgrades, reinforcing steel) to receive concrete, in addition to the normal requirements of tightness, soundness, being free of debris, etc., shall be:

a) Protected against excessive air currents.

b) Sprinkled systematically with cool water.

2) Note: Wetting down around the work will cool the surrounding air and increase the humidity, thus reducing temperatures and evaporation from the concrete.

5. Bonding:

a. When specified, the surface of joints shall be prepared in accordance with Section 03 32 00 - Joints in Concrete.

b. The hardened concrete of joints between footings and walls or columns, between walls or columns and beams or floors they support, joints in unexposed walls and all other not mentioned below shall be dampened (but not saturated) immediately prior to placing of fresh concrete.

c. The hardened concrete of horizontal construction joints in exposed work; horizontal construction joints in the middle of beams, girders or joints, and slabs; and horizontal construction joints in work designed to contain liquids shall be dampened (but not saturated) then thoroughly covered with a coat of neat cement mortar of similar proportions on vertical surfaces and at least 1/2 in. thick on horizontal surfaces. The fresh concrete shall be placed before the mortar has attained its initial set.

d. Joints receiving an adhesive shall have been prepared and adhesive applied in accordance with the manufacturer's recommendations prior to placing of fresh concrete.

e. Surfaces of joints which have been obtained by the use of a chemical retarder shall have been prepared in accordance with the manufacturer's recommendations prior to placing of fresh concrete.

6. Protection and Cleaning of Exposed Structural Steel:

a. The Contractor shall take all necessary precautions to prevent mortar and concrete splashes on the steel. The Contractor shall exercise care to prevent abrasion or scuffing of the paint on the structural steel while concrete is being formed, placed or stripped.

b. The Contractor shall thoroughly clean the structural steel of all concrete drippings or other foreign matter that may have been deposited on the steel or on any other part of the structure as a result of his operations. All the work involved in thoroughly cleaning the steel shall proceed before concrete drippings have

hardened. Immediately after the concrete has been placed, the Contractor shall clean the steel with water and/or such other additional means subject to the approval of the Supervising Engineer for Concrete Construction as may be necessary to remove all mortar, concrete and other foreign matter that has been dropped, dripped, splashed or otherwise deposited on the steel as a result of his operations. It will be the Contractor's obligation and responsibility to remove all foreign matter to the satisfaction of the Supervising Engineer for Concrete Construction.

c. After formwork has been removed, any concrete or other foreign material that may have been previously missed and that still remains on the steel shall be removed.

7. Concrete finishes shall conform to the requirements of Section 03 35 00 - Concrete Finishing.

C. Concrete Curing and Protection

1. General:

a. Protect all freshly deposited concrete from premature drying, from weather elements, from defacement, from flowing water, and from mechanical injury. The concrete shall be maintained with minimal moisture loss at a relatively constant temperature for a period of time necessary for the hydration of the cement and proper hardening of the concrete in accordance with the requirements specified herein.

b. As soon as the concrete has been placed and horizontal top surfaces have received their required finish, provision shall be made for maintaining the concrete in a moist condition for at least a 7-day period thereafter except for high early strength concrete, for which the period shall be at least the first three days after placement. Horizontal surfaces shall be kept covered, and intermittent, localized drying will not be permitted.

c. Concrete curing shall be in accordance with NYCBC Section 1905.11.

2. Curing Methods:

a. The Contractor shall use one of the following methods to insure that the concrete remains in a moist condition for the minimum period stated above.

1) Ponding or continuous fogging or sprinkling.

2) Application of mats or fabric kept continuously wet.

3) Continuous application of steam (under 150 degrees F).

4) Application of sheet materials conforming to ASTM C 171.

5) If approved by the Engineer, application of a curing compound in accordance with Article 3.02, Paragraph C.7.

6) High Early Strength concrete shall be maintained above 50 degrees F and in a moist condition for at least the first 3 days. Accelerated curing of concrete shall comply with ACI 318, Section 5.11.3.

3. The Contractor shall keep absorbent wood forms wet until they are removed. After form removal, the concrete shall be cured by one of the methods in Article 3.02, Paragraph C.2.

4. Any of the curing procedures used in Article 3.02, Paragraph C.2 may be replaced by one of the other curing procedures listed in Article 3.02, Paragraph C.2 after the concrete is one-day old. However, the concrete surface shall not be permitted to become dry at any time.

5. Curing Concrete under Cold Weather Conditions:

   a. Curing under cold weather conditions shall conform to the requirements of ACI 306.

   b. Stripping time for forms and supports shall be increased as necessary to allow for retardation in concrete strength caused by colder temperatures. This retardation is magnified when using concrete made with blended cements or containing fly ash or ground granulated blast furnace slag. Therefore, curing times and stripping times shall be further increased as necessary when using these types of concrete.

   c. The methods of protecting the concrete shall be approved by the Engineer and shall prevent local drying. Equipment and materials approved for this purpose shall be on the site in sufficient quantity before the work begins. The Contractor shall assist the Engineer by providing holes in the forms and the concrete in which thermometers can be placed to determine the adequacy of heating and protection. All such thermometers shall be furnished by the Contractor in quantity and type which the Engineer directs.

6. Curing Concrete under Hot Weather Conditions:

   a. When air temperatures exceed 85ºF, the Contractor shall take extra care in placing and finishing techniques to avoid formation

of cold joints and plastic shrinkage cracking. If ordered by the Engineer, temporary sun shades and/or windbreakers shall be erected to guard against such developments, in addition to generous use of wet burlap coverings and fog sprays to prevent drying out of the exposed concrete surfaces.

b. Curing and protection of the concrete shall begin immediately after completion of the finishing operation. Continuous moist-curing, consisting of methods listed in Article 3.02, Paragraph C.2.a.1 or C.2.a.2, is mandatory for at least the first 24 hours. Method specified in Article 3.02, Paragraph C.2.a.2. may be used only if the finished surface is not marred or blemished during contact with the coverings.

c. At the end of the initial 24-hour period, curing and protection of the concrete shall continue for at least four (4) additional days using one of the methods listed in Article 3.02, Paragraph C.2.

d. Curing procedures during hot weather conditions shall conform to the requirements of ACI 305.

7. Use of Curing Compound:

a. Curing compound shall not be used on surfaces to receive subsequent coatings. Curing compound shall not be used on surfaces exposed to water in potable water storage tanks and treatment plants unless curing compound is certified in accordance with ANSI/NSF Standard 61.

b. When permitted, the curing compound shall maintain the concrete in a moist condition for the required time period, and the subsequent appearance of the concrete surface shall not be affected.

c. The compound shall be applied in accordance with the manufacturer's recommendations after water sheen has disappeared from the concrete surface and after finishing operations. The rate of application shall not exceed 300 square feet per gallon. For rough surfaces, apply in two directions at right angles to each other.

8. Early Termination of Curing:

a. Moisture retention measures may be terminated earlier than the specified times only when at least one of the following conditions is met:

1) The strength of the concrete reaches 85 percent of the specified 28-day compressive strength in laboratory-cured cylinders representative of the concrete in place,

and the temperature of the in-place concrete has been constantly maintained at 50 degrees Fahrenheit or higher.

2) The strength of concrete reaches the specified 28-day compressive strength as determined by accepted nondestructive methods or laboratory-cured cylinder test results.

3) Tests are made of cylinders kept adjacent to the structure and cured by the same methods and reach 70 percent of the specified compressive strength f'_c as determined in accordance with ASTM C 39.

9. Protection:

a. Floors which have received their final finish shall be closed to all traffic for at least 48 hours following the completion of trowelling. Thereafter, before the floor is subjected to any traffic, it shall be covered with paper covering meeting the requirements of ASTM C 171. This protection shall be maintained as long as necessary to avoid damage to the floor.

b. During the curing period, and thereafter as conditions may require, the concrete shall be protected from damaging mechanical disturbances, particularly excessive load stresses, heavy shock, and excess vibration. All finished concrete surfaces shall be protected from damage caused by construction equipment, materials, or methods, and by rain or running water. Self-supporting structures shall not be loaded in such a way as to overstress the concrete.

c. Following removal of protective paper, the surface shall be protected from painting and other work. All stains shall be removed.

D. Concrete Repairs

1. Repair of Formed Surfaces:

a. The following defects shall be repaired in all types of formed finishes:

1) Spalls, air bubbles, rock pockets, form depressions, and other defects which are more than 1/4 inch in depth.

2) Holes from tie rods and other form tie systems.

3) Fins, offsets and other projections which extend more than 1/4" beyond the designated member surface.

4) Structural cracks, as defined by the Engineer.

5) Non-structural cracks, as defined by the Engineer, which are greater than 0.010 inches wide. In water retaining members, elevated slabs subject to rainfall and washdown, and below grade members, any crack which shows any amount of leakage. Where it is not possible to verify that a crack is not leaking, it shall be repaired.

6) Stains and substances marring the surface.

b. The following defects shall be repaired in smooth finish surfaces, in addition to those listed above:

1) Spalls, air bubbles, rock pockets, form depressions, and other defects which extend to more than 1/2" in width in any direction, no matter how deep.

2) Spalls, air bubbles, rock pockets, form depressions, and other defects of any size which exceed 3 in number in a 12 inch square or 12 in number in a 3 foot square.

3) Fins, offsets and other projections shall be completely removed and smoothed.

4) Scratches and gouges in the surface.

5) Surfaces that exceed allowable tolerances.

6) Texture and color irregularities. At water retaining surfaces, texture and color irregularities need not be repaired when greater than 12 inches below the minimum normal operating water surface except where such defects are indicative of reduced durability.

c. Where a smooth rubbed or grout cleaned finish is specified, minor surface defects repairable by the finishing process need not be repaired prior to the finish application, when approved by the Engineer.

2. Method of Repair of Formed Surfaces:

a. Repair and patch defective areas with cement mortar or concrete repair mortar immediately after removal of forms and as directed by the Engineer.

b. Repairs made to water bearing and below grade surfaces shall be made with repair mortar only. Repairs of form tie holes in water bearing or buried surfaces shall be made with non-shrink grout as specified in Section 03 60 00 - Grouting.

c. Cut out honeycomb, rock pockets, voids, and holes left by tie rods and bolts, down to solid concrete but, in no case, to a depth of less than 1 inch for cement mortar and 1/2 inch for repair mortar. Make edges of cuts perpendicular to the concrete surface. Before placing the cement mortar, thoroughly clean and brush-coat the area to be patched with the specified bonding agent. Where concrete repair mortar is used, the surface shall be prepared and mortar placed per manufacturers recommendations. Compact mortar in place and strike off slightly higher than the surrounding surface. Cure as specified.

d. Repairs to surfaces exposed to public view shall match the color and texture of surrounding concrete.

e. Provide test areas at inconspicuous locations to verify mixture, texture and color match before proceeding with the patching.

f. Structural cracks shall be pressure grouted using epoxy injection in accordance with the manufacturer's directions and recommendations.

g. Non-structural cracks shall be pressure grouted using hydrophilic resin in accordance with the manufacturer's directions and recommendations.

h. Fill holes extending through concrete by means of a plunger- type gun or other suitable device from the least exposed face, using a flush stop held at the exposed face to ensure completely filling.

i. Remove stains, grout accumulations, sealing compounds, and other substances marring surfaces by scrubbing, power washing, or abrasive blast using sand finer than No. 30 and air pressure from 15 to 25 psi.

3. Repair of Unformed Surfaces:

a. Test unformed surfaces, such as monolithic slabs, for smoothness and to verify surface plane to the tolerances specified for each surface and finish according to ACI 117. Correct low and high areas as herein specified.

b. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having the required slope. Correct high and low areas as herein specified.

c. Repair finish of unformed surfaces that contain defects which adversely affect the durability of the concrete. Surface defects include crazing, spalling, popouts, honeycomb, rock pockets, and other objectionable conditions.

d. Repair structural cracks as defined by the Engineer in all structures.

e. Repair non-structural cracks as defined by the Engineer which are greater than 0.01 inches wide, which are in below grade structures, or which are exposed to public view. In water retaining structures, repair any crack which shows any amount of leakage and all cracks where leakage potential cannot be determined.

4. Methods of Repair of Unformed Surfaces:

a. Correct high areas in unformed surfaces by grinding, after the concrete has cured sufficiently so that repairs can be made without damage to adjacent areas.

b. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out the low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Where the concrete has already set and repairs are required, sawcut around the perimeter of the area to be repaired to a 1/2-inch depth and remove concrete so that the minimum thickness of the repair is 1/2 inch. Apply specified concrete repair mortar in accordance with the manufacturer's directions and recommendations.

c. Remove defective areas to sound concrete with clean, square cuts, to a minimum depth of 1.5 inches. Provide 3/4-inch clearance all around exposed reinforcing steel. Clean and dampen all concrete surfaces in contact with patching concrete and brush with the specified bonding agent. Place patching concrete while the bonding agent is still tacky. Mix patching concrete of the same materials and proportions to provide concrete of the same type or class and color as the adjacent finished concrete. Place, compact and finish as required to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.

d. Repair isolated random non-structural cracks in members which are not below grade or water retaining, and single holes not over 1 inch diameter, by the dry-pack method. Groove the top of cracks, and cut out holes to sound concrete and clean of dust, dirt and loose particles. Dampen all cleaned concrete surfaces and brush with the specified bonding agent. Place dry-pack grout before the cement grout takes its initial set. Mix dry-pack grout as specified in Section 03 60 00 - Grouting, Grout. Compact dry-pack mixture in place and finish to match adjacent concrete.

Keep patched areas continuously moist for not less than 72 hours.

e. Structural cracks shall be pressure grouted using an epoxy injection system. Apply in accordance with the manufacturer's directions and recommendations.

f. Non-structural cracks in below grade and water retaining structures shall be pressure grouted using hydrophilic resin. Apply in accordance with the manufacturer's directions and recommendations.

g. Where flooring material is to be installed, assure that surface is acceptable for flooring material to be installed in accordance with manufacturer's recommendations.

5. Other Methods of Repair:

a. Repair methods not specified above may be used with written approval of the Engineer.

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Quality Control Testing:

1. General:

a. Unless required otherwise by the Contract, all field quality control testing of materials and the resulting concrete for compliance with the technical requirements of the specifications shall be performed by the Division of Design Services of the Bureau of Engineering Design and Construction and/or it's QA/QC Consultant.

b. The use of these, or any, testing services shall in no way relieve the Contractor of his responsibility to furnish materials and construction in full compliance with the Contract. The Contractor shall provide concrete of the quality specified and it is hereby emphasized that the responsibility for so doing is solely and completely his. It shall be the Contractor's responsibility to work with the Supervising Engineer for Concrete Construction and the DEP designated Testing Laboratory and to keep himself fully informed of the Evaluation of the Compression Test results as described in Paragraph 3.03 B.

2. Testing Provided by DEP – at DEP's discretion, the following testing and inspection shall be provided.

a. Secure production samples of materials at plants or stockpiles during the course of the work and test for compliance with the

specifications unless otherwise noted in the Schedule of Mixes Proportioning and Testing stipulated in the Contract.

b. Provide the services of a qualified concrete technician at each location on the job site where concrete is being mixed and discharged from the mixer for the duration of the concrete placement.

c. Strength Tests: The Concrete Testing Laboratory provided by DEP shall conduct all strength tests (in accordance with ASTM C39). Strength tests of the concrete shall be conducted in accordance with the following procedures.

1) Secure composite samples in accordance with ASTM C 172.

2) Each strength test shall be obtained from a different batch of concrete on a representative, truly random basis, avoiding any selection of the test batch other than by a number selected at random before commencement of concrete placement.

3) Additional concrete test cylinders shall be made from concrete taken out of the bucket, hopper or forms as directed by the Supervising Engineer for Concrete Construction. These test cylinders shall be separate and distinct from those made from the mixer and shall be made from the same batch as the sample taken from the mixer. Where concrete is placed directly from the mixer into forms, without any intermediate conveyance, these additional cylinders will not be required.

4) When pumping or pneumatic equipment is used, samples shall be taken at the discharge end.

5) Compressive strength tests shall be conducted on a set of four specimens molded from each sample in accordance with ASTM C 31, and cured under standard moisture and temperature conditions in accordance with ASTM C 31.

6) Test two specimens at 7 days in accordance with ASTM C 39. Test two specimen at 3 days instead of 7 days when high early strength is required.

7) Test three specimens at 28 days in accordance with ASTM C 39. The 28-day test result shall be the average of the strengths of the three specimens, except that if one specimen in a test manifests evidence of improper sampling, molding or testing, it shall be discarded and

the remaining two strengths averaged. Should more than one specimen in a test show any of the above defects, the entire test shall be discarded. When high early strength is required, the specimens shall be tested at 7 days instead of 28 days.

8) When the 7-day test results (3-day for high early strength) are below 65% of the specified strength and/or whenever the 28-day test results (7-day for high early strength) are below the specified strength, the specimens shall be kept intact and stored for a minimum of 30 days or until inspected by both the Supervising Engineer for Concrete Construction or his authorized representative and the Contractor.

9) Written results of the compression test results shall be posted on the DEP's concrete database 24 hours following the test date on the following business day. The test results are available to the Supervising Engineer for Concrete Construction, the Engineer, Contractor and concrete supplier. A hard copy of the final result will be sent to the Resident Engineer.

10) Unless otherwise directed, all cylinders shall only be handled by DEP designated personnel.

d. Other Required Tests:

1) Check the slump, air content, concrete temperature, unit weight, yield, and water content of each sample of concrete to be used in molding strength test specimens.

2) Perform all other field testing of concrete as required by the New York City Building Code.

3) Slump testing shall be conducted in accordance with ASTM C 143.

4) Air content testing shall be conducted in accordance with either ASTM C 231 (Pressure Method) or ASTM C 173 (Volumetric Method) on concrete samples from which the compressive strength test specimens are made. Note that the chase indicator is not the approved ASTM volumetric test method. Air content testing of Lightweight Concrete shall be in accordance with ASTM C 173.

5) Additional tests of air content shall be performed on a regular and frequent basis for control as directed by the

Supervising Engineer for Concrete Construction. A Chase indicator, calibrated at least once daily against the readings for air content obtained by methods outlined in Article 3.03, Paragraph A.2.d.4, may be used for additional testing. Use of the Chase Indicator alone will not be considered as having met the requirements of Article 3.03, Paragraph A.2.d.1 for checking air content.

6) Measurements of concrete temperature shall be performed in accordance with ASTM C 1064.

7) Unit Weight tests shall be made with a calibrated one-half (1/2) cubic foot bucket in accordance with ASTM C 138. On obtaining the unit weight, the yield shall be immediately computed as the ratio; weight of all the ingredients batched including the water added per cubic yard (from the batching ticket) divided by the unit weight determined times 27. Over-yielding or under-yielding by more than 2% are cause for concern and should be immediately investigated.

8) Water content testing shall be conducted in accordance with AASHTO TP 23.

9) Properly note and record the time of day when all tests were made and the corresponding results. Also, record from what truckloads the samples were taken, the class of concrete which the samples represent and exactly where the concrete represented by the sample was deposited in the structure.

e. Frequency of Testing:

1) For buildings, make one strength test for each 50 Cu. Yd. or fraction thereof for each mix design placed in any one day except that a minimum of two tests will be made for each day's placement.

2) The minimum number of tests shown in the following table will be made for concrete used for all structures other than buildings.

Total Cubic Yards of Concrete Placed During Day	Minimum Number of Strength Tests
Up to 100	One for each 50 Cu. Yds.*
OVER 100 CU. YDS.	One for each 100 Cu.Yds.*
* or fraction thereof.	

3) The Supervising Engineer for Concrete Construction may require that additional tests be made.

f. Additional Services: The DEP provided testing agency shall provide additional services to the extent deemed necessary by DEP and shall also perform the following services.

1) Inspect concrete batching, mixing, and delivery operations in accordance with Inspection Requirements of the administrative building code of the City of New York.

2) Check batching and mixing operations.

3) Review the manufacturer's report of each shipment of cement, aggregates and reinforcing steel and/or conduct laboratory spot checks of these materials as received.

4) Inspect the location and dimension of the forms, the placing of the reinforcing steel and the placing, conveying and depositing of the concrete.

5) Sample concrete at point of placement and other locations directed by the Supervising Engineer for Concrete Construction and perform required tests.

6) Additional testing and inspection required because of changes in materials or mixture proportions requested by the Contractor. When required, such testing shall be performed at the Contractor's expense.

7) Additional testing of materials or concrete occasioned by failure to meet specification requirements. When required, such testing shall be performed at the Contractor's expense.

3. Authority and Duties of the DEP provided Special Inspection Testing Agency:

a. Special Inspections of concrete shall be in accordance with NYCBC Table 1704.4.

b. Technicians representing the testing agency shall inspect the materials and the manufacture of concrete and shall report their findings to the Supervising Engineer for Concrete Construction or his authorized representative and the Contractor.

c. When it appears that the material furnished or work performed by the Contractor fails to fulfill specification requirements, the technician shall immediately notify the Supervising Engineer for Concrete Construction or his authorized representative, and the Contractor of such failure.

d. The technician shall not act as foreman or perform other duties for the Contractor.

e. Technicians are not authorized to revoke, alter, relax, enlarge or release any requirement of the specifications, nor to approve or accept any portion of the work.

4. Responsibilities and Duties of the Contractor:

a. Submit data and test documentation on materials and design mixtures including trial batch and shrinkage test results to the Engineer at least 60 days prior to the start of field operations.

b. Submittal to the Supervising Engineer for Concrete Construction the procedures, methods and concrete mix designs, the name and location of the proposed concrete plant. Submit the quality assurance programs of the concrete suppliers and provide copies of all test reports to the Engineer.

c. Provide all materials, labor and equipment necessary to assist the representatives of the Owner's testing agency in obtaining, preparing and handling test samples at the project site or at other sources of material. When directed by the Engineer, the Contractor shall be responsible for transferring strength test specimens from point of casting to curing boxes and/or to testing agency vehicles.

d. Advise the Resident Engineer and the Supervising Engineer for Concrete Construction and the DEP provided Testing Agency sufficiently in advance of operations to allow for completion of quality tests and for the assignment of personnel.

e. Provide and maintain for the sole use of the testing agency adequate facilities for safe storage and proper curing of concrete test cylinders on the project site for the first 24 hours, as required by ASTM C 31. The Contractor shall provide an insulated box

of substantial construction for use in storing cylinders on the site until such time as they are transported to the testing laboratory. The box shall be large enough to accommodate the maximum number of test cylinders which may be required for any day's concrete placement, and shall have an insulated hinged cover. Heating facilities shall be installed in the box such that the temperature within the box may be maintained at the limits specified by ASTM C 31. The box shall be of such dimensions as to permit placing the cylinders in the box one (1) high only. No stacking of cylinders will be permitted. A high-low thermometer shall be placed in the storage box and the maximum and minimum temperatures noted shall be recorded on an appropriate identification card for each test. To minimize the hazard of disturbance during curing, the storage box shall be located in an area free from vibration such as pile driving and traffic of all kinds. No concrete shall be delivered on the site until such storage curing box has been provided and any identified problems with the box addressed to the satisfaction of the Engineer. Cylinders shall remain in the curing box until ready for delivery to the testing laboratory but not less than 24 hours. Sufficient box storage capacity shall be provided by the Contractor to allow for up to 72 hours of cylinder storage.

f. The DEP provided Testing Agency shall deliver concrete test cylinders to the DEP designated testing laboratory, or such other location as designated in the Contract. Delivery methods shall be in accordance with the requirements of ASTM C 31. Deliveries shall be made such that cylinders remain at the job site (in the boxes provided for their storage) no less than 24 hours and no more than 72 hours after the casting.

g. The Contractor shall furnish copies of mill test reports of all shipments of cement, aggregates and reinforcing steel being used to Supervising Engineer for Concrete Construction and the testing agency.

h. The Contractor shall be responsible for:

1) All testing associated with the evaluation proposed mix designs including required trial batch and shrinkage testing.

2) Establishing and controlling the mix proportions during the entire progress of the work in accordance with Article 2.02, Paragraph E.

3) Testing required because of changes in materials or proportions of the mix requested by the Contractor, as well as, any extra testing of concrete or materials occasioned by failure to meet specification requirements.

B. Evaluation of Concrete Quality:

1. General:

a. Concrete quality shall include but not be limited to satisfactory strength, durability, density (air entrainment), wearing quality, shrinkage cracks, color, physical appearance etc.

b. Wherever there is evidence that any of the concrete in place does not appear to produce the results required by the specifications, such concrete shall be considered questionable and evaluations shall be made as detailed below.

2. Evaluation of Compressive Test Results:

a. Test results shall be evaluated separately, for each type and each specified strength of concrete. Evaluation shall be in accordance with the ACI 214R.

b. The strength level of an individual class of concrete shall be considered satisfactory if both of the following requirements are met:

1) Every arithmetic average of any three consecutive compressive strength tests equals or exceeds the specified compressive strength f'c.

2) No individual strength test (average of two cylinders) falls below the specified compressive strength f'c by more than 500 psi when f'c is 5,000 psi or less, or by more than 0.10 f'c when f'c is more than 5,000 psi. The strength level of the concrete will be considered satisfactory as long as the averages of all sets of three consecutive compressive strength test results equal or exceed the specified compressive strength f'c and no individual strength test result falls below the specified compressive strength f'c by more than 500 psi.

c. For evaluation of the control of the quality and uniformity, each type and specified strength of the concrete shall be represented by at least five (5) tests.

d. If results of a number of consecutive seven (7) day tests at any stage of the work indicate abnormalities or results of a number of twenty-eight (28) day tests are below the specified strengths,

the production and testing of the concrete shall be immediately investigated and reported upon by the Evaluation Committee noted in Article 3.03, Paragraph B.5. It is emphasized that the report of the Evaluation Committee is advisory. The responsibility for the production of the concrete and the decision as to how to proceed with the work remain with the Contractor. However, the decision as to how to proceed is subject to review and approval by the Commissioner.

3. Evaluation of Questionable In-Place Concrete Construction by Non-destructive Methods:

   a. Visual inspection, impact hammers, sonoscopes, microscopic examination, chemical analysis of the hardened concrete, probes or other nondestructive testing devices may be used as an indicator of the relative quality and uniformity of various areas of the structure, as an aide in evaluating concrete in place, or in determining locations of areas to be cored. Any program of nondestructive testing shall be performed as directed by and under the supervision of the Evaluation Committee noted in Article 3.03, Paragraph B.5. Test results of any program of nondestructive testing and recommendations based thereon shall be reported by the Committee to the Commissioner prior to the commencement of any other program of further testing, if recommended or required. All viewpoints if there is no complete agreement, shall be noted in the report.

   b. Nondestructive Tests:

      1) Test results shall be evaluated and shall be valid only if tests have been conducted by properly calibrated equipment in accordance with recognized standard procedures.

      2) Nondestructive tests shall not be used as the sole basis for accepting or rejecting concrete.

4. Evaluation of Questionable In-Place Concrete Construction from Core Tests:

   a. Core tests shall be conducted only as recommended and directed by the Evaluation Committee noted in Article 3.03,Paragraph B.5 and only after a program of nondestructive testing as noted in Article 3.03,Paragraph B.3. Core tests shall be evaluated and shall be valid only if tests have been conducted in accordance with specified procedures.

b. When core testing is required, cores shall be obtained and tested in accordance with ASTM C 42. Cores shall be tested saturated-surface-dry or shall be tested air-dry depending as to whether the area where the questionable concrete is located shall be wet or dry under service conditions. Such determination shall be made by the Committee and they shall direct the condition of the cores at the time of testing. If the cores are to be tested dry, they shall be air dried (temperature 60 to 70 degrees F and relative humidity less than 60 percent) for seven (7) days before the test. If the cores are to be tested wet, they shall be tested after moisture conditioning in accordance with ASTM C 42. The laboratory report shall state whether the cores were tested saturated-surface-dry or surface-dry.

c. At least three representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores will be determined by the Committee so as to least impair the strength of the structure.

d. If, before testing, one or more of the cores shows evidence of having been damaged subsequent to or during removal from the structure, or is obviously defective, replacement cores shall be taken.

e. Concrete in the area represented by a core test, made and tested in accordance with the specified requirements above will be considered adequate for structural strength if the average strength of the three cores taken from the immediate area of the questionable concrete is equal to or greater than the specified strength and no single core strength is less than 85 percent of the specified strength (f'c).

f. The Committee shall determine the area where the cores are to be taken and they shall determine the number of cores to demonstrate the adequacy of the questionable concrete. Corrections to the strength values shall be made if the length to the diameter ratio is different from two. No strength correction shall be made for the age of the concrete cores.

g. If the average strength of the cores as tested is less than the required value, the Committee will make a recommendation as to whether the values obtained are acceptable or they will recommend that the values obtained be checked against a structural analysis as covered in Paragraph 3.03 C.

h. Core holes shall be plugged solid as specified.

5. Evaluation Committee:

   a. The following shall constitute a Committee for the investigation and the evaluation of the quality of the concrete when there are indications that the requirements of Paragraph 3.03 B are not being met. The Resident Engineer (who shall act as Chairman of the Committee), the Supervising Engineer for Concrete Construction or authorized representative, representatives of the Contractor, the Concrete Producer, the Testing Agency, the Architect/Engineer responsible for the design and such other members as the Commissioner may designate. Such members of the Committee as designated by the Chairman shall meet whenever request for such meeting is made by any member and/or as otherwise specified. Reports and recommendations of the Committee shall be submitted to the Contractor and the Commissioner. All viewpoints, if there is no complete agreement shall be noted in the report and reports shall be countersigned by all participating members of the Committee. The Contractor shall be responsible for the preparation and submission of reports.

   b. The functions of the Committee and any reports, recommendations, etc., it submits shall be advisory in nature. The responsibility for the production and quality of the concrete remains solely and completely with the Contractor.

   c. All expenses incurred due to the functioning of the Committee shall be borne by the Contractor except that all members of the Committee shall serve without fee.

6. Additional Curing:

   a. If the concrete fails to meet the specified compressive strength requirement, additional curing as specified by the Supervising Engineer for Concrete Construction may be required and modifications may be required in the concrete mix design for the remaining concrete work, at the expense of the Contractor, in addition to the measures outlined in Article 3.03, Paragraph B.

7. Acceptance of Concrete:

   a. Concrete Strength:

      1) Concrete not meeting the requirements of Article 3.03, Paragraph B.2 shall be considered potentially deficient. Steps shall be taken to increase the strength to ensure that the strength level will be satisfactory. For potentially deficient concrete, see Article 3.03, Paragraph C.

b. Air Content:

1) Concrete not within the specified limits of air entrainment and tested in accordance with Article 3.03, Paragraph B shall be rejected.

2) Steps must be made to control the proper air content.

c. Slump:

1) Concrete not within the specified slump limits at the point of placement may be rejected.

2) When the concrete is tested and found to be out of specifications the Contractor shall immediately adjust the mix to bring the mixture within the specified slump limits.

C. Acceptance of Structure:

1. General:

a. Notwithstanding the provisions of any section of this Contract, all concrete shall conform to the requirements of the New York City Building Code.

b. Completed concrete work which meets all applicable requirements will be accepted without qualification.

c. Completed Concrete work which fails to meet one or more requirements shall be considered potentially deficient. Potentially deficient concrete which has been repaired to bring it into compliance will be accepted without qualification. The decision as to whether it has been brought into compliance except as otherwise noted in this Section shall rest with the Supervising Engineer for Inspection subject to approval of the Commissioner and the Building Department.

d. Potentially deficient concrete which cannot be brought into compliance shall be evaluated by the Committee noted in Article 3.03, Paragraph B and a report submitted to the Commissioner. The Commissioner will then, in writing, either accept without qualification or accept subject to Retainage (as outlined in Article 3.03, Paragraph .C.8) or direct that the concrete be reinforced or supplemented with additional construction to bring it into compliance after which it may be resubmitted to the Commissioner.

e. Repair potentially deficient concrete work by removing and replacing or by reinforcing with additional construction as required by the Engineer. To bring the rejected work into

compliance, use repair methods that will maintain the strength of the structure and meet all other applicable requirements for function, durability, dimensional tolerances, and appearance.

f. Obtain acceptance by the Engineer for repair methods and materials and for modifications needed to assure that concrete work complies with requirements in the Contract Documents.

g. The Contractor shall pay all costs incurred including redesign and reverification in bringing the concrete work into compliance and acceptance.

2. Dimensional Tolerances:

a. Formed surfaces resulting in concrete outlines smaller than required by an amount exceeding the requirements of Section 3.3 of ACI 347R shall be considered deficient in strength and subject to the provisions of Article 3.03, Paragraph C.4.

b. Formed surfaces resulting in concrete outlines larger than required, by an amount exceeding the requirements of Section 3.3 of ACI 347R may be rejected and the excess material shall be subject to removal. If removal of the excess material is permitted, it shall be accomplished in such a manner as to maintain the strength of the section and to meet all other applicable requirements of function and appearance.

c. Concrete members cast in the wrong location may be rejected if the strength, appearance or function of the structure is adversely affected or misplaced items interfere with other construction.

d. Inaccurately formed concrete surfaces exceeding the requirements of Section 3.3 ACI 347R and which are exposed to view may be rejected and shall be repaired or removed and replaced if required.

3. Appearance:

a. Concrete exposed to view with defects which adversely affect the appearance of the specified finish may be repaired, if possible. If, in the opinion of the Supervising Engineer for Concrete Construction, the defects cannot be repaired, the concrete shall be considered potentially deficient, such concrete shall be evaluated by the Committee noted in Article 3.03.B and a report submitted to the Commissioner. The Commissioner will then in writing, either accept without qualification or accept subject to Retainage (as outlined in Article 3.03, Paragraph C.8) or direct that other remedial measures be taken after which it may be resubmitted to the Commissioner.

4. Strength of Structure:

   a. The strength of the structure in place will be considered potentially deficient if it fails to comply with any requirements which control the strength of the structure, including but not necessarily limited to the following conditions:

      1) Low concrete compression test strength as evaluated by Article 3.03, Paragraph B above. However, in those areas or members containing such concrete, if a structural analysis by the architect/engineer indicates the completed structure will be suitable for its intended use, i.e., that the stresses which will be developed under design load in the members containing below-strength concrete are less than the design stress permitted for the actual compression test strengths reported and the analysis is approved by the Building Department, the member or members will be accepted without qualification.

      2) Low concrete core tests as evaluated by Article 3.03, Paragraph B above. However, in those areas or members where core tests are made in accordance with Article 3.03, Paragraph B.4, if a structural analysis by the architect/engineer indicates the suitability of the structure for its intended use, i.e., that the stresses which will be developed under design load in the members containing below-strength concrete are less than the design stress permitted for the actual core test strengths reported, and the analysis is approved by the Building Department, the areas or members will be accepted without qualification.

      3) Reinforcing steel size, quantity, strength, position or arrangement at variance with the specified requirements or the Contract Drawings.

      4) Concrete which differs from the required dimensions or location in such a manner as to reduce the strength.

      5) Curing less than specified.

      6) Inadequate protection of concrete from extremes of temperature during early stages of hardening and strength development.

7) Mechanical injury, construction fires, accidents or premature removal of formwork likely to result in deficient strength.

8) Poor workmanship likely to result in deficient strength.

5. Action Required When Strength Is Potentially Deficient:

a. When the strength of the structure is considered potentially deficient, the following actions may be required by the Engineer/Architect:

1) Structural analysis or additional testing or both may be required.

2) Core tests may be required.

3) If testing is inconclusive or impractical or if structural analysis does not confirm the Safety of the structure, load tests may be required and their results evaluated in accordance with ACI 318.

4) Concrete Work rejected by structural analysis or by results of a load test shall be reinforced with additional construction as required by the Engineer/Architect, or replaced.

5) Document all repair work performed to bring strength-deficient concrete work into compliance with Contract Documents, and submit the documentation to the Engineer/Architect for acceptance.

6. Durability:

a. The durability of the concrete work will be considered deficient and therefore the concrete work shall be rejected, if it fails to comply with any of the requirements which control the durability of the structure, including, but not necessarily limited to, the following conditions:

1) Strength failing to comply with Article 3.03, Paragraph B above.

2) Materials for concrete not conforming with the specified requirements of Article 3.03, Paragraph C.2. above.

3) Concrete not conforming with either the specified air-entrainment requirements or the air content limits.

4) Curing not accomplished in accordance with Contract Documents.

5) Inadequate protection of concrete from extremes of temperature during early stages of hardening and strength development.

7. Withholding:

a. Where concrete is placed which is considered to be deficient, whether in strength, appearance, durability or any other quality defined, payment may be withheld at the discretion of the Supervising Engineer for Concrete Construction. If such concrete is subsequently accepted without qualification, then payment shall be made for such concrete including return of all monies withheld.

8. Retainage:

a. Deficient concrete which cannot be brought into compliance and is nevertheless accepted by the Commissioner shall be subject to the following permanent retainage. For every cubic yard of concrete so placed, an amount equal to 10% of the unit price for concrete in place for unit price contracts or 10% of the price established in the detailed estimate for concrete in place for lump sum contracts shall be permanently retained.

9. Rejected Concrete:

a. Concrete which has been rejected, in writing, by the Commissioner, shall be removed and replaced. The cost of all such removed and replaced concrete shall be borne by the Contractor.

10. Protection of In-Place Concrete:

a. Loading and Support of Concrete:

1) Do not allow construction loads to exceed the superimposed load which the member, with necessary supplemental support, is capable of carrying safely and without damage. Submit for acceptance data on the amount of loading, method of distributing load, and any proposed supplemental support during construction.

b. Protection from Mechanical Injury:

1) During the curing period, protect, the Contractor shall protect the concrete and its shoring from damaging mechanical equipment inducing shock and vibrations at all times. Protect all concrete surfaces from damage by construction traffic, equipment, materials, rain or running water, and other adverse weather conditions.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

The items below are found on the following pages:

"Table 1 -- Concrete Mix Requirements"

Sample Concrete Placement Card

Mix Design Submittal (MDS) Forms

TABLE 1 - CONCRETE MIX REQUIREMENTS										
Class of Concrete	Coarse Aggregate Sizes (ASTM C 33)			Minimum Cementitious Materials (lbs/cu yd.)	Cement Type (ASTM C 150)	Mineral Admixtures (%)		W/(C + P) Max.	Specified Strength (psi)		GWP (kg CO_2e/m^3)
	A	B	C			A	B		fc minimum field condition	f_{cr} minimum for mix design See FN3	
45	#57 (1" to No. 4)	#8	-	525	II		-	0.42	4,500 at 28 days	5,850 at 28 days	284
45F	#4 (1.5" to 3/4")	#67	#8	525	II	See FN2	-	0.41	4,500 at 56 days	5,850 at 56 days	284
45PG	3/8” to No. 16	#8	-	660	II	See FN2	-	0.40	4,500 at 28 days	5,850 at 28 days	284
25	#57 to #67	-	-	376	II	See FN2	-	0.60	2,500 at 28 days	3,500 at 28 days	228

Note: Concrete containing coarse aggregate smaller than #67 shall only be used with the approval of the Engineer.

Footnotes (FN) to Table 1:
FN 2. As approved by the Engineer, up to 20% fly ash, 20% GGP and 40% GGBF may be used in Class 25, Class 45, Class 45PG and Class 45F concrete that will not be in contact with potable water.
FN3. Minimum fcr for mix design listed in this column are based on ACI 301, Table 4.2.3.1; when data are not available to establish standard deviation.

END OF SECTION

SAMPLE CONCRETE PLACEMENT CARD

Contract:	**Contractor:**		
Placement Date:		**Concrete Mix:**	
Scheduled Start Time:		**Approximate Quantity:**	**cu. yds.**
Identification of Placement: **Placement No:**			
Item	**Initials** **Inspector**	**Date**	**Remarks**
Foundations			
Construction Joint Preparation			
Forms and Blockouts			
Waterstops			
Reinforcement			
Embedments/Anchor Bolts			
Piping/Test			
Temperature Checkout			
Cleanup			
Provisions for Weather			
Contractor			
Electrical Contractor			
HVAC Contractor			
Plumbing Contractor			
Structures Contractor			

Mix Design
Proportions Summary Sheet
MDS

- USE ONE FORM PER MIX DESIGN -

Contract:	Mix Design Code (DEP Only):	Class (Specified Strength): PSI + %	Proposed Trial Batch Date:	Submittal Date:
Contractor:	Concrete Supplier:		Testing Laboratory:	
Mix Description (Common Name)	Concrete Supplier Address:		Testing Laboratory Address:	
	City: / State: / Postal Code:		City: / State: / Postal Code:	

Expedite:	Application:	Field Inspection:	Weight Type:	Fly Ash:	Field Curing:
☐ Yes (Comment Reqd.) ☐ No	☐ Structural ☐ Non-structural	☐ Yes (Controlled) ☐ No (Uncontrolled)	☐ Normal ☐ Lightweight	☐ Yes, List %: ☐ No	☐ Yes, Min. Days: ☐ No

Specimen Transport, Testing & Disposal Ages (Use Comments Area, If Applicable):	No. of Specimens (Per Set)	Transport Age (Days)	Test Age (No. of Specimens at Days)						Disposal Age for Unused Specimens (Days)
			Preliminary		Final		Other(s)		
			Qty	Days	Qty	Days	Qty	Days	
☐ Yes ☐ No CQAP Standard	5	2	2	7	3	28	-	-	28
☐ Yes ☐ No Other:									

Cement /Slag /Fly Ash

Grade/Class:	Source:	PCY:

Cement/Slag /Fly Ash

Grade/Class:	Source:	PCY:

Crushed Stone

Size Number:	Source:	PCY (SSD):

Crushed Stone

Size Number:	Source:	PCY (SSD):

Sand

Type:	Source:	FM:	PCY (SSD):

Water

	PCY:	GAL/CY:

Air Entraining Admixture

Designation:	Brand:	OZ/CY:

_____-Range Water Reducing Agent

Designation:	Brand:	OZ/CY:

Water-Reducing/Retarding Agent

Designation:	Brand:	OZ/CY:

Other Admixtures

Designation:	Brand:	OZ/CY:
Designation:	Brand:	OZ/CY:
Designation:	Brand:	OZ/CY:

Specified Slump (IN):	Specified Air Content (%):	Yield (CY):	Theoretical Unit Weight (PCF):	Water-Cement Ratio (from trial batch):

Comments:

- SUBMIT TO NYCDEP CQAP AT 1-800-673-2816 -

Submitted By (Print): **Testing Laboratory:** **Signature:** **Date:**

Mix Design
Submittal of Proportions
MDS

Contract:	Mix Design Code (DEP Only):	Class (Specified Strength): PSI + %	Proposed Trial Batch Date:	Submittal Date:
Contractor:	Concrete Supplier:		Testing Laboratory:	

Cement (ASTM C150)

Type:	Sp. Gr.:	Class/Grade:	Source:	Total Mass Per CY (PCY):	Volume (CU FT):

Other Cementitious Materials (ASTM C18)

Type:	Sp. Gr.:	Class/Grade:	Source:	Total Mass Per CY (PCY):	Volume (CU FT):

Aggregate No. 1, Fine (ASTM C33)

Type:	SSD Sp. Gr.:	Size:	Source:	Total Mass Per CY (PCY):	Volume (CU FT):

Dry Rodded Unit WT (PCF):	Absorption (%):	FM:

Aggregate No. 2, Coarse (ASTM C33)

Type:	SSD Sp. Gr.:	Size:	Source:	Total Mass Per CY (PCY):	Volume (CU FT):

Dry Rodded Unit WT (PCF):	Absorption (%):	

Aggregate No. 3, 4 Coarse (ASTM C33)

Type:	SSD Sp. Gr.:	Size:	Source:	Total Mass Per CY (PCY):	Volume (CU FT):

Dry Rodded Unit WT (PCF):	Absorption (%):	

Aggregate No. 2, Lightweight Alternative (ASTM C330)

Type:	Sp. Gr. Factor:	Size:	Source:	Oven Dry (PCY):	Volume (CU FT):

Loose Unit WT (PCF):	Estimated Wet (PCF):	

Chemical Admixtures (OZ/CY)

No. 1 ASTM C:	Type:	Source:	Name:	WT (OZ):
No. 2 ASTM C:	Type:	Source:	Name:	WT (OZ):
No. 3 ASTM C:	Type:	Source:	Name:	WT (OZ):

Water (Total)			**Air Content**		**Total Mixture Mass and Volume**	
GAL:	PCY:	CU FT:	%	CU FT:	LB/CU FT:	CU FT:

Comments:

Submitted By (Print): **Company:** **Signature:** **Date:**

Mix Design
Aggregates Gradation
MDS

Sieve Size	Percent Passing Aggregate No.								
	1 (Fine)		2 (Coarse) Stone Size (no):_____		3 (Coarse) Stone Size (no):_____		4 (Coarse) Stone Size (no):_____		Combined Gradation
	Per ASTM C33:	Tested:	Per ASTM C33:	Tested:	Per ASTM C33:	Tested:	Per ASTM C33:	Tested:	
3 IN									
2 1/2 IN									
2 IN									
1 1/2 IN									
1 IN	-								
3/4 IN	-								
1/2 IN	-								
3/8 IN	100								
1/4 IN	-								
#4	95-100								
#8	80-100								
#16	50-85								
#30	25-60								
#50	5-30								
#100	0-10								
Dry Unit WT (PCF)									
Absorption (%)									
FM									

Remarks:

Mix Design
Trial Batches Proportions
MDS

Material (Trial Batch Proportions Per Cubic Yard)			Trial Batch No. #1	#2	#3	#4
1. Cement						
Type:	Source:		LB:	LB:	LB:	LB:
2. Other Cementitious Material						
Type:	Source:		LB:	LB:	LB:	LB:
Grade/Class:						
3. Aggregate No. 1 (Fine) SSD						
Type:	Source:		LB:	LB:	LB:	LB:
Sp. Gr.:	FM:	Absorption (%):				
4. Aggregate No. 2 (Coarse) SSD						
Type:	Source:		LB:	LB:	LB:	LB:
Sp. Gr.:	Size:	Absorption (%):				
5. Aggregate No. 3 & 4 (Coarse) SSD						
Type:	Source:		LB:	LB:	LB:	LB:
Sp. Gr.:	Size:	Absorption (%):				
6. Aggregate No. 2 (Lightweight, Alternative)						
Type:	Source:		Oven Dry: LB:	LB:	LB:	LB:
Sp. Gr.:	Size:	Absorption (%):	Wet: LB:	LB:	LB:	LB:
7. Water (Total):			LB:	LB:	LB:	LB:
8. Water-Cementitious Ratio:						
9. Chemical Admixtures						
No. 1 Type:			WT (OZ):	WT (OZ):	WT (OZ):	WT (OZ):
No. 2 Type:			WT (OZ):	WT (OZ):	WT (OZ):	WT (OZ):
No. 3 Type:			WT (OZ):	WT (OZ):	WT (OZ):	WT (OZ):
10. Total Mass			LB:	LB:	LB:	LB:
11. Total Mass Per Cubic Foot (Theoretical Unit Weight)			PCF:	PCF:	PCF:	PCF:

Mix Design
Mixture Properties
MDS

Properties	ASTM	Target Per Specification	Trial Batch No.			
			#1	#2	#3	#4
1. Fresh Concrete						
Temperature (F):	C1064					
Slump (IN):	C143					
Before Add HRWR						
End of Mixing						
15 (MIN)						
30 (MIN)						
45 (MIN)						
1 (HR)						
Unit WT (PCF):	C138					
Air Content (%):	C231/C173					
Mortar Content (%):						
Yield (CU FT/CU YD):						
Water-Cementitious Ratio						
Time of Set (MIN):	C403					
Initial (MIN):						
Final (MIN):						
Difference (MIN):						
2. Hardened Concrete						
Cylinder No.			1 (A-_____)	2 (A-_____)	3 (A-_____)	4 (A-_____)
Compressive Strength (PSI):	C39/C192					
3 Days						
Specimen 1						
Specimen 2						
Average						
7 Days						
Specimen 1						
Specimen 2						
Average						
28 Days						
Specimen 1						
Specimen 2						
Specimen 3						
Average						

Mix Design
Mixture Properties
MDS

Properties	ASTM	Target Per Specification	Trial Batch No.			
			#1	#2	#3	#4
56 Days (If Required by Contract Only)						
Specimen 1						
Specimen 2						
Average						
Shrinkage (%):	C157					
_____ Days						
Specimen 1						
Specimen 2						
Average						
_____ Days						
Specimen 1						
Specimen 2						
Average						
Observations						
Color						
Bleeding						
Heat Signature (If Specified in the Specification and for the Submitted Batch Only)						

Trial Batch No. (Submitted and Recommended for Approval):

Comments:

Laboratory Director (Print):	**Company:**	**Signature & Seal:**	**Date:**
CQAP WITNESS (Print):	**Company:**	**Signature:**	**Date:**
Contractor (Print):	**Company:**	**Signature:**	**Date:**
Designer Of Record (Print):	**Company:**	**Signature:**	**Date:**

Mix Design
Laboratory Trial Batch Mix Design Data
MDS

- TO BE COMPLETED BY CQAP -

Contract No.	Contract Name:	Basic Description of Specified Mix Design (Mix Design Common Name):	Trial Batch Date:
Batch Plant Name:	Design Trial Lab Name:	Class (Specified Strength): PSI + %	Weight Type: ☐ Normal ☐ Lightweight
			Concrete Type: ☐ Pump ☐ Conventional

Description				Weight Per Cubic Yard			
Mix Point No.:				1	2	3	4
Cement:			LBS				
Cementitious:			LBS				
Sand:			LBS				
Stone:			LBS				
Stone:			LBS				
Water:			GAL				
Water:			LBS				
Admixture:		Air	OZ				
Admixture:		HRWR/MRWR	OZ				
Unit Weight:			PCF				

Description				Laboratory Trial Batch Weights			
Mix Point No.:				1	2	3	4
Cement:			LBS				
Cementitious:							
Sand:			LBS				
Stone:			LBS				
Stone:			LBS				
Water:			LBS				
Admixture:		Air	ML				
Admixture:		HRWR/MRWR	ML				

Description			Trial Batch Results							
Mix Point No.:			1		2		3		4	
Time:			Initial	30 MIN	Initial	30 MIN	Initial	30 MIN	Initial	30 MIN
Slump:		IN								
Water Content:		LBS								
Water Used:		LBS								
Computed Mix Water:		LBS								
Total Mix Water:		LBS								
Unit Weight:		LBS								
		PCF								
Air:		%								
Temp:		DEG								
Actual W/C Ratio										

Comments:

CQAP WITNESS (Print): **Company:** **Signature:** **Date:**

Mix Design
Trial Batch Strength Test Results Form
ASTM C39/ C192

- TO BE COMPLETED BY CQAP -

Contract No.	Contract Name:	Design Trial Lab Name:	Class (Specified Strength): PSI + %	Trial Batch Date:

Preliminary Strength Testing (See Page 1 for Preliminary Strength Age):

Age of Specimen:	Trial Batch #1 (Maximum Load / PSI)	Trial Batch #2 (Maximum Load / PSI)	Trial Batch #3 (Maximum Load / PSI)	Trial Batch #4 (Maximum Load / PSI)
Testing Date:	#1	#2	#3	#4
Specimen 1				
Specimen 2				
Specimen 3				
Average				

Comments:

CQAP WITNESS (Print): Company: Signature: Date:

Final Strength Testing (See Page 1 for Final Strength Age):

Age of Specimen:	Trial Batch #1 (Maximum Load / PSI)	Trial Batch #2 (Maximum Load / PSI)	Trial Batch #3 (Maximum Load / PSI)	Trial Batch #4 (Maximum Load / PSI)
Testing Date:	#1	#2	#3	#4
Specimen 1				
Specimen 2				
Specimen 3				
Average				

Comments:

CQAP WITNESS (Print): Company: Signature: Date:

CQAP CPM Comments (Preliminary & Final Age Testing):

CQAP CPM (Print): Company: Signature: Date:

Mix Design
Trial Batch Strength Test Results Form
ASTM C39/ C192

- TO BE COMPLETED BY CQAP -

Contract No.	Contract Name:	Design Trial Lab Name:	Class (Specified Strength): PSI + %	Trial Batch Date:

Additional Strength Testing:

Age of Specimen:	Trial Batch #1 (Maximum Load / PSI)	Trial Batch #2 (Maximum Load / PSI)	Trial Batch #3 (Maximum Load / PSI)	Trial Batch #4 (Maximum Load / PSI)
Testing Date:	#1	#2	#3	#4
Specimen 1				
Specimen 2				
Specimen 3				
Average				

Comments:

CQAP WITNESS (Print): Company: Signature: Date:

Additional Strength Testing:

Age of Specimen:	Trial Batch #1 (Maximum Load / PSI)	Trial Batch #2 (Maximum Load / PSI)	Trial Batch #3 (Maximum Load / PSI)	Trial Batch #4 (Maximum Load / PSI)
Testing Date:	#1	#2	#3	#4
Specimen 1				
Specimen 2				
Specimen 3				
Average				

Comments:

CQAP WITNESS (Print): Company: Signature: Date:

CQAP CPM Comments (Preliminary & Final Age Testing):

CQAP CPM (Print): Company: Signature: Date:

SECTION 03 32 00 - JOINTS IN CONCRETE
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Work specified in this Section consists of providing all labor, materials, and incidentals necessary to furnish and install joints, joint materials, waterstops and embedded items as indicated on the Contract Drawings, specified herein and as needed for a complete installation.

B. Joints shall comply with the requirements of Section 03 10 00 - Concrete Forming and Accessories.

C. Types of joints in concrete shall be as follows:

1. Construction Joints - Joints between adjacent concrete placements continuously connected with reinforcement.

2. Control Joints - Joints formed in concrete to provide a weakened plane in the concrete section to control formation of shrinkage cracks.

3. Expansion Joints - Joints in concrete which allow thermal expansion and contraction of concrete. Reinforcement terminates within concrete on each side of joint.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 03 10 00 - Concrete Forming and Accessories

B. Section 03 30 10 - Low Carbon Cast-in-Place Concrete.

1.04 REFERENCES

A. Definitions

1. Environmental Product Declaration - A third-party-verified International Organization for Standardization (ISO) Series 14025 Type III declaration that quantifies environmental information on the life cycle of a product to enable comparisons between products fulfilling the same function.

B. Reference Standards

1. ASTM C 990 - Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.

2. ASTM C 1016 - Test Method for Determination of Water Absorption of Sealant Backing (Joint Filler) Material.

3. ASTM D 545 - Test Methods for Preformed Expansion Joint Fillers for Concrete Construction (Nonextruding and Resilient Types).

4. ASTM D 994 - Preformed Expansion Joint Fillers for Concrete (Bituminous Type).

5. ASTM D 1190 - Concrete Joint Sealer, Hot-Applied Elastic Type.

6. ASTM D 1191 - Test Methods for Concrete Joint Sealers.

7. ASTM D 1751 - Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

8. ASTM D 1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

9. ASTM D 2835 - Lubricant for Installation of Preformed Compression Seals in Concrete Pavements.

10. ASTM D 5329 - Test Methods for Sealants and Fillers, Hot-Applied, For Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements.

11. ASTM D 5973 - Elastomeric Strip Seals with Steel Locking Edge Rails Used in Expansion Joint Sealing.

12. ASTM D 5898 - Guide for Standard Details for Adhered Sheet Waterproofing.
13. ASTM E 1612 - Preformed Architectural Compression Seals for Buildings and Parking Structures.
14. ASTM E 1783 - Preformed Architectural Strip Seals for Buildings and Parking Structures.
15. ASTM F 1123 - Non-Metallic Expansion Joints.
16. ACI 318 - Building Code Requirements for Structural Concrete.
17. ISO 14025 - Environmental labels and declarations - Type III environmental declarations
18. New York City Building Code.
19. NYC Department of Transportation, Standard Highway Specifications.
20. U.S. Army Corps of Engineers Specifications for Polyvinyl Chloride Waterstops, CRD-C572.

1.05 DESCRIPTION

A. The Contractor shall install joint material per the construction schedule submitted to and approved by the Engineer in a sequence and manner that will not damage the Work.

1.06 QUALITY ASSURANCE

A. Reviews of Shop Drawings shall be obtained before custom fabrication is started and before delivery of materials to the project site.

B. Work of this Section shall be coordinated with the work of other trades so that construction is not delayed.

C. Joint installation procedures and health and safety of the work force shall be the responsibility of the Contractor. The requirements of authorities having jurisdiction shall be complied with.

D. The final responsibility for constructing a watertight condition at expansion joints and construction joints remains with the Contractor as part of the Work under this Contract. Errors of detailing and fabrication and for the correct fit of the work shall be the responsibility of the Contractor.

E. Defective Work, as determined by the Engineer, shall be remedied by cutting and rebuilding the concrete walls and slabs, replacing the waterstop assemblies or other methods as approved by the Engineer.

1.07 SUBMITTALS

A. Contractor shall submit Shop drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Information as shown on the Contract Drawings and at the site, where necessary.

2. Sizes, sections, reinforcement and dimension of units, the jointing, dowels, anchors, etc., and all other necessary details.

3. Installation of joints, including various connections, anchorage details, special jointing, the Contractor's proposed construction and control joints, and other accessories as required to complete the work.

4. Prior to installation, the Contractor shall submit layout drawings for approval, showing the extent of the waterstop installations that are proposed to ensure that all construction and expansion joints, in water-containing structures, will be watertight. The drawings shall include elevations, sections, etc., and all details to show that a continuous watertight installation is provided.

5. Equipment pad layout drawings.

B. Manufacturer's specifications and installation instructions for each type of required joint and accessory shall be submitted. These include expansion joint fillers, expansion joint sealers, waterstops, shapes of waterstops, chemical retarders, adhesives, sleeves, inserts, anchors, embedded items, and similar items.

C. The Contractor shall submit to the Engineer one sample of each type of waterstop. Each sample shall include a splice.

D. Method to be used to roughen construction joints and achieve bond including product identification as applicable.

E. Applicator's Qualifications.

F. Proof of satisfactory field service of sealants.

G. Sustainability Submittals:

1. Environmental Product Declarations

a. The Contractor shall provide product-specific type III Environmental Product Declaration (EPD) conforming to ISO 14025, 14044.

2. Envision Submittals

a. The Contractor shall report information pertaining to the sustainable procurement, regional sourcing, and/or recycled content of new materials to be procured during the Work, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall coordinate with its vendor on sustainable product requirements as stipulated by the Contractor's approved New Materials Sustainable Implementation Plan, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall submit vendor shop drawings for review by the Engineer that clearly illustrate the vendor is meeting the requirements as approved in the Contractor's New Materials Sustainable Implementation Plan.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered to the site in an undamaged condition and at such intervals as will avoid delay in the Work.

B. Materials shall be stored and protected in a clean, properly drained location and shall be kept off the ground under a weather-tight covering permitting good air circulation. Materials shall be stored on dry wood sleepers, pallets, platforms or other appropriate supports which have slope for positive drainage. Materials shall be protected from distortion, excessive stresses, corrosion and other damage. Materials shall not be stored on the structure in a manner that might cause distortion or damage to the supporting structure. The maximum uniform distributed storage load shall not exceed 20 pounds per square foot.

C. Materials shall be protected before, during and after installation to ensure acceptable finished Work. In-place materials and other Work in connection with the joint installations shall be protected.

D. Material shall be handled safely in a manner that will prevent distortion or other damage. Care shall be exercised at all times to avoid damage through careless handling during unloading, storing and installing.

E. In the event of damage to the Work, necessary repairs or replacements shall be performed until satisfactory work is met at no expense to the City.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Concrete Bonding Agent

1. The concrete bonding agent shall be:

a. Corr-Bond, as manufactured by Euclid Chemical, East Brunswick, NJ.

b. Armatec 110, as manufactured by Sika Chemical Company, Lyndhurst, NJ

c. Or approved equal

B. Expansion joint fillers (Type I) shall be:

1. Type FF-7 cross-linked, closed cell polyethylene, as manufactured by Progress Unlimited Inc., Lynbrook, NY.
2. Type W, cross-linked, closed cell polyethylene, as manufactured by Hydrozo/Jeene, Inc, Lincoln, NE.
3. Or approved equal

C. Joint Sealants:

1. Type A shall be
   a. Sikaflex-2C NS/SL as manufactured by Sika Corporation, Lyndhurst, NY.
   b. Sonolastic SL-1, as manufactured by Sonneborn/Master Business Solution, Parsippany, NJ.,
   c. Permapol RC-270 Resevoir Sealant, as manufactured by Products Research and Chemical Company, (now is Courtaulds, PLC,) London W1A2BB, England.
   d. Or approved equal.
2. Type B shall be
   a. Magnum NS-100, as manufactured by Tamms Industries, Kirkland, IL.
   b. Sikaflex 1A, Sika Corporation, Lyndhurst, NY.
   c. Or approved equal.
3. Type C shall be
   a. Sonolastic Two-part, as manufactured by Sonneborn/Master Business Solution, Parsippany, NJ.
   b. Hornflex-L, as manufactured by Tamms Industries, Kirkland, IL.
   c. Cormax PSC, as manufactured by DuPont, (Multiple locations in USA).
   d. Or approved equal.

D. PVC waterstops shall be:

1. Model 679 for construction joints and Model 738 for expansion joints, as manufactured by Greenstreak/Sika Corp USA, Lyndhurst, NJ.
2. Or approved equal.

E. Hydrophilic Rubber Waterstops shall be:

1. Duroseal Gasket, Type 2010, as manufactured by BBZ USA, Inc, St. Louis, MO

2. Adeka Ultraseal MC-2010M, as manufactured by Asahi Denka Kogyo KK, Japan

3. Or approved equal.

F. Hydrophilic Sealant shall be:

1. Duroseal Paste, by BBZ USA, Inc, St. Louis, MO.

2. Adeka Ultraseal P-201, by Asahi Denka Kogyo K.K, Japan.

3. Sika Swell S, by Sika Corporation, Lyndhurst, NJ.

4. Or approved equal.

G. Hydrophilic Injection Resin shall be:

1. Duroseal Inject 1K/2K, by BBZ, USA, Inc., St. Louis, MO.

2. Sika Injection 29 by Sika Corporation, Lyndhurst, NJ.

3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

1. Concrete Bonding Agent

a. The concrete bonding agent product and manufacturer shall be as specified in this Section.

b. Surface preparation, application and curing shall be performed in strict accordance with the manufacturer's directions.

B. Performed Expansion Joint Filler

1. Preformed expansion joint filler shall be nonextruding, and shall be of the following types:

a. Type I Sponge Rubber, conforming to ASTM D 1752, Type I.

b. Type II Cork, Conforming to ASTM Designation D 1752, Type II.

c. Type III Self-expanding cork, conforming to ASTM Designation D 1752, Type III.

d. Type IV Bituminous Fiber, conforming to ASTM Designation D 1751.

2. Expansion joint fillers (Type I) product and manufacturer shall be as specified in this Section.

3. Unless otherwise specified, Type II and Type III shall conform to the requirements of the Standard Highway Specifications of the NYC Department of Transportation..

4. Asphaltic blown joint filler for sealing joints over Type IV preformed joint filler shall comply with the requirements of Section 2.16 of the Standard Highway Specifications of the NYC Department of Transportation.

C. Joint Sealants

1. Type A: Multi-component, non-sag, low-modulus polyurethane rubber sealant meeting ASTM C 920, Type M, Grade NS, Class 25, use NT, M, A, and O Capable of withstanding 50% in extension or compression shall be as specified in this Section

2. Type B: Single component polyurethane sealant meeting ASTM C 920, Type S, Grade NS, Class 25, Use NT, M, A, and O, capable of withstanding 25% in extension or compression shall be as specified in this Section.

3. Type C: Multi-component chemical resistant polysulfide sealant conforming to ASTM C 920, Type M, Grade NS, Class 25 shall be as specified in this Section

D. Backer Rod

1. Backer rod shall be an extruded closed-cell polyethylene foam rod. The material shall be compatible with the sealant material used and shall have a tensile strength of not less than 40 psi and a compression deflection of approximately 25 percent at 8 psi. The rod shall be 1/8-inch larger in diameter than the joint width at joints less than 3/4-inch wide and 1/4-inch larger in diameter at joints 3/4-inch end wider.

E. PVC Waterstops

1. PVC waterstops shall be manufactured from virgin polyvinylchloride and shall meet or exceed all requirements set forth in the U.S. Army Corps of Engineers Specification CRD C 572.

2. All PVC waterstops shall be of polyvinylchloride extruded from an elastomeric plastic compound of which the basis resin shall be polyvinylchloride. The compound shall contain any additional resins, plasticizers, stabilizers or other materials needed to ensure qualities which will meet the requirements herein specified.

3. The required minimum physical characteristics for this material are:

   a. Tensile strength 1,750 psi

   b. Ultimate elongation not less than 280%.

4. No reclaimed PVC materials shall be used for manufacture of the waterstops. The Contractor shall furnish certification that the proposed waterstops meet the above requirements.

5. PVC waterstops for construction joints shall be flat ribbed type, 6 inches wide unless otherwise shown on the Contract Drawings, with a minimum thickness at any point of 3/8 inches.

6. PVC waterstops for expansion joints shall be ribbed with a center bulb, 9 inches wide with a minimum thickness at any point of 3/8 inches. The center bulb shall have an O.D. not less than 1-3/8 inches.

7. All PVC waterstops shall have an integral fastening system consisting of hog rings and grommets.

8. PVC waterstops product and manufacturer shall be as specified in this Section.

F. Hydrophilic Rubber Waterstop

1. Hydrophilic rubber waterstop materials shall be bentonite-free and shall expand by a minimum of 80 percent of dry volume in the presence of water to form a watertight joint seal without damaging the concrete in which it is cast. For location, see the Contract Drawings.

2. The material shall be composed of resins and polymers which absorb water and cause an increase in volume in a completely reversible and repeatable process. The waterstop material shall be dimensionally stable after repeated wet-dry cycles with no deterioration of swelling potential.

3. Hydrophilic rubber waterstop shall be solid rectangular shape with minimum cross sectional dimensions of 3/8-inch by 3/4-inch.

4. Hydrophilic Rubber Waterstops product and manufacturer shall be as specified in this Section.

G. Hydrophilic Sealant

1. The Hydrophilic Sealants shall adhere firmly to concrete, metal and PVC in dry or damp conditions. When cured, it shall be elastic indefinitely.

2. Hydrophilic Sealants product and manufacturer shall be as specified in this Section.

H. Hydrophilic Injection Resin

1. Hydrophilic injection resin shall be acrylate-ester based. Its viscosity shall be less than 50 cps. It shall be water soluble in its uncured state, solvent free, and non-water reactive. In the cured state, it shall form a solid hydrophilic flexible material which is resistant to permanent water pressure and shall not attack bitumen, joint sealants or concrete.

2. Hydrophilic Injection Resin product and manufacturer shall be as specified in this Section.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Field Measurements

1. Prior to commencement of the Work, existing dimensions, elevations, locations and conditions applicable to the work shall be field verified. Variances and discrepancies from the Contract Drawings and potential interferences shall be reported promptly to the Engineer.
2. Sufficient field measurements shall be taken prior to preparation of Shop Drawings and fabrication of construction materials, where possible, to ensure proper fitting of the work. However, job progress shall not be delayed. Allow for adjustments and fittings wherever the taking of field measurements before fabrication may not be possible or might delay the work.
3. Actual field-verified conditions may require modifications to the fabrication and/or erection details indicated on the Contract Drawings. The Work shall be performed to meet actual field conditions encountered.

B. Preparation

1. The Contractor shall examine the areas and conditions under which the Work of this Section is to be performed. Conditions detrimental to the proper and timely completion of the Work shall be corrected. Work shall not be proceeded until unsatisfactory conditions have been corrected.
2. All new placement of concrete shall be in accordance with Section 03 30 10 – Low Carbon Cast-In-Place Concrete.
3. Concrete shall not be allowed to enter the joint or the space for the sealant and destroy the proper functions of the joint.
4. The surface of the concrete at all joints shall be thoroughly cleaned and all laitance removed by wire brushing, air or light sand blasting.
5. The joint shall be thoroughly clean and free from dirt and debris before the primer and the sealant are applied. Where the finished joint will be visible, masking of the adjoining surfaces shall be carried out to avoid their discoloration. The sealant shall be neatly tooled into place and its finished surface shall present a clean and even appearance.
6. All joints shall be sealed as shown on the Contract Drawings.

C. Not Used

3.02 IMPLEMENTATION

A. Construction Joints

1. Construction joints shall be as shown on the Contract Drawings where structural integrity is affected, otherwise, Contractor shall submit description of the joint and its location to the Engineer for approval.
2. Unless noted otherwise on the Contract Drawings, construction joints shall be located near the middle of the spans of slabs, beams, and girders unless a beam intersects a girder at this point. In this case, the joints in the girders shall be offset a distance equal to twice the width of the beam. Joints in

walls and columns shall be at the underside of floors, slabs, beams, or girders and the top of footings or floor slabs unless noted otherwise on the Contract Drawings. Beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at the same time as slabs. Joints shall be perpendicular to the main reinforcement.

3. Maximum distance between horizontal joints in slabs and vertical joints in walls shall be 45'-0" unless otherwise indicated on the Contract Drawings.

4. All corners shall be part of a continuous placement, and should a construction joint be required, the joint shall not be located closer than five feet from a corner.

5. Waterstop shall be provided at all joints in water retaining structures. Waterstop shall be provided at all joints below grade in walls or slabs which enclose an accessible area.

6. All reinforcing steel and welded wire fabric shall be continued across joints. Inclined dowels shall be provided as detailed or directed by the Engineer.

7. The surface of the concrete at all joints shall be thoroughly cleaned and all laitance removed. Following methods are acceptable:

   a. The use of an approved chemical retarder applied in accordance with the manufacturer's recommendations which delays but does not prevent the setting of the surface mortar. Retarded mortar shall be removed within 24 hours after placing to produce a clean exposed aggregate bonding surface.

   b. By roughening the surface of the concrete in an approved manner which will expose the aggregate uniformly and will not leave laitance, loosened particles of aggregate or damaged concrete at the surface.

8. All construction joints shall be bonded by one of the following methods:

   a. The use of an approved adhesive applied in accordance with the manufacturer's recommendations.

   b. Use of Portland cement grout of similar proportions to the mortar in the concrete in an acceptable manner.

B. Control Joints

1. Location of control joints shall be as shown on the Contract Drawings.

2. Control joints shall be formed with control joint inserts.

3. Sawcutting of control joints in lieu of forming shall not be allowed unless otherwise noted on the Contract Drawings. Where sawcutting is allowed, joints shall be sawed as soon as the concrete can support foot traffic without leaving any impression, normally the same day as concrete is placed and in no case longer than 24 hours after concrete is placed.

4. Unless noted otherwise on the Contract Drawings, depth of control joints shall be 1-1/2 inches in reinforced concrete and 1/3 of concrete thickness in unreinforced concrete.

C. Expansion Joints

1. Size and location of expansion joints shall be as shown on the Contract Drawings.

2. A center-bulb type waterstop shall be provided at all expansion joints in water-retaining structures. A center-bulb type waterstop shall be provided at all expansion joints below grade in walls or slabs which enclose an accessible area. Waterstop shall be as shown on the Contract Drawings and specified herein.

3. Expansion joint filler for use in concrete pavements and structures shall be Types I, II, or III. Expansion joint filler-for use in sidewalk and curbing shall be Type IV.

4. Reinforcement or other embedded items bonded to the concrete (except dowels in floors bonded on only one side of joint) shall not be permitted to extend continuously through any expansion joint.

D. Installation of Joints and Joint Filter

1. Type B joint sealant shall be used in all expansion and control joints in concrete except Type A joint sealant shall be used in all concrete pavements and floors subject to heavy traffic and Type C joint sealant shall be used in high corrosive areas unless otherwise specified or shown on the Contract Drawings.

2. Joint fillers and sealants shall be installed in accordance with manufacturer's recommended procedures and as shown on the Contract Drawings. Prior to sealant installation, the Contractor shall arrange to have a representative of the sealant manufacturer instruct the crew doing the work as to the proper methods of surface preparation, mixing and application of the sealant. The joint filler shall be furnished with a pressure sensitive adhesive or a separate adhesive as recommended by the manufacturer.

3. Joint filler that will be exposed after removal of forms shall be cut and trimmed to ensure a neat appearance and shall completely fill the joint except for the space required for the sealant. The filler shall be held securely in place and no concrete shall be allowed to enter the joint or the space for the sealant and destroy the proper functions of the joint.

4. A bond breaker of polyethylene film shall be used between filler and sealant. The joint shall be thoroughly clean and free from dirt and debris and shall receive a light sand blasting before the primer and the sealant are applied. Where the finished joint will be visible, masking of the adjoining surfaces shall be carried out to avoid their discoloration.

5. The primer and sealant used shall be supplied by the same manufacturer. Sealant shall not be placed without the use of a primer.

6. The sealant shall be neatly tooled into place and its finished surface shall present a clean and even appearance.

7. The depth of the sealant shall not exceed the width of the joint.

8. All sealants used in water retaining structures shall achieve final cure at least seven (7) days before the structure is filled with water.

E. PVC Waterstops

1. The design and location of PVC waterstops in construction joints and expansion joints shall be as specified herein and shown on the Contract Drawings. Splices in PVC waterstops shall be made, and molded pieces used, as recommended by the manufacturer.

2. Each piece of premolded PVC waterstop shall be of maximum practicable length in order that the number of end joints will be held to a minimum.

3. Joints shall develop effective watertightness fully equal to that of the continuous PVC waterstop material and shall permanently develop not less than 80 percent of the mechanical strength of the parent section and shall permanently retain its flexibility.

4. PVC waterstops shall be installed in the Work so that they are embedded to an equal depth in concrete on both sides of the joint in keyways as shown on the Contract Drawings and shall be kept free from oil, grease, mortar or other foreign matter. PVC waterstops shall be adequately secured against movement during the pouring of concrete. Contractor shall submit methods of PVC waterstop installation to the Engineer for approval prior to placing the concrete. Concrete adjacent to PVC waterstops shall be placed in 12 inch lifts and power vibrated to prevent honeycombing, voids and separation of aggregates at the surfaces of concrete separation joints.

   a. PVC waterstop fabrications for all changes of direction, intersections and transitions shall be made in the shop, leaving only straight butt joint splices for the field.

   b. Butt joint splices of PVC waterstop runs shall be made by heat sealing the adjacent surfaces in accordance with the manufacturer's recommendations using a thermostatically controlled electric source of heat. At least three satisfactory field splices shall be made as samples on site. The Engineer may require tests on these splices by an approved laboratory, at the Contractor's expense, to certify the tensile strength of the joint. The strength attained shall be at least 80% of the unspliced material before any is used in the work.

F. Hydrophilic Waterstop

1. Hydrophilic rubber waterstop or sealant shall be installed in accordance with the manufacturer's instructions and recommendations, except as modified herein.
2. The manufacturer shall provide technical assistance in the field.
3. The waterstop or sealant shall be located as near as possible to the center of the joint and shall be continuous around the entire joint. The minimum distance from the edge of the waterstop to the face of the member shall be 3 inches.
4. Where a hydrophilic rubber waterstop is used in combination with PVC waterstop, the hydrophilic rubber waterstop shall overlap the PVC waterstop for a minimum of 6 inches. The contact surface between the hydrophilic rubber waterstop, and the PVC waterstop shall be filled with hydrophilic sealant.
5. The hydrophilic rubber waterstop shall be installed in a bed of hydrophilic sealant, before skinning and curing begins, so that any irregularities in the concrete surface are completely filled and the waterstop is bonded to the sealant. After the sealant has cured, concrete nails, with washers of a diameter equal to the waterstop width shall be placed to secure the waterstop to the concrete at a maximum spacing of 18 inches.
6. Prior to installation of hydrophilic sealant, the concrete surface shall be wire brushed or sand blasted to remove any laitance or other materials that may interfere with the bonding. Surfaces of metal or PVC to receive sealant shall be cleaned of paint and any material that may interfere with bond. When sealant alone is shown on the Contract Documents, it shall be placed in a built-up bead which has a triangle cross section with each side of the triangle at least 3/4 inch in length, unless indicated otherwise. Concrete shall not be placed until the sealant has cured in accordance with the manufacturer's recommendations.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. PROTECTION

1. Joints and accessories shall be protected from damaging from traffic during the entire construction period. Waterstops provided for adjoining future structures shall be protected from corrosion as shown on the Contract Drawings.

END OF SECTION

SECTION 03 35 00 - CONCRETE FINISHING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all materials, labor, and equipment required to provide finishes of all concrete surfaces specified herein and shown on the Drawings.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not used.

1.04 REFERENCES

A. Definitions

1. Environmental Product Declaration - A third-party-verified International Organization for Standardization (ISO) Series 14025 Type III declaration

that quantifies environmental information on the life cycle of a product to enable comparisons between products fulfilling the same function.

B. Reference Standards:

1. New York City Building Code
2. ACI 301 - Specifications for Structural Concrete for Buildings
3. ACI 302.1R - Guide for Concrete Floor & Slab Construction
4. ACI 308.1 - Specification for Curing Concrete
5. ACI 318 - Building Code Requirements for Structural Concrete
6. ACI 347R - Guide to Formwork for Concrete
7. ISO 14025 - Environmental labels and declarations - Type III environmental declarations

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301, ACI 302.1R, ACI 308.1, ACI 318 and ACI 347R and other applicable codes.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Material certifications and technical data sheets.
2. Manufacturer's literature containing instructions and recommendations on the mixing, handling, placement, and appropriate uses for each type of material used in the Work.

B. Sustainability Submittals:

1. Environmental Product Declarations
   a. The Contractor shall provide product-specific type III Environmental Product Declaration (EPD) conforming to ISO 14025, 14044.
2. Envision Submittals
   a. The Contractor shall report information pertaining to the sustainable procurement, regional sourcing, and/or recycled content of new materials to be procured during the Work, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall coordinate with its vendor on sustainable product requirements as stipulated by the Contractor’s approved New Materials Sustainable Implementation

Plan, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall submit vendor shop drawings for review by the Engineer that clearly illustrate the vendor is meeting the requirements as approved in the Contractor's New Materials Sustainable Implementation Plan.

1.08 DELIVERY, STORAGE, AND HANDLING

A. General: Failure to comply with the following shall be sufficient cause for rejection of materials by the Engineer and his requiring its removal from the Site. Upon determination by the Engineer that the material is subject to rejection, the Contractor shall supply new material at no additional expense to the City.

B. Delivery of Materials:

1. Deliver materials in manufacturer's original unopened and undamaged containers, with all labels intact and legible at the time of use.

2. The label shall include:

a. Name of material and manufacturer.

b. Installation, handling and protection requirements.

c. Safety Data Sheet as required.

3. Deliver materials in sufficient quantities to allow uninterrupted continuity of the work, minimizing the amount of time stored prior to being used on the Site.

C. Storage of Materials:

1. Store only approved materials on project site.

2. Store materials in original, undamaged containers with manufacturer's labels and seals intact.

3. Store all materials in secure, enclosed, dry area, off the ground and away from all possible contact with water and in a location where temperature can be maintained above freezing. Protect stored materials as per manufacturer's instructions.

4. Prevent damage to materials during storage primarily by minimizing the amount of time they are stored at the Site before being incorporated into construction systems.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Concrete Floor Sealer

1. Floor sealer shall be:

a. MasterTop TC 493 330 as manufactured by Master Builders Solutions by BASF, Florham Park, NJ;

b. Superior Diamond Clear VOX as manufactured by Euclid Chemical, Cleveland, OH;

c. ArmorSeal Rexthane I as manufactured by Sherwin Williams,

d. Masterseal 330 as manufactured by Master Builders Solutions, Shakopee, MN.

e. Eucothane as manufactured by Euclid Chemical, East Brunswick, NJ.

f. Or approved equal.

B. Concrete Floor Hardener

1. Liquid Floor hardener shall be:

a. MasterKure 300 WB (Lapidolith) as manufactured by BASF, Florham Park, NJ;

b. Liquid Hard as manufactured by W.R. Meadows, Hampshire, IL;

c. Diamond Hard as manufactured by Euclid Chemical Company, Cleveland, OH;

d. Or approved equal.

2. Aggregate floor hardener shall be:

a. MasterTop 110ABR as manufactured by Master Builders Solutions, Shakopee, MN;

b. Surflex as manufactured by Euclid Chemical, East Brunswick, NJ.

c. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Concrete Floor Sealer:

1. Sealer shall be aliphatic urethane or epoxy coating with resistance to abrasion and chemical attack.

B. Concrete Floor Hardener

1. Liquid Floor hardener product and manufacturer shall be as specified in this Section.

2. Aggregate floor hardener product and manufacturer shall be non-metallic and shall be as specified in this Section.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examine substrates, areas, and conditions where concrete finishing products will be installed, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Prepare cementitious substrates according to manufacturer's published installation instructions prior to application of concrete finishing products.

3.02 IMPLEMENTATION

A. Finishes on Formed Concrete Surfaces

1. After removal of forms, the finishes described below shall be applied in accordance with – "Concrete Finish Schedule" included in this Section. Unless specified in the Contract, all surfaces shall receive at least a Type I finish. The Engineer shall be the sole judge of acceptability of all concrete finish work.

Type II - Smooth Form Finish: Concrete shall be cast against forms constructed of plywood not less than 5/8 inch thick, or of boards lined with tempered hardboard not less than 3/16 inch thick, or other approved materials. Form material shall not have torn grain, worn edges, patches of holes from previous use, or other defects which would impair the texture of the concrete surface. Form material shall utilize sheets as large as practicable in an orderly and symmetric configuration. Other aspects of the finish shall conform to the requirements of the rough form finish.

B. Slab and Floor Finishes

1. The finishes described below shall be applied to floors, slabs, flow channels and top of walls in accordance with – "Concrete Finish Schedule" included in this Section. The Engineer shall be the sole judge of acceptability of all such finish work.

a. Type "D" - Troweled: Following completion of a Type "C" finish and sufficient hardening of the concrete to prevent excess fine

material from working to the surface, the surface shall be compacted and smoothed with a power trowel. Following the power trowel, hand trowel to provide a smooth, dense surface, free from defects, trowel marks, and blemishes. For surfaces exposed to wear as indicated in the Contract Documents, continue hand troweling until a ringing sound is produced as the floor is troweled.

C. Sealing of Concrete Floor

1. After installation of all equipment and piping, and after completion of other related construction activities, all floor slabs which are to remain unpainted and not intended to be immersed, and all equipment pads, shall be sealed with a floor sealer unless the slab has had liquid hardener applied or stated otherwise. Remove all dirt, droppage, grease, asphalt or other foreign matter with caustics and detergents as required prior to application. Sealer shall be applied in accordance with the manufacturer's recommendations.

D. Finishes on Equipment Pads

1. Formed surfaces of equipment pads shall receive a Type II finish.

2. Top surfaces of equipment pads, except those surfaces subsequently required to receive non-shrink grout and support equipment bases, shall receive a Type "D" finish, unless otherwise noted. Surfaces which will later receive non-shrink grout shall, before the concrete takes its final set, be made rough by removing the sand and cement that accumulates on the top to the extent that the aggregate will be exposed with irregular indentations in the surface up to 1/2 inch deep.

E. Concrete Finish Schedule

Item	Finish Type
All concrete surfaces not exposed to public view including utility spaces	I
All exterior surfaces and interior vertical surfaces exposed to public view	IV
All interior overhead surfaces exposed to public view and interior walls of tanks	II
Surfaces to be painted	III
Surfaces to receive bonded cementitious mixtures	B
Drives, interior stairs, surfaces to receive waterproofing, roofing insulation, or terrazzo, and floors of tanks	C
Floors for walking surfaces in manufacturing, storage, and warehousing areas, and floors to receive coverings	D

Item	Finish Type
Sidewalks	E
Garage and storage area floors	F or G
Exterior stairs, platforms, landings and ramps and interior ramps	E or H

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 03 42 00 – PRECAST CONCRETE UNDERGROUND UTILITY TRENCH SYSTEM
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish and install the complete precast concrete underground utility trench system as indicated on the Contract Drawings. Work shall include all labor, materials, hardware, equipment, transportation, and services required for the proper fabrication, delivery, placement, alignment, and connection of precast trench components. This includes all joint sealing, anchoring, and any special work necessary to ensure structural integrity, watertightness, and compliance with project requirements. The Contractor shall provide all accessories, covers, frames, and fittings required for a fully functional trench system, and shall perform all work in accordance with this Section and as approved by the Engineer for a complete installation.

B. The following index of this Section is presented for convenience:

C.

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the

applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used.

1.04 REFERENCES

A. ASTM A283 - Low and Intermediate Tensile Strength Carbon Steel Plates

B. ASTM A1011 - Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

1.05 DESCRIPTION

A. A. Design Requirements

1. 1. Concrete shall conform to Sections 03 30 00 – Cast-in-Place Concrete and 03 41 00 – Precast Structural Concrete, and when tested at the end of 28 days shall have the following minimum compressive strengths:

a. CONCRETE TRENCH BOXES - 5,000 psi

1.06 QUALITY ASSURANCE

A. General: Provide concrete fittings and specials that are precast or machine made and are the product of a company that can demonstrate by tests and installation records satisfactory experience in manufacturing concrete pipe of the quality and type specified.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. All sizes and classes of fittings and specials and for concrete sills showing dimensions, strength and materials specifications and standards, joint details and reinforcement position

2. Area of all cages of reinforcing steel

3. Angle of the joint

4. Length and thickness of joint

5. Manufacturer, size and type of gasket

6. Manufacturer's recommendations for gap dimension and tolerance for a properly installed joint

7. Signature and title of authorized representative of the manufacturer

8. All requirements of the latest ASTM Specifications as called for in these specifications will be complied with in the manufacture of the trench box

B. Quality Control: Submit certified results of all shop tests for approval.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Trenwa, Inc., Fort Thomas, KY;

B. Concast, Inc., Zumbrota, MN;

C. Oldcastle Infrastructure, Middle Island, NY;

D. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Steel Protective Plate Cover over Trench Box:

1. Protective plates are required for all new chemical piping installations.

2. Each plate size shall be 1/4" x 4' x 8'.

3. All protective plates and cover shall be overlapped a minimum of 3-inches.

B. Sikaflex-1a One Part Polyurethane, Elastomeric Sealant/Adhesive

1. Or approved equal.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Reinforced Concrete Fittings and Specials

1. General: Provide reinforced concrete fittings and specials where shown, specified or required, and manufactured in accordance with the applicable sections of the respective standard.

2. Strength: Retain a Registered Professional Engineer, licensed in the State of New York to prepare, sign and seal all designs for fittings and specials.

B. Concrete Trench Boxes for Chemical Pipe Protection:

1. The trench system will consist of precast concrete U-shaped bases and removable covers, installed in earth trenches with covers.
2. All sections of trench designated for road crossing use will be designed to carry HS40, 64,000 pounds axle loading.
3. The trench shall have an interior clear cross-sectional area as shown in drawings.
4. The precast U-shaped bases for the trench will be furnished in standard 10 foot lengths, except that special lengths will be furnished where required by the layout on the drawings. The U-shaped bases will be solid bottom. The trench shall not require cross braces to support the walls during backfilling.
5. The covers will have slots for lifting tools and will be made of Fiber and Steel Reinforced Concrete.
6. The precast trench system shall be designed and constructed so that neither the covers, nor temporary side-to-side braces need to be installed to facilitate installation or subsequent machine backfilling and tamping.
7. Trench boxes will be sealed along all joints to prevent water from entering.
8. Double containment piping should be installed such that any joints are located toward the middle of each trench box, keeping at least 12” away from the edge of the trench box. Contractor should provide an as-built drawing of the location of joints.
9. Piping and conduit supports shall be furnished within the trench boxes.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT THIS PAGE

SECTION 03 45 00 – PRECAST ARCHITECTURAL CONCRETE
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Precast architectural concrete and cast stone as specified herein shall include precast concrete wall panels, and all accessories necessary.

B. Precast architectural concrete and cast stone wall panels shall be provided where shown on the Contract Drawings, specified in the Contract, or as required for a complete installation.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 03 21 00 - Reinforcing Steel

B. Section 03 30 10 - Low Carbon Cast-in-Place Concrete

C. Section 03 35 00 - Concrete Finishing

1.04 REFERENCES

A. Definitions

1. Environmental Product Declaration - A third-party-verified International Organization for Standardization (ISO) Series 14025 Type III declaration that quantifies environmental information on the life cycle of a product to enable comparisons between products fulfilling the same function.

B. Reference Standards

1. Building Code of the City of New York
2. AC1 318 - Building Code Requirements for Reinforced Concrete
3. AWS D1.4 - Structural Welding Codes – Reinforcing Steel
4. ASCE 7 - Minimum Design Loads for Buildings
5. ASTM A36 - Specification for Carbon Structural Steel
6. ASTM A153 - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
7. ASTM A325 - Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
8. ASTM A276 - Specification for Stainless and Heat-Resisting Steel Bars and Shapes
9. ASTM A615 - Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement
10. ASTM A666 - Specification for Austenitic Stainless Steel, Sheet, Strip, Plate and Flat Bar for Structural Application
11. ASTM C33 - Specification for Concrete Aggregates
12. ASTM C138 - Test method for Unit Weight, Yield, and Air Content of Concrete
13. ASTM C150 - Specification for Portland Cement
14. ASTM C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volume Method
15. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

16.	ASTM C260	-	Standard Specification for Air-Entraining Admixtures for Concrete
17.	ASTM C270	-	Standard Specification for Mortar for Unit Masonry
18.	ASTM C330	-	Standard Specification for Lightweight Aggregates for Structural Concrete
19.	ASTM C494	-	Standard Specification for Chemical Admixtures for Concrete
20.	ASTM C 618	-	Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Concrete
21.	ASTM C 666	-	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
22.	ASTM C 979	-	Standard Specification for Coloring Pigments for Integrally Pigmented Concrete
23.	ASTM C 989	-	Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete
24.	ASTM C 1194	-	Standard Test Method for Compressive Strength of Architectural Cast Stone.
25.	ASTM C 1195	-	Standard Test Method for Absorption of Architectural Cast Stone
26.	ASTM C 1364	-	Standard Specification for Architectural Cast Stone
27.	ASTM D 2244	-	Standard Test Method for Calculation of Color Differences from Instrumentally Measured Coordinates
28.	Cast Stone Institute Technical Manual		
29.	ISO 14025	-	Environmental labels and declarations - Type III environmental declarations
30.	PCI MNL 117	-	Precast/Prestressed Concrete Institute, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products"
31.	PCI MNL 120	-	Precast/Prestressed Concrete Institute "PCI

Design Handbook," latest edition

1.05 DESCRIPTION

A. Load Calculations: Precast and cast stone units shall be detailed and fabricated to withstand loads as calculated in accordance with the Building Code of the City of New York, and erection forces. Structural properties of the units shall be calculated in accordance with ACI 318.

B. Dimensions and Tolerances: Cast stone units shall be fabricated to dimensional tolerances in accordance with Cast Stone Institute Design Manual.

C. Design of wall panels shall account for all openings shown on the Contract Drawings. Design shall also allow for field trimming of up to ½ inch around openings and edges of wall panels if needed for clearance during installation.

1.06 QUALITY ASSURANCE

A. Cast Stone Manufacturer:

1. A current producer member of Cast Stone Institute, with a minimum of 10 years of experience in producing cast stone of types required for project.

2. Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of cast stone required in accordance with the project schedule.

3. Manufacturer shall submit a written list of projects similar in scope and at least three (3) years of age, along with owner, architect and contractor references.

4. Standards: Comply with the requirements of the Cast Stone Institute Technical Manual and the project specifications. Where a conflict may occur, the contract documents shall prevail.

5. Mock-up:

a. Provide full size unit(s) for use in construction of sample wall. The approved mock-up shall become the standard for appearance and workmanship for the project.

B. Quality-Control Standard: Comply with Cast Stone institute Technical Manual.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.4, "Structural Welding Code--Reinforcing Steel".

1.07 SUBMITTALS

A. The Contractor shall prepare and submit Shop Drawings and reference materials for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Fabricator Qualifications: Cast stone fabricator shall submit producer member of Cast Stone Institute documentation and a list of five successfully completed precast jobs in the least five years old. Include a detailed

description of the fabricated item, project name, location, general contractor, and architect or engineer.

2. Installer Qualifications: Submit a list of five successfully completed cast stone jobs in the least five years old similar to those required for this Contract.
3. Catalog cuts, drawings,
4. Shop Drawing: Placing drawings, including checked Shop Drawings for manufacture and erection of cast stone wall panels shall indicate:
5. Unit shapes, including elevations and sections, member piece marks and dimensions
6. Plans and elevations locating and defining all products furnished by the manufacturer
7. Finishes
8. Relationship to adjacent materials
9. Reinforcement, joint and connection details
10. Erection sequence and handling requirements
11. Lifting and erection inserts
12. All dead, live and applicable loads used in the design
13. Location, dimensional tolerances, and details of anchorage devices that are embedded in or attached to structure or other construction
14. Other items cast into panels
15. Handling procedures, plans and/or elevations showing panel location and sequence of erection for special conditions
    a. Location where field drilling or cored opening are permitted

B. Samples: The following shall be submitted:

1. Samples shall be representative of finished exposed face showing typical range of color and texture. Samples shall be submitted and approved prior to commencement of manufacture.
2. Building Base Sample size: 12 inches wide by full height by thickness indicated on the Contract Drawings, representative of the proposed finished product

C. Quality Control Submittals: The following items shall be submitted:

1. Concrete mix designs
2. Test reports for laboratory cured concrete cylinders
3. Air content tests in accordance with ASTM C 138 submitted with mix design

4. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

D. Mock-up:

1. Supply initial production for job site assembly showing each finish, corner and special condition for cast stone unit in wall. Minimum size 8 foot 0 inches wide by 12 foot 0 inches high of complete wall assembly (Cast stone, CMU, Metal Wall Panel, and Brick). Assembly shall be approved by the Engineer prior to fabrication of remaining panels. Remove mock-up after completion and approval of cast stone work on building by Engineer.

E. Sustainability Submittals:

1. Environmental Product Declarations

a. The Contractor shall provide product-specific type III Environmental Product Declaration (EPD) conforming to ISO 14025, 14044.

2. Envision Submittals

a. The Contractor shall report information pertaining to the sustainable procurement, regional sourcing, and/or recycled content of new materials to be procured during the Work, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall coordinate with its vendor on sustainable product requirements as stipulated by the Contractor's approved New Materials Sustainable Implementation Plan, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall submit vendor shop drawings for review by the Engineer that clearly illustrate the vendor is meeting the requirements as approved in the Contractor's New Materials Sustainable Implementation Plan.

1.08 DELIVERY, STORAGE, AND HANDLING

A. All cast stone materials and appurtenances shall be properly protected in accordance with the manufacturer's requirements so that no damage or deterioration will occur from the time of shipment until installation is completed. All products and materials shall be delivered, stored and handled as follows:

1. Delivery: All cast stone units shall be delivered to the project site in such quantities and at such times to maintain continuity of erection.

a. Mark production units with the identification marks as shown on the shop drawings.

b. Package units and protect them from staining or damage during shipping and storage.

c. Provide an itemized list of product to support the bill of lading.

2. Orientation During Transport: Units shall be handled and transported in a position consistent with their shape and design in order to avoid stresses which could cause cracking or damage.

3. Equipment and Personnel: Transportation, site handling and erection shall be accomplished using acceptable equipment and methods by qualified personnel so that units shall not be damaged.

4. Lifting: Units shall be lifted or supported only at the points shown on the Shop Drawings.

5. Spacers: Nonstaining resilient spacers of even thickness shall be placed between each unit.

6. Support: Units shall be supported during shipment and storage on nonstaining shock-absorbing material.

7. Storage: Units shall be stored and protected so as to prevent contact with soil, staining, or physical damage.

   a. Units shall be stored on firm, level, and smooth surfaces to prevent cracking, distortion, warping or other physical damage.

   b. Stored units shall be placed so that identification marks are discernible, and so that product can be inspected.

   c. Units shall not be placed directly on ground.

   d. Stacked cast stone units shall be separated by battens across full width of each bearing point.

   e. The top of tier stack shall not be used as storage.

B. Factory assembled parts and components shall not be dismantled for shipment unless written permission is received from the Engineer.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Manufacturer shall warrant that cast stone wall panel units will not spall or show evidence of visible cracking beyond accepted industry standards, splitting, deformation, or loosening resulting from inferior materials or workmanship by this trade for a period of one (1) year effective from the date of the substantial completion of the cast stone erection. Cast stone units showing such defects will be repaired or replaced at the Engineer's option and made acceptable to industry standards.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide cast stone units and panels as manufactured by:

1. American Artstone Company, New Ulm, MN.
2. Advanced Cast Stone, Forth Worth, TX.
3. Or approved equal

2.02 MATERIALS / EQUIPMENT

A. Stone Materials:

1. Portland cement - Type I or Type III, white and/or grey, ASTM C 150.
2. Coarse aggregates - Granite, quartz or limestone, ASTM C 33, except for gradation.
3. Fine aggregates - Manufactured or natural sands, ASTM C 33, except for gradation.
4. Colors - Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.
5. Admixtures - Comply with the following:
    a. ASTM C 260 for air-entraining admixtures.
    b. ASTM C 494/C 495M Types A - G for water reducing, retarding, accelerating and high range admixtures.
    c. Other admixtures: integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
    d. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.
    e. ASTM C 989 granulated blast furnace slag may be used to improve physical properties. Tests are required to verify these features.
6. Water – Potable
7. Reinforcing bars:

B. Reinforcing

1. Reinforce the units as required by the drawings and for safe handling and structural stress.
2. Minimum reinforcing shall be 0.25 percent of the cross section area.
3. Reinforcement shall be non-corrosive where faces exposed to weather are covered with less than 1.5 inches of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.
4. Panels, soffits and similar stones greater than 24 inches in one direction shall be reinforced in that direction. Units less than 24 inches in both their length and width dimension shall be non-reinforced unless otherwise specified.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. General: Cast stone shall be manufactured in accordance with ACI-533. Fabricate panels straight, smooth and true to size and shape with exposed edges and corners precise and square.

B. Physical Properties: Provide the following:

1. Compressive Strength - ASTM C 1194: 6,500 psi minimum for products at 28 days.

2. Absorption - ASTM C 1195: 6% maximum by the cold-water method, or 10% maximum by the boiling method for products at 28 days.

3. Air Content – ASTM C173 or C 231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for VDT products.

4. Freeze-Thaw – ASTM C 1364: The CPWL shall be less than 5% after 300 cycles of freezing and thawing.

5. Linear Shrinkage – ASTM C 426:

6. Shrinkage shall not exceed 0.065%.

C. Manufacturing Tolerances

1. Cross section dimensions shall not deviate by more than ±1/8 inches from approved dimensions.

2. Length of units shall not deviate by more than length/ 360 or ±1/8 inches, whichever is greater, not to exceed ±1/4 inches.

a. Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.

3. Warp, bow or twist of units shall not exceed length/ 360 or ±1/8 inches, whichever is greater.

4. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features – On formed sides of unit, 1/8 inches, on unformed sides of unit, 3/8inches maximum deviation.

D. Curing:

1. Cure units in a warm curing chamber approximately 100ºF at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 70ºF for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350 degree-days (i.e. 7 days @ 50°F or 5 days @ 70°F) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

E. Color and Finish:

1. Match sample on file in architect’s office.

a. Match Cast Stone Institute color Cream, unless otherwise noted.

2. All surfaces intend to be exposed to view shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32 in. (0.8 mm) and the density of such voids shall be less than 3 occurrences per any 1 square inches and not obvious under direct daylight illumination at a 5 feet distance.

3. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft distance.

a. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.

1) Total color difference – not greater than 6 units.

2) Total hue difference – not greater than 2 units.

4. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under direct daylight illumination from a 20-ft distance.

5. The occurrence of crazing or efflorescence shall not constitute a cause for rejection.

6. Remove cement film, if required, from exposed surfaces prior to packaging for shipment.

F. Openings:

1. Other openings shall be located and field drilled or cut by the trade after erection. Openings shall be approved by both Engineer and precaster before drilling or cutting.

G. Patching: Shall be acceptable providing the structural adequacy of the product and the appearance are not impaired.

H. Damaged, chipped or discolored units shall be replaced, patched or refinished as directed by the Engineer, and to their approval.

I. Testing.

1. Test compressive strength and absorption from specimens selected at random from plant production.

2. Samples shall be taken and tested from every 500 cubic feet of product produced.

3. Perform tests in accordance ASTM C 1194 and C 1195.

4. New and existing mix designs shall be tested for strength and absorption compliance prior to producing units.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. The Contractor shall verify that areas to receive cast stone units and panels are properly prepared and completed to final elevations as shown on the Contract Drawings.

1. Installing contractor shall check cast stone materials for fit and finish prior to installation. Do not set unacceptable units.

B. Examine substrates and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Cast stone shall be installed in accordance with the manufacturer's recommendations and approved Working Drawings.

B. Tolerances:

1. Comply with Cast Stone Institute Technical Manual.

2. Set stones 1/8 inches or less, within the plane of adjacent units.

3. Joints, plus - 1/16 inches, minus - 1/8 inches.

C. Jointing:

1. Joint size:

a. stone/brick joints 3/8 inches.

b. At stone/stone joints in vertical position 3/8inches.

c. Stone/stone joints exposed on top 3/8 inches.

2. Joint materials:

a. Mortar, Type N, ASTM C 270.

b. Use a full bed of mortar at all bed joints.

c. Flush vertical joints full with mortar.

d. Leave all joints with exposed tops or under relieving angles open for sealant.

e. Leave head joints in copings and projecting components open for sealant.

3. Location of joints:

a. As shown on shop drawings.

b. At control and expansion joints unless otherwise shown.

D. Setting:

1. Drench units with clean water prior to setting.
2. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
3. Set units in full bed of mortar, unless otherwise detailed.
4. Rake mortar joints 3/4 inches in. for pointing.
5. Remove excess mortar from unit faces immediately after setting.
6. Tuck point unit joints to a slight concave profile.

E. Temporary Supports: Temporary supports and bracing shall be provided as required to maintain position, stability and alignment as units are being permanently connected.

F. Setting Units: Non-loadbearing units shall be set dry without mortar. Specified joint dimensions shall be attained with 300 series stainless steel or plastic spacing shims.

G. Removal of Temporary Devices: Temporary lifting and handling devices cast into the cast stone units shall be completely removed. If protectively treated, however, devices not visible in the finished Work may be left in place only where they do not interfere with the work of any other trade.

H. All anchors, cramps, dowels and similar ties shall be furnished and set for proper erection.

I. All joints shall be a uniform thickness.

J. Site access: General contractor shall be responsible for providing suitable access to the building, proper drainage and firm, level bearing for the hauling and erection equipment to operate under their own power.

K. Anchor cast stone units in position by doweling, clip angles, grouting, or as otherwise indicated.

L. Clean exposed surfaces of cast stone units after erection to remove weld marks, other markings, dirt, and stains caused by the erector. If other trades cause damage, marks, dirt, or stains they shall be liable for the costs of cleaning or repair.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Repair

1. Repair chips with touchup materials furnished by manufacturer.
2. Saturate units to be cleaned prior to applying an approved masonry cleaner.

3. Consult with manufacturer for appropriate cleaners.

B. Protection

1. Protect precast cast stone units from all damage and abuse from all other Contractors and installers involved in the Work until Final Acceptance by the City.

C. Cleaning

1. After installation and joint treatment, cast stone surfaces shall be cleaned with detergent and water, using soft fiber brushes and sponges. Units shall be rinsed thoroughly with clean water in accordance with the cast stone manufacturer's recommendation. Cleaning materials and processes shall be used which will not change the character or color of exposed concrete finishes.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 03 60 00 - GROUTING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish all materials, labor, and equipment required to provide all grout used in concrete work and as bearing surfaces for base plates as specified herein and shown on the Contract Drawings.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete.

1.04 REFERENCES

A. Definitions

1. Environmental Product Declaration - A third-party-verified International Organization for Standardization (ISO) Series 14025 Type III declaration that quantifies environmental information on the life cycle of a product to enable comparisons between products fulfilling the same function.

B. Reference Standards

1.	ASTM C109	-	Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inch or 50 mm Cube Specimens).
2.	ASTM C531	-	Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts and Monolithic Surfacings.
3.	ASTM C579	-	Test Method for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfacings.
4.	ASTM C939	-	Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
5.	ASTM C1107	-	Packaged Dry, Hydraulic Cement Grout (Nonshrink).
6.	CRD-C 621	-	Corps of Engineers Specification for Non-shrink Grout.
7.	ISO 14025	-	Environmental labels and declarations - Type III environmental declarations

1.05 DESCRIPTION

A. Services of Manufacturer’s Representative

1. The Contractor shall provide the services of a qualified manufacturer's technical representative who shall instruct the Contractor's personnel in the mixing, proper use and application of the non-shrink grout and epoxy grout.

2. The manufacturer's representative shall provide written certification that materials have been mixed and applied properly and surfaces to receive these products have been prepared properly, all in conformance with manufacturer's requirements.

3. The on-site time required for the manufacturer's representative to achieve a successful installation shall be at the expense of the Contractor. The manufacturer's representative shall sign in and out at the office of the

Resident Engineer and provide written verification of the areas he has approved on each day he is at the project.

B. Grout Uses

1. The different types of grout shall be used for the applications stated below unless noted otherwise specified herein or on the Contract Drawings. Where grout is called for in this Section or on the Contract Drawings which does not fall under any of the applications stated below, non-shrink grout shall be used.

   a. Cement grout shall be used for grout toppings and for patching of fresh concrete.

   b. Non-shrink grout shall be used for grouting beneath base plates of equipment and structural metal framing.

   c. Epoxy grout shall be used for bonding new concrete to hardened concrete.

2. New concrete surfaces to receive cement grout shall be as specified in Section 03 30 00 – Cast-in-Place Concrete, and shall be cleaned of all dirt, grease and oil-like films.

   a. Existing concrete surfaces shall likewise be cleaned of all similar contamination and debris, 4 protection of cement grout shall be as specified in Section 03 30 00 – Cast-in-Place Concrete.

   b. Curing and protection of cement grout shall be as specified in Section 03 30 00 – Cast-in-Place Concrete.

3. All mixing, surface preparation, handling, placing, consolidation, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.

1.06 QUALITY ASSURANCE

A. Testing Agency:

1. Testing of materials and of resulting grout for compliance with the technical requirements of the specification will be performed by QA/QC consultant employed and paid by the City.

   a. The Contractor shall be charged by the City for the cost of any additional tests and investigation on work performed which does not meet the specifications.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Shop drawings shall include, but not be limited to:

1. Material certifications and technical data sheets.

2. Samples of all materials to be used.

B. The Contractor shall also submit the following:

1. Certified test results verifying the compressive strength, shrinkage and expansion requirements specified herein.

2. Manufacturer's literature containing instructions and recommendations on the mixing, handling, placement and appropriate uses for each type of grout used in the work.

C. Sustainability Submittals:

1. Environmental Product Declarations

a. The Contractor shall provide product-specific type III Environmental Product Declaration (EPD) conforming to ISO 14025, 14044.

2. Envision Submittals

a. The Contractor shall report information pertaining to the sustainable procurement, regional sourcing, and/or recycled content of new materials to be procured during the Work, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall coordinate with its vendor on sustainable product requirements as stipulated by the Contractor's approved New Materials Sustainable Implementation Plan, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall submit vendor shop drawings for review by the Engineer that clearly illustrate the vendor is meeting the requirements as approved in the Contractor's New Materials Sustainable Implementation Plan.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Epoxy grout:

1. Sikadur 32 Hi-Mod as manufactured by Sika Corporation, Lyndhurst, NJ.

2. Euco #452 as manufactured by Euclid Chemical, East Brunswick, NJ.

3. Duralcrete LV as manufactured by Tamms Industries, Kirkland, IL.

4. Or approved equal.

B. Non-shrink grout shall be:

1. Euco N-S as manufactured by Euclid Chemical Company, East Brunswick, NJ.

2. Masterflow 713 as manufactured by Master Builders Solutions, Shakopee, MN.

3. Sikagrout 212 as manufactured by Sika Corporation, Lyndhurst, NJ.

4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Cement Grout

1. Cement grout shall be composed of Portland cement, sand and water. The sand to be used shall be selected to suit the spacing for placement. Where sand is not usable, the grout shall be composed of cement and water only.

2. Gradation of sand and mix proportioning shall be in accordance with the following table for grouts using natural sands and having a minimum 28-day compressive strength of 4,000 psi. For higher strength grouts or those using manufactured sands, strength shall be established by trial mixes.

a. Gradation for Natural Sand:

Sieve Size	Spaces less than one (1) inch	Spaces one (1) inch or more
Passing 3/8		100
Passing 4	100	95-100
Passing 8	95-100	80-100
Passing 16	70-100	50-85
Passing 30	40-75	25-60
Passing 50	10-35	10-30
Passing 100	2-15	2-10
Passing 200	--	--

b. Mix Proportioning:

By Weight	Non-Air Entrained Grouts (Maximum 4 Percent Entrapped Air)		Air Entrained Grouts (Air 8 Percent to 10 Percent)	
	Spaces less than one (1) inch	Spaces one (1) inch or more	Spaces less than one (1) inch	Spaces one (1) inch or more
Cement (bags)	10.8	10.5	11.3	11.0
Sand (lb)	2150	2240	1930	1990
Maximum water (gals)	59.5	57.8	57.5	55.8
Maximum water (gals per bag)	5.5	5.5	5.1	5.1

By Volume	Non-Air Entrained Grouts (Maximum 4 Percent Entrapped Air)		Air Entrained Grouts (Air 8 Percent to 10 Percent)	
	Spaces less than one (1) inch	Spaces one (1) inch or more	Spaces less than one (1) inch	Spaces one (1) inch or more
Cement	1	1	1	1
Sand (dry rodded)	1.85	2.10	1.6	1.7
Sand (damp & loose)	2.30	2.35	2.0	2.1
Maximum water (gals per bag)	5.5	5.5	5.1	5.1

3. Water shall be kept to a minimum, the amounts noted in the preceding table are the maximum for grout. Proportioning by volume shall be limited to small quantities mixed at the job site.

4. White Portland cement shall be mixed with the Portland cement as required to match the color of adjacent concrete.

B. Non-Shrink grout

1. The grout material shall be an approved ready to use mixture requiring only water for use at the job site. The compressive strength of 2-inch cubes shall be 3,000 psi at 7 days.

2. Non-shrink grout shall conform to CRD-C 621 and ASTM C1107, Grade B or C when tested at a maximum fluid consistency of 30 seconds per ASTM C939 at temperature extremes of 45 degrees Fahrenheit and 90 degrees Fahrenheit and an extended working time of 15 minutes.

3. Non-shrink grout product and manufacturer shall be as specified in this Section.

4. Non-shrink grouts depending on oxidation to limit shrinkage and containing additives such as iron or steel particles shall not be used.

C. Epoxy Grout

1. Epoxy grout shall be modified as required for each particular application with aggregate per manufacturer's instructions.

2. Epoxy grout product and manufacturer shall be as specified in this Section.

D. Dry Pack

1. Dry pack (to be packed or tamped in place) shall be made at no slump consistency.

2. When mixing the batch, only enough water shall be added to the dry materials to produce a rather stiff mixture, then additions of water may be made in small increments until the desired consistency is obtained.

E. Curing Materials

1. Curing materials for cement grout shall be as specified in Section 03 30 00 – Cast-in-Place Concrete and as recommended by the manufacturer for prepackaged grouts.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Installation

1. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency shall be such that the grout is plastic and moldable but will not flow.
2. Measurements for cement grout shall be made accurately by weight or by volume using containers. All measurements shall be made in a manner satisfactory to the Engineer. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.
3. Grout shall be placed quickly and continuously, shall completely fill the space to be grouted, be thoroughly compacted and free of air pockets. The grout may be poured in place, pressure grouted by gravity, or pumped.
4. For grouting beneath base plates, grout shall be poured from one side only and shall flow across to the open side to avoid air-entrapment.
5. The use of pneumatic pressure or dry-packed grouting requires approval of the Engineer.

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Tests:

1. Compression test specimens will be taken during construction from the first placement of each type of grout and at intervals thereafter as selected by the Engineer to insure continued compliance with these Specifications.
2. Compression tests and fabrication of specimens for cement grout and non-shrink grout will be performed as specified in ASTM C109 at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at seven days, 28 days and any additional time period as appropriate.
3. Compression tests and fabrication of specimens for epoxy grout shall be performed as specified in ASTM C579, Method B, at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at seven days and any other time period as appropriate.

B. All grout which has already been placed and which fails to meet the requirements of this Section is subject to removal and replacement by the Contractor at no additional cost to the City.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 04 05 00 – COMMON WORK RESULT FOR MASONRY
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Mortar and masonry grout as specified herein include, but are not limited to, Portland Cement, lime, sand, coarse aggregate, admixtures for use in mortar and masonry grout, and appurtenances.

B. Mortar and masonry grout shall be provided as indicated on the Contract Drawings, specified herein, or as required for a complete installation.

C. The Contractor shall implement practices and procedures to meet the project's sustainability goals as identified in the Contract Documents. The Contractor shall ensure that the sustainability requirements of this Section are implemented to the fullest extent.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 04 22 00 - Concrete Unit Masonry

1.04 REFERENCES

A.	ASTM C91	-	Standard Specifications for Masonry Cement
B.	ASTM C144	-	Standard Specification for Aggregate for Masonry Mortar
C.	ASTM C150	-	Standard Specification for Portland Cement
D.	ASTM C207	-	Standard Specification for Hydrated Lime for Masonry Purposes
E.	ASTM C270	-	Standard Specification for Mortar for Unit Masonry
F.	ASTM C404	-	Standard Specification for Aggregates for Masonry Grout
G.	ASTM C476	-	Standard Specification for Grout for Masonry
H.	ASTM C595	-	Standard Specification for Blended Hydraulic Cement
I.	ASTM C780	-	Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
J.	ASTM C1329	-	Standard Specification for Motor Cement
K.	ASTM C1019	-	Standard Test Method for Sampling and Testing Grout
L.	NYCBC	-	Section BC 2103 Masonry Construction Materials, BC 2104 Construction

1.05 DESCRIPTION

A. Where questions of compliance with the requirements of this Section arise, the specifications for mortar properties shall take precedence over the specification for mortar proportions.

B. No change shall be made in the proportions established for mortar approved under the specifications for mortar properties nor shall material with different physical characteristics be utilized in mortar used in the work unless compliance with the specifications for mortar properties are re-established by Shop Drawing data submission to Engineer.

C. Two different air-entraining materials shall not be combined in mortar or grout.

D. Sustainable Design Requirements:

1. Recycled Content of Mortar and Masonry Grout Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 15 percent.

E. Project-specific system/ design requirements will be provided in the Contract, if necessary, to supplement requirements given herein or Contract Drawings.

1.06 QUALITY ASSURANCE

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

C. The Contractor shall engage an independent testing agency to conduct tests specified herein and as follows:

1. Mortar: Mortar tests shall be performed in accordance with ASTM C270.

2. Grout: Grout tests shall be performed in accordance with ASTM C1019.

D. Requirements of Regulatory Agencies: Wherever a fire-resistance classification is shown or scheduled for unit masonry construction (4-hour, 3-hour and similar designations), proportion mortar and masonry grouts to comply with the requirements established by UL and other governing authorities having jurisdiction at the Project Site

1.07 SUBMITTALS

A. The Contractor shall submit the Shop Drawings for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Product Data: Manufacturer's specifications and installation instructions for proprietary materials.

2. Certificates: Notarized certificates that the following comply with the specified requirements:

a. Portland Cement

b. Hydrated lime

c. Mortar and grout aggregates

3. Design Mix: Certified design mix for mortar and grout.

4. Test Results: Results of mortar and grout tests as specified herein and as specified in referenced standards.

5. Samples:

a. Each type of colored mortar in metal channels at least 6-inches long, showing the range of color that can be expected in the finished work.

b. Complete selection of standard and custom colors of epoxy grout used for pointing mortar, for final selection by Engineer.

c. Label samples to indicate type and amount of colorant used. Engineer's review will be for color only. Compliance with all other requirements is the responsibility of Contractor.

6. Construction: Weight slips for grout materials at time of delivery.

7. Schedule of locations where each mortar and grout type will be used in the work.

B. Sustainable Design Submittals:

1. Environmental Materials Reporting Form (EMRF) Recycled Content. Provide the following information:

a. Name of Product and Manufacturer.

b. Material cost breakdowns. Cost breakdowns must include total material-only cost (excluding installation, labor and equipment).

c. The percentage (by weight) of post-consumer and pre-consumer recycled content.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Materials shall not be delivered to the Site before the time of installation.

2. Materials delivered and stored at the Site shall be from approved manufacturers and sources only.

3. Materials shall be delivered in sufficient quantities to allow continuity of the work.

B. Storage of Materials:

1. Materials shall be stored in original, undamaged containers with manufacturer's labels and seals intact.

2. Cement shall be stored in weathertight containers that exclude moisture and contaminants.

3. Hydrated lime shall be stored in weathertight containers that exclude moisture and contaminants.

4. Aggregates shall be kept clean and free from other materials during transportation and handling. Aggregate shall be stockpiled in a manner to prevent segregation.

5. Damage to materials during storage shall be prevented primarily by minimizing the amount of time they are stored at the Site before being incorporated into construction systems.

C. Handling of Materials:

1. Materials shall be handled in such a manner to avoid damage or breakage.

2. Materials shall not be exposed to detrimental conditions or physical damage. Materials which are so exposed shall be removed from the Site and shall not be incorporated into the work.

3. Materials shall be handled in such a manner to prevent inclusion of contaminants.

4. Packages or containers shall not be opened until all preparatory work is complete and installation is to begin immediately. Materials shall not be allowed to become wet or soiled or covered with ice or snow.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mortar and masonry grout materials shall be as manufactured by:

1. Spec Mix, Minneapolis, MN.

2. Amerimix, Atlanta, GA.

3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Portland Cement:

1. Provide Type I or III Portland Cement that conforms to the requirements of ASTM C150.

2. Provide nonstaining Portland Cement of natural color or of the color required to be compatible with the required colored mortar pigment selected by Engineer.

B. Hydrated Lime: Provide Type S hydrated lime that conforms to the requirements of ASTM C207.

C. Sand for Mortar: Provide natural sand that conforms to the requirements of the following:

1. ASTM C144, except for joints less than 1/4 inch use aggregate graded with 100 percent passing the No. 16 sieve.

2. White Mortar Aggregates: Provide natural white sand or ground white stone for Portland cement-lime mortars, as required for compatibility with mortar colors selected by Engineer.

3. Colored Mortar Aggregates: Provide ground marble, granite or other sound stone, as required to match the sample approved by Engineer for Portland Cement-lime mortars.

D. Aggregates for Grout: Provide fine and coarse aggregates that conform to the requirements of ASTM C404, ASTM C476.

E. Coloring Additive: A mineral-oxide pigment, harmless to mortar set and strength shall be provided. Colors shall be as selected by the Engineer.

F. Epoxy Pointing Mortar:

1. Provide a two-component non-sag epoxy resin and hardener with mineral filler complying with ANSI A118.3.

2. Colors: Complete selection of standard and custom colors for final selection by Engineer.

3. Provide epoxy mortar capable of water-cleanup during installation but which, after curing, is waterproof.

G. Water: Provide clean and potable water from approved sources.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Mixes for Mortar: Provide mortar that conforms to the requirements of ASTM C270, except as modified herein, and of the type and color specified in the Contract.

1. Provide a cement-lime mortar; masonry cement mortars are not acceptable.

2. Calcium chlorides are not permitted.

3. Admixtures shall not be used unless specifically directed by the Contract.

4. Grout: Provide grout that conforms to the requirements of ASTM C476, ASTM C404 for fine or coarse grout.

B. Mixes for Grout: Provide grout that conforms to the requirements of ASTM C476, ASTM C404 for fine or coarse grout.

1. Fine grout shall be used for filling spaces with openings less than 2 inches.

2. Course grout shall be used for filling spaces with openings greater than 2 inches.

C. Measurement of Materials:

1. Cement and Hydrated Lime: Batched by the bag.

2. Sand: Batched by volume in suitably calibrated containers. Make allowance for bulking and consolidation, and for weight per cubic foot of contained moisture.

3. Proportion of Volumetric Mixtures: One 94-pound sack of Portland cement and one 50-pound sack of hydrated lime constitute nominal one cubic foot.

4. Shovel measurement: Not permitted.

D. Mortar:

1. All cementitious materials and aggregates shall be mixed between three and five minutes in a mechanical batch mixer with a sufficient amount of water to produce a workable consistency. Mortar shall not be hand mixed.
2. When required, cement and pigment shall be mixed for colored mortar prior to mixing in mortar. The maximum percentage by weight of cement for pigment shall be limited to 10 percent.
3. Limit batch size to avoid retempering.
4. Mortar that has begun to stiffen or is not used within two hours after initial mixing shall not be used.
5. The mixer drum shall be completely emptied before recharging the next batch.

E. Mortar Temperature:

1. For temperatures below 40 degrees F mortar materials shall be heated to protect both mortar and completed work from freezing.
2. When outside air temperature is:
   a. 25 to 40 degrees F: Mixing water and sand shall be heated to produce mortar temperature between 40 and 120 degrees F. Temperatures of mortar on boards shall be maintained above freezing.
   b. Below 25 degrees F: Masonry shall not be installed.
3. Ideal mortar temperature is 70 degrees F $\pm$10 degrees F. Mixing temperature selected shall be maintained within 10 degrees F.
4. Antifreeze compounds or calcium chloride in mortars shall not be used to lower the freezing point or accelerate setting.

F. Grout: Grout shall be mixed in accordance with the requirements of ASTM C476.

G. Epoxy Pointing Mortar: Epoxy pointing mortar shall be mixed in strict accordance with the manufacturer's instructions.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Prior to placing mortar or grout, remove laitance, loose aggregate and any substance that may prevent mortar or grout from bonding to the foundation.

3.02 INSTALLATION

A. Installation of mortar and grout shall be in accordance with the requirements of Section 04 22 00 – Concrete Unit Masonry

B. Installation of epoxy grout shall be in accordance with the manufacturer's instructions and recommendations.

3.03 FIELD TESTING / QUALITY CONTROL

A. Mortar shall be prepared and tested for preconstruction and construction evaluation in accordance with the requirements of ASTM C780. Specimens for construction evaluation shall be prepared a minimum of every 500 square feet of masonry construction.

B. Grout shall be prepared and tested for construction evaluation in accordance with the requirements specified in ASTM C1019 and NYCBC Section BC 2104. Specimens shall be prepared a minimum of every 100 cubic feet of grout placed.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. If any adjustment are needed after installation, the Contractor shall make those adjustments with care, to maintain consistency with the work completed.

B. It is the Contractor's responsibility to protect all completed work in and around the site. Any damage done to the completed work during construction shall be fixed at no extra charge to the City.

C. The Contractor is also responsible for cleaning up after the work under this Section has been completed, to maintain a clean and neat site.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Unit masonry as specified herein includes, but is not limited to, glazed brick, concrete masonry units, reinforcement, anchorage, and all accessories and appurtenances.

B. Unit masonry shall be provided as indicated on the Contract Drawings, specified herein, or as required for a complete installation.

C. The Contractor shall implement practices and procedures to meet the project's sustainability goals as identified in the Contract Documents. The Contractor shall ensure that the sustainability requirements of this Section are implemented to the fullest extent.

D. The following index of this Section is presented for convenience:

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3.03 Field Testing / Quality Control 14
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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 04 05 00 - Common Work Results for Masonry

B. Section 05 50 00 - Metal Fabrications

C. Section 07 62 00 - Sheet Metal Flashing and Trim

1.04 REFERENCES

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

C. ASTM C90 - Standard Specification for Load-Bearing Concrete Masonry Units

D. Masonry Standards Joint Committee (MSJC):

1. TMS 402/ACI 530/ASCE 5 - Building Code Requirements for Masonry Structures

2. TMS 602/ACI 530.1/ASCE 6 - Specification for Masonry Structures

E. New York City Building Code Section BC 2103 Masonry Construction Materials, BC 2104 Construction

1.05 DESCRIPTION

A. Provide masonry accessories of sizes, dimensions and configurations coordinated with unit masonry construction system component sizes, dimensions and configurations.

B. Where continuous horizontal cavity wall reinforcement is specified as providing restraint for cavity wall insulation, coordinate dimensions with thickness of cavity wall insulation specified for proper clearances.

C. Where structural steel will be provided with fireproofing do not use welded-on channel slots. Coordinate required offset of welded-on wire ties with depth of fireproofing.

D. Concrete Masonry Units: Limit total moisture absorption until time of installation to the maximum percentage specified for Type I units for the average annual relative humidity as reported by the United States Weather Bureau Station nearest the Site and the corresponding percentage of total linear drying shrinkage of the concrete masonry units.

E. Comply with ASTM C90 Climatic Map establishing criteria for percent annual mean relative humidity.

F. Structural elements of masonry shall conform to the requirements of TMS 402/ ACI 530/ASCE 5 for materials and installation.

G. Masonry materials and installation shall conform to the requirements of TMS 602/ACI 530.1/ASCE 6.

H. Sustainable Design Requirements:

1. Recycled Content of Unit Masonry: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 15 percent.

2. Regional Materials: Unit Masonry shall be manufactured within 500 miles of Project site, from materials that have been extracted, harvested, or recovered within 500 miles of Project site.

I. Project-specific system design requirements will be provided in the Contract, if necessary, to supplement requirements given herein or Contract Drawings.

1.06 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Wherever a fire-resistance classification is shown or scheduled for unit masonry construction (4-hour, 3-hour and similar designations), provide masonry accessories, masonry units and unit masonry construction complying with the requirements established by UL and other governing authorities having jurisdiction at the Project Site.

B. Source Quality Control: Provide all metal sheet, wire, plate and bar stock masonry accessories from the same manufacturer.

C. Sample Panel: The Contractor shall erect a composite 4 feet long by 3 feet high sample panel.

1. The sample panel shall include facing veneer, bond pattern, mortar color, tooled joints, insulation, reinforcing, and backup.

2. Upon approval, the sample panel shall remain in place for the duration of masonry construction and shall be used as a basis of comparison for all masonry work.

3. After final approval of finished masonry work by the Engineer, the Contractor shall demolish the sample panel, and shall perform all site restoration work.

4. Masonry work shall not be started until the specified sample panel has been approved. The sample panel shall be used as a standard for comparison of masonry work. Sample panel shall be destroyed only after all masonry work has been completed and approved by the Engineer.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and other material for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Catalog cuts, drawings and reference materials.

2. Samples: The Contractor shall submit three samples each of glazed brick, that are representative of the full range of color, shading and texture of the material to be provided.

3. Test Reports: The Contractor shall submit material test reports or manufacturer's certificate of compliance for glazed brick, concrete masonry units.

B. Shop Drawings: Submit for approval the following:

1. Copies of manufacturer's specifications and installation instructions for each masonry accessory required. Include data substantiating that materials comply with specified requirements.

2. Provide drawings and material schedules showing all dimensions and sizes of masonry accessories coordinated with unit masonry construction work, and other work in which masonry accessories will be embedded, be supported from, or restrain.

3. Indicate methods for identifying and coordinating, at the Site, the location and accurate placement of each masonry accessory in unit masonry construction as the work progresses. Indicate by letter of transmittal that items which must be installed in the shop have been received in time for proper sequencing of the work to avoid delays.

4. Explanation of where each masonry accessory will be used in the work, quantities purchased and intended spacings indicating compliance with code requirements.

5. Complete layout of all glazed brick walls and veneers showing modular planning and all special shapes to be used in the work. Show all details for each condition encountered in the work. Provide plan and elevation views drawn at 1/4-inch scale and details drawn at 1-1/2-inch scale. Show all items required to be built into unit masonry construction.

6. Masonry control joint locations and details.

7. Drawings showing the location, extent and accurate configuration and profile of all items shown, specified and required by this and other Sections to be built into the unit masonry construction as the work progresses. Provide elevations drawn at 1/4-inch scale and all details drawn at 1-1/2-inch scale.

8. Drawings for fabrication, bending, and placement of reinforcing bars. Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabrication and placement of reinforcing for unit masonry construction.

C. Sustainable Design Submittals:

1. Environmental Materials Reporting Form (EMRF) Recycled Content and Regional Materials. Provide the following information:

   a. Name of Product and Manufacturer.

   b. Material cost breakdowns. Cost breakdowns must include total material-only cost (excluding installation, labor and equipment).

   c. The percentage (by weight) of post-consumer and pre-consumer recycled content for the submitted product.

d. Indicate the location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material.

1.08 DELIVERY, STORAGE, AND HANDLING

A. General: All products and materials shall be delivered, stored, and handled as follows.

B. Delivery and Storage: Masonry materials delivered and stored at the site shall be from approved manufacturers and sources only.

C. Masonry Units:

1. Masonry units shall be handled in a manner which prevents undue breakage or chipping.

2. Face brick and concrete masonry units shall be unloaded using brick clamps.

3. All masonry units shall be stored on platforms under shelter or in another approved manner so as to protect these materials from soil and weather.

D. Rejection: Glazed bricks, and concrete masonry units that are warped, cracked or of inferior quality will be rejected. Such items shall be removed from the site and not offered again for inspection.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers of unit masonry items shall be:

1. York Building Products, Stewart Company
York, PA

2. Consolidated Brick
Avon, MA

3. Nitterhouse Masonry Products, LLC
Chambersburg, PA

4. Or approved equal.

B. Manufacturers of glazed unit masonry items shall be:

1. Beldan Brick Company,
   Canton, Ohio.
2. Elgin Butter Company
   Elgin, Texas.
3. Or approved equal. .

2.02 MATERIALS / EQUIPMENT

A. Glazed Brick: Glazed brick shall meet the requirements of ASTM C-1405, Grade S, Type I & II, Class Exterior, Division Solid, or H40V. Face dimensions and custom colors shall be as specified in the Contract.

1. Brick Size: Modular.
2. Brick Colors:
   a. Belden Brick Company:
      1) Salt Creek Glaze, 30%.
      2) Wrangler Blue, 70%.
   b. Elgin Butler Company:
      1) Dove #7400 Glossy, 30%.
      2) Cobalt Blue #2200A Glossy, 70%.

B. Concrete Masonry Units: Concrete masonry units shall be manufactured with lightweight aggregate and shall be provided as follows:

1. Hollow Load-Bearing Units: Hollow load-bearing units shall conform to ASTM C90, Type I for exterior walls, foundation walls, interior load-bearing and non-load-bearing walls and partitions. Units shall have a compressive strength of 3,000 psi over the net area.
2. Solid Load-Bearing Units: Solid load-bearing units shall conform to ASTM C90, Type I, except units exposed to weather shall be Grade U. Solid units shall be provided for masonry bearing under structural framing members and for fireproofing of steel structural members. Units shall have a compressive strength of 3,000 psi over the net area.
3. Special Shapes: Special shapes, such as closures, header units, and jamb units shall be provided as necessary to complete the work. Special shape units shall conform to the applicable provisions for the units with which they are used.

C. Metal Accessories:

1. For interior walls and partitions, and as required to secure masonry to adjoining construction, the Contractor shall provide hot-dipped galvanized metal anchors, ties and reinforcements conforming to ASTM A153/A153M, Class B2 that are galvanized after cutting.

2. For exterior walls, the Contractor shall provide Type 316 stainless steel for anchors, anchor slots, ties and horizontal reinforcement.

D. Deformed reinforcing bars shall conform to ASTM A615/A615M Grade 60.

E. Horizontal Joint Reinforcement: Horizontal reinforcing shall be 2 inches less in width than the actual thickness of the wall or partition in which it is to be placed.

1. Solid interior or exterior masonry walls: Walls shall be reinforced horizontally with truss type, standard 9 gauge (.148-inch) by 9 gauge (.148-inch). Reinforcing shall be spaced at 16-inch centers vertically.

2. Exterior Cavity Walls: Walls shall be reinforced horizontally with truss type 9 gauge (.148-inch) by 9 gauge (.148-inch) reinforcing in the inner wythe with rectangular pintle and seismic clip to continuous 9 gauge wire reinforcing in the outer wythe. Reinforcing system shall include insulation clip washers. Reinforcing shall be spaced at a minimum of 16-inch centers vertically.

3. Corners: Corners shall be reinforced with the same type as wall reinforcing, standard 9 gauge (.148 inch) by 9 gauge (.148-inch), spaced in the same course as the wall reinforcing.

4. Intersections: Intersections between walls and partitions shall be reinforced horizontally with same type as wall reinforcing, standard 9 gauge (.148-inch) by 9 gauge (.148-inch), spaced in the same course as the wall reinforcing.

F. Rebar Positioners: The Contractor shall provide vertical and horizontal rebar positioners spaced at 48-inch centers maximum.

G. Dovetail Anchors: Dovetail anchors shall be 1/8-inch by 1-inch by 2-inch with 3/16-inch diameter wire.

H. Rigid Anchors: Rigid steel anchors shall be 1 inch wide (minimum), 3/16 inch thick, and 18 inches long between bent ends. Each end shall be bent down 3 inches (minimum) into mortar filled masonry cells.

I. Column Anchors: Masonry shall be anchored to columns at 24-inch centers with stainless steel anchors.

J. Metal Fastenings: Bolts, metal wall plugs or other approved metal fastenings for securing items to masonry and elsewhere shall be provided and installed as necessary.

K. Weep Holes: Weep holes shall be provided where shown, and shall consist of clear polyethylene, medium density plastic, rectangular tubes, 3/8 inch wide, 1-1/2 inches high, 3-1/2 inches deep.

L. Weep Vents: Weep vents shall be provided where shown and shall be an offset T-shaped vent injection molded from flexible polyvinyl chloride. The vents shall be provided in a custom size and color to match brick and mortar as specified in the Contract.

M. Mortar Net: Mortar net shall be of high-density polyethylene and shall be one inch nominal thickness.

N. Mortar Materials: Mortar materials shall be in accordance with Section 04 05 00 – Common Work Results for Masonry.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

1. Environmental Conditions: Materials and surrounding air temperature shall be maintained at a minimum 50 degrees F prior to, during, and 72 hours after completion of masonry work. Masonry shall not be erected when the ambient temperature is below 32 degrees F with a rising or falling temperature, or when there is a probability of such a condition existing within 48 hours, unless special provisions are made for heating the materials and protecting the work from freezing. Work will not be permitted with or on frozen materials. Use of masonry units having a film of frost on their surfaces will not be permitted.

3.02 INSTALLATION

A. General

1. Build chases and recesses as shown or required by others. Provide not less than 8 inches of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.

2. Leave openings for equipment, piping, ducts, and other items to be installed subsequent to starting of unit masonry construction. After installation of said items, complete unit masonry construction to match work immediately adjacent to openings.

3. Use full size units without cutting wherever possible. Provide special unit masonry shapes for all transitions and intersections. Do not field-cut special shapes from regular unit masonry shapes or substitute other alternatives for the use of special unit masonry shapes.

4. Build interior masonry walls, visible from both sides in the finished work, using two wythes of masonry. Masonry units shall be continuous over the entire plan of the wall including walls which continue behind fixtures, equipment, furniture, lockers and similar items.

5. Coursing: Masonry walls shall be carried up level and plumb all around. Do not carry up one section of the walls in advance of the others, unless specifically approved. Heights of masonry shall be checked with an instrument at each floor, and at sills and heads of openings, to maintain the

level of walls. Masonry courses shall be maintained to a uniform dimension. Vertical and horizontal joints shall be formed to a uniform thickness. Concrete masonry units shall be laid in running bond. One unit and one mortar joint shall be coursed to equal 8 inches. Mortar joints shall be tooled to be concave.

6. Placing and Bonding: Solid masonry units shall be placed in a full bed of mortar, with full head joints, and shall be uniformly jointed with other work.

   a. Mortar Removal: Excess mortar shall be removed as the installation progresses.

   b. Corners and Intersections: Intersections and external corners shall be interlocked. Horizontal reinforcing shall be spliced at intersections and corners with a 6-inch overlap of side rods.

   c. Adjustment: Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, mortar shall be removed and replaced with new mortar.

   d. Cutting: Job site cutting of exposed masonry units shall be performed with power masonry saws to provide straight, clean, unchipped edges. All glazed brick and glazed structural tile shall be cut using a continuous rim wet cutting diamond blade suitable for cutting these material types. Broken masonry unit corners or edges shall not be allowed.

   e. Flush Joints: Mortar joints shall be cut flush where ceramic wall tile is to be installed.

   f. Control Joints: Non-load-bearing masonry partitions shall be isolated from vertical and horizontal structural framing members with control joints.

   g. Placing Metalwork: Structural steelwork, bolts, anchors, inserts, plugs, ties, lintels and miscellaneous metalwork specified in other Sections, shall be placed and built into position as the installation progresses.

   h. Extent of Masonry: Masonry partitions and walls shall extend from the floor to the bottom of floor or roof construction above, unless otherwise indicated.

   i. Bonding and Anchoring: Walls and partitions shall be structurally bonded or anchored to each other and to concrete walls, beams, columns, and wall and roof diaphragms. Non-load-bearing walls and partitions shall be anchored to construction above in a manner that provides appropriate lateral stability and vertical movement of floor and roof construction above.

   j. Preparation for New Work: Unfinished masonry shall be stepped back for joining with new masonry. Toothing will not be permitted.

7. Weeps and Mortar Nets: Weep holes shall be installed in veneer at bottom of walls at spacing indicated in the Contract Documents. Mortar nets shall be installed at bottom of cavities to maintain open weeps.

8. Horizontal Joint Reinforcement and Anchorages: Horizontal joint reinforcement and anchorages shall be constructed as follows:

   a. Reinforcement Spacing: Horizontal joint reinforcement shall be spaced at a minimum of 16 inches on center, measured vertically.

   b. Reinforcement Placing: Masonry joint reinforcement shall be placed in the first horizontal joint above and below openings. Reinforcement shall be extended a minimum of 16 inches on each side of openings. Joint reinforcement shall be placed continuously in the first joint below the top of all walls. Joint reinforcement ends shall be lapped a minimum of 6 inches. Joints at corners and intersections shall be reinforced with strap anchors at 16-inch centers.

   c. Veneer Anchorage: Dovetail anchorage shall be provided in concrete for bonding veneer at a maximum of 16-inch centers vertically and horizontally. Anchors shall be placed within 8 inches of all openings.

9. Waterproofing Course: A waterproofing course of flashing as specified in Section 07 62 00 - Sheet Metal Flashing and Trim, and as shown on the Contract Drawings, and at the following locations: at the bottom of masonry walls, at points where roofs adjoin exterior masonry walls, at lintels, below louver sills and window sills, and at other locations shown on the Contract Drawings.

   a. Surface Condition: Surfaces to receive waterproofing course shall be smooth, dry, and free from loose material before applying the waterproofing course.

   b. Application: Flashing shall project 2 inch from the outside face of the wall and shall be built into the walls as indicated. Flashing shall extend a minimum of 8 inches beyond the line of the jamb, with the ends turned up 2 inches to form a pan at the heads and sills of louver and window openings, and at the heads of door openings.

10. Control Joints: Preformed control joint material shall be installed in continuous lengths. Butt and corner joints shall be sealed in accordance with manufacturer's instructions. Control joints shall be sized as indicated on the Contract Drawings. Horizontal joint reinforcement shall not continue through control joints.

11. Built-In Work: Metal door and window frames, fabricated metal frames, louvered openings, anchor bolts, pipes, ducts, conduits, plates and items specified in other sections shall be built in as the work progresses. Items shall be built in plumb and level. Frame voids shall be filled solid with grout. Adjacent masonry cores shall be filled with grout for a minimum of

12 inches beyond the framed openings. Do not build in organic materials subject to deterioration.

12. Tolerances: Masonry work shall meet the tolerances specified in ACI 530.1/ASCE 6-95/TMS 602.

13. Cutting and Fitting: Masonry shall be cut and fit for chases, pipes, conduit, sleeves, grounds, and other items specified elsewhere. The work shall be coordinated to provide correct size, shape, and location.

B. Laying Masonry Walls, General

1. Mortar Types: Unless otherwise indicated, use mortar as specified in Section 04 05 00 – Common Work Results for Masonry and as follows:

a. Use Type M mortar for all structural reinforced masonry walls.

b. Use Type S mortar for all exterior and all load-bearing walls.

c. Use Type N mortar for all interior non-load-bearing walls.

d. Use epoxy pointing mortar for all glazed brick unit joints.

e. Use grout fill for structural requirements and for grouting reinforcing steel in unit masonry construction.

f. Do not use mortar which has begun to set or if more than 2 hour has elapsed since initial mixing. Retemper mortar during the 2-hour period only as required to restore workability.

2. Lay out walls in advance for accurate spacing of surface pattern bond with uniform joint widths and to properly locate openings, masonry control joints, returns and offsets. Avoid the use of less than half size units at corners, jambs and wherever possible at other locations.

3. Lay-up walls plumb and true to comply with specified tolerances, with courses level, accurately spaced and coordinated with other work.

4. Mortar Color and Texture:

a. Lay all concrete unit masonry using mortar of natural color.

b. Lay all glazed brick using epoxy mortar colors selected by Engineer at time of sample panel erection.

C. Glazed Brick

1. Bond: Glazed brick shall be laid in bond as indicated on the Contract Drawings and as specified in the Contract.

2. Joints: All joints between bricks shall be completely filled with mortar. Bed joints shall comprise a thick layer of mortar, smoothed or furrowed lightly. Head joints shall be formed by applying, to the brick to be laid, a full coat of mortar on the entire end, or on the entire side, as the case requires, and then shoving the mortar-covered end or side of the brick tightly against the brick laid previously.

3. Joint Treatment: Mortar joints shall be tooled or struck when they are thumb print hard. All mortar joints in glazed brick shall be tooled concave using a non-metallic tool of a size as specified in the Contract.

4. Special Joints: Special joints in glazed brick shall consist of control joints, which shall be constructed as detailed and specified, and accent joints, which shall have mortar raked back 2 inch, and shall then be caulked to match the appearance of control joints. Control and accent joints shall be installed where shown on the Contract Drawings.

5. Weep and Mortar Nets: Provide rows of weep vents in the head joints of the first and third courses of masonry immediately above all concealed flashings. Space weep vents 16 inches on centers horizontally. Provide rows 8 inches on center vertically. Stagger rows.

6. Horizontal Joint Reinforcement and Anchorages.

7. Closure Brick: Closure brick shall be laid with a bed joint and with head joints. Brick shall be carefully placed so as not to disturb the brick previously laid.

D. Reinforcement Spacing: Continuous horizontal joint reinforcement shall be spaced as follows:

E. For multi-wythe walls, solid or cavity, where continuous horizontal reinforcing also acts as structural bond or tie between wythes, space reinforcing as required by governing authorities having jurisdiction at the Project Site, but not more than 24-inches on centers, vertically.

F. For single wythe walls, space reinforcing at 16 inches on centers vertically.

G. For parapets, space reinforcing at 8 inches on centers vertically for large square glazed brick.

1. Reinforce all walls with continuous horizontal joint reinforcement unless specifically noted or specified to be omitted.

H. Application: Flashing shall terminate flush with outside face of walls and shall be built into the walls as indicated. Flashing shall extend a minimum of 8 inches beyond the line of the jamb, with the ends turned up 2 inches to form a pan at the heads and sills of louvers and window openings, and at the heads of door openings in masonry.

I. Place through-wall flashing on bed of mortar and cover with mortar.

J. Interlock metal 3-way sawtooth flashings and overlap at seams as recommended by the manufacturer, with minimum lap of 4 inches.

K. Lintels and Bond Beams

1. Provide stainless steel lintels where shown and as specified in Section 05 50 00 - Metal Fabrications.

L. Provide masonry lintels and bond beams where shown and wherever openings of 16 inches or more are shown without structural stainless steel lintels. Provide

formed-in-place masonry lintels and bond beams. Temporarily support formed-in-place lintels and bond beams.

M. Provide minimum bearing at each jamb, of 4 inches for openings less than 6 feet wide, and 8 inches for wider openings.

N. On concrete and clay unit masonry walls where pattern bond remains visually exposed, increase minimum bearing of masonry lintels to maintain continuity of joint pattern of wall and install to be indistinguishable from surrounding masonry.

O. Collar Joints: Fill the vertical space between wythes solidly with mortar by parging the in-place wythe and shoving units into the parging, for all exterior multi-wythe walls (except do not fill cavity of cavity wall construction) and interior multi-wythe walls and partitions.

P. Concrete Masonry Units

1. Bed and Head Joints: The first course of concrete masonry units shall be laid in a full bed of mortar for the full width of the unit. Bed joints of concrete masonry units shall be formed by applying the mortar to the entire top surfaces of the inner and outer face shells, and head joints shall be formed by applying the mortar for a width of about 1 inch to the ends of the adjoining units laid previously. Joints shall be mortared smooth, not furrowed, and of such thickness that mortar will be forced out of the joints as the units are being placed in position. Where anchors, bolts, reinforcing and ties occur within the cells of the units, such cells shall be filled solid with grout as the work progresses.

2. Concrete Brick: Concrete brick shall be used for topping out walls under sloping slabs, distributing concentrated loads, backing brick headers, and elsewhere as indicated.

3. Unit Condition: Concrete masonry units shall be placed dry with no previous wetting.

Q. Cavity Walls

1. Construction: Cavity walls shall be constructed using a masonry backing separated from a masonry exterior wythe by a continuous air space and insulation as indicated. The two wythes shall be securely tied together with a seismic horizontal joint reinforcement system, placed as indicated.

2. Insulation: Insulation board shall be secured to the backup construction using insulation clip washers as specified to hold the insulation in place. The insulation board shall be job fabricated as necessary, using a knife or saw, to fit around obstructions, such as reinforcing and vents. Joints between the obstructions and the insulation shall be sealed with mastic. All joints in the insulation shall be shoved tight. Insulation shall be installed in strict compliance with the manufacturer's recommendations.

3. Cavity: The space between the wythes shall be kept clear and clean of mortar droppings by use of wood strips, slightly narrower than the cavity, laid on horizontal reinforcing. The wood strips shall be lifted out and

cleaned when horizontal joint reinforcing is placed. Mortar shall not be allowed to drop into cavity while cleaning wood strips. Weep holes shall be provided at the base of the wall cavity, where the cavity is closed over with masonry or flashing, and at other locations as indicated. A continuous mortar net shall be set on top of the base flashing.

R. Reinforced Masonry

1. Setting Masonry: Masonry for vertically reinforced masonry units shall be laid with core cells vertically aligned. Core cells shall be clear of mortar and unobstructed. Mortar shall be placed in masonry unit bed joints and shall be back 1/4 inch from the edge of the unit grout spaces, and beveled back and upward. Mortar shall be cured 7 days before placing grout.

2. Reinforcing: Concrete masonry unit cores shall be reinforced with reinforcement bars and grout as shown. Vertical reinforcement shall be kept in position using rebar positioners at top and bottom of cells and at intervals not exceeding 48 inches. Reinforcement shall be spliced in accordance with ACI 530/ASCE 5-95/TMS 402, but splice lap shall be not less than 24 bar diameters.

3. Grouting: Masonry unit surfaces in contact with grout shall be wetted just prior to grout placement. Spaces less than 2 inches in width shall be grouted with fine grout using low lift grouting techniques. Spaces 2 inches or greater in width shall be grouted with coarse grout using high or low lift grouting techniques. When grouting is stopped for more than one hour, grout shall be terminated 1-1/2 inches below top of upper masonry unit to form a positive key for subsequent grout placement.

4. Low Lift Grouting: The first lift of grout shall be placed to a height of 16 inches and then shall be rodded for grout consolidation. Subsequent lifts shall be placed in 8-inch increments and rodded for grout consolidation.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting

1. During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point up all joints at corners, openings and adjacent work to provide a neat, uniform appearance, properly prepared for application of sealant compounds.

B. Protection

1. Protection of Finished Work: Protective boards shall be provided at exposed external corners susceptible to damage by construction activities, without damaging completed work.

2. Remove and replace masonry units that are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

3. At all times, surfaces of masonry on which work is not being performed shall be protected. When rain or snow is imminent and work is discontinued, tops of exposed masonry walls and similar surfaces shall be covered with a strong waterproof membrane, well secured in place.

C. Cleanup

1. General: After mortar has set, new masonry work shall be cleaned as follows:

a. All masonry: All excess mortar and mortar smears shall be removed. Any defective mortar shall be removed and replaced, matching adjacent work. Nonmetallic tools shall be used in all cleaning operations.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 05 05 13 – SHOP APPLIED COATINGS FOR METALS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section furnishes requirements for metals that shall be shop-applied coatings for metals as shown on the Contract Drawings or as specified in other specifications.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. AAMA 621 – Voluntary Specifications for High Performance

			Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.
B.	AAMA 2603-17	–	Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
C.	AAMA 2604-17	–	Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
D.	AAMA 2605-17	–	Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels. Used
E.	ASTM B 117	–	Standard Practice for Operating Salt Spray (Fog) Apparatus.
F.	ASTM D 1005	–	Standard Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers.
G.	ASTM D 1730	-	Standard Practices for Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting.
H.	ASTM D 2244	–	Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
I.	ASTM D 2247	–	Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
J.	ASTM D 3363	–	Standard Test Method for Film Hardness by Pencil Test.
K.	ASTM D 4214	–	Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
L.	ASTM D 4585	–	Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation.
M.	ASTM D 7091	–	Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals.
N.	ASTM E 1980	–	Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
O.	ASTM G 85	–	Standard Practice for Modified Salt Spray (Fog) Testing.

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Coordination of Shop-Applied Coating Systems:

1. Coordinate submittal and selection procedures for metal products to receive shop-applied coating systems.

2. Where products are indicated to match coatings selected for other products, adjust formulations as required to achieve match.

3. Submit samples for verification, indicating compliance with matching requirements

B. Manufacturer's Qualifications: Manufacturer regularly engaged, for minimum of 10 years, in the manufacturing of shop-applied coating systems of similar type to that specified.

C. Applicator's Qualifications:

1. Applicator regularly engaged in application of shop-applied coating systems of similar type to that specified.

a. Certified by AAMA and listed on AAMA Verified Components List or

b. Approved by manufacturer.

2. Employ persons trained for application of shop-applied coating systems.

3. Equipped, trained, and approved for application of shop-applied coating systems required for this Project.

4. Approved to provide warranty specified in this Section.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings for approval by the Engineer. The submittals shall include, but not be limited to:

1. Product Data: Submit manufacturer's product data for each coating system specified, including:

a. Type of coating system.

b. Type of substrates.

c. AAMA compliance.

d. DFT of each coat.

e. Total DFT.

f. Physical properties.

g. Application characteristics.

h. Accelerated test data.

i. Field performance.

B. Samples: Submit manufacturer's samples of each color and gloss specified for each coating system specified for:

1. Sample size shall be minimum of 2" x 2".

2. Selection.

3. Verification on each specified metal substrate.

C. Manufacturer's Certification: Submit manufacturer's certification that coating systems comply with specified requirements and are suitable for intended application.

D. Manufacturer's Project References: Submit manufacturer's list of recently completed shop-applied coating system projects, including project name and location, name of architect, type of metal products receiving shop-applied coating systems, and type and quantity of shop-applied coating systems furnished.

E. Applicator's Project References: Submit applicator's list of recently completed shop-applied coating system projects, including project name and location, name of architect, type of metal products receiving shop-applied coating systems, and type and quantity of shop-applied coating systems applied.

F. Cleaning and Maintenance Instructions: Submit manufacturer's cleaning and maintenance instructions for shop-applied coating systems, including:

1. Graffiti removal instructions.

G. Warranty Documentation: Submit manufacturer's standard warranty

H. A report of the test results shall be furnished to the Engineer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Shop-Applied Coating Systems:

1. Delivery Requirements: Deliver coating systems to applicator in manufacturer's original, unopened containers and packaging, with labels clearly identifying:

a. Coating system name.

b. Manufacturer.

c. Color.

d. Weight.

e. Gallons.

f. Batch number.

2. Storage and Handling Requirements:

a. Store and handle coating systems in accordance with manufacturer's instructions.

b. Keep coating systems in manufacturer's original, unopened containers and packaging until shop application.

c. Protect coating systems during storage, handling, and shop application to prevent contamination or damage.

B. Metal Products to Receive Shop-Applied Coating Systems:

1. Delivery Requirements: Refer to sections specifying metal products to receive shop-applied coating systems.

2. Storage and Handling Requirements:

a. Refer to sections specifying metal products to receive shop-applied coating systems.

b. Package and protect metal product finish during storage, handling, and installation.

c. Protect metal product finish from damage from standing water.

d. Protect metal product finish from contact with materials that could damage or adversely affect shop-applied coating systems.

e. Protect metal product finish with temporary protective coverings until after installation.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Applicator's Warranty:

1. Applicator agrees to repair finish or replace coated metal products that demonstrate deterioration of shop-applied coating systems within warranty period.

2. Exposed Coating Systems: Deterioration includes, but is not limited to:

a. Solid Colors: Color fading in excess of 5 delta E Hunter color units in accordance with ASTM D 2244, Appendix XI.1.

b. Peeling, checking, or cracking of coating adhesion to metal.

c. Chalking in excess of a No. 8 in accordance with ASTM D 4214, Method A.

B. Manufacturer's Warranty: The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in materials and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Shop-Applied, High-Performance Organic Finish Materials – Aluminum Extrusions

1. Liquid Fluoropolymer Aluminum Extrusion Coatings, AAMA 2605: Minimum 70 percent PVDF resin by weight, in color coat and clear topcoat.

a. Pencil Hardness, ASTM D 3363: F minimum.

b. Prohesion, ASTM G 85: 2,000 hours.

c. Humidity Resistance, ASTM D 2247: 4,000 hours.

d. South Florida Exposure:

1) Color, ASTM D 2244.

2) Chalk, ASTM D 4214, Method A.

e. Primer Coat: 0.20 to 0.40 mil.

1) Color Coat: 0.70 to 0.90 mil.

2) Clear Coat: 0.40 to 0.50 mil.

3) Total Thickness: 1.30 to 1.60 mils.

2. Liquid Fluoropolymer Aluminum Extrusion Coatings, AAMA 2604: Minimum 50 percent PVDF resin by weight, in color coat.

a. Pencil Hardness, ASTM D 3363: F minimum.

b. Humidity Resistance, ASTM D 2247 or D 4585: 3,000 hours.

c. Dry Film Thickness, ASTM D 7091:

1) Primer Coat: 0.20 to 0.40 mil.

2) Color Coat: 1.00 to 1.70 mils.

3) Total Thickness: 1.20 to 1.90 mils..

B. Shop-Applied, High-Performance Organic Finish Materials – Coil Coatings

1. Liquid Fluoropolymer Aluminum Sheet Coil Coatings, AAMA 2605: Minimum 70 percent PVDF resin by weight, in color coat and clear topcoat.

a. Pencil Hardness, ASTM D 3363: HB to H.

b. Salt Spray Resistance, ASTM G 85: 4,000 hours.

c. Humidity Resistance, ASTM D 2247: 4,000 hours.

d. South Florida Exposure:

1) Color, ASTM D 2244.

2) Chalk, ASTM D 4214, Method A.

e. Dry Film Thickness, ASTM D 7091:

1) Primer Coat: 0.2 to 0.30 mil.

2) Color Coat: 0.70 to 0.80 mil.

3) Clear Coat: 0.40 to 0.50 mil.

4) Total Thickness: 1.30 to 1.60 mils.

2. Liquid Fluoropolymer Steel Sheet Coil Coatings, AAMA 621: FEVE resin.

a. Pencil Hardness, ASTM D 3363: HB to H.

b. Salt Spray Resistance, ASTM B 117: 750 hours.

c. Humidity Resistance, ASTM D 2247: 1,000 hours.

d. Dry Film Thickness, ASTM D 7091:

1) Primer Coat: 0.40 to 0.50 mil.

2) Color Coat: 0.70 to 0.90 mil.

3) Total Thickness: 1.10 to 1.40 mils.

C. Shop Finishing Methods

1. Pretreatment: Mechanically clean and chemically pretreat metal fabricated items in accordance with requirements of the following for finish indicated:

a. Chemical pretreatment manufacturer.

b. Coating manufacturer.

c. AAMA.

2. Coating Application: Apply coatings in accordance with requirements of the following for finish indicated:

a. Coating manufacturer.

b. AAMA.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Shop Finishing Quality Control

1. Tests and Inspections: Applicator is responsible for performing all physical property testing as prescribed in the appropriate AAMA standard.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 APPLICATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Touch up minor scratches and abrasions in finishes in accordance with finish manufacturer's instructions; replace components having damage that cannot be successfully touched up. Replacement shall occur to the following condition but not limited to these conditions:

1. Scratches over 2" in length and abrasions larger than 1 square inch shall be cause for replacement of component.
2. Pitting of finish to base material shall be cause for replacement of component.

B. Clean finished surfaces after installation in accordance with finish manufacturer's instructions.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This Section furnishes requirements for all iron or steel materials which are to be galvanized as shown on the Contract Drawings.

B. All galvanizing shall be done by the hot-dip process.

C. The following index of this Section is presented for convenience:

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D. Attachments

1. Table 1 Schedule of Hot-Dip Galvanizing Requirements

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Acronyms

1. American Galvanizers Association (AGA)
2. Canadian Standards Association (CSA)

B. Reference Standards:

1. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
2. ASTM A90 - Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
3. ASTM A111 - Zinc-Coated (Galvanized) "Iron" Telephone and Telegraph Wire
4. ASTM A116 - Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric
5. ASTM A121 - Zinc-Coated (Galvanized) Steel Barbed Wire
6. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
7. ASTM A143 - Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
8. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware
9. ASTM A239 - Test Method for Locating the Thinnest Spot in a Zinc (Galvanized) Coating on Iron or Steel Articles by the Preece Test (Copper Sulfate Dip)
10. ASTM A384 - Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
11. ASTM A385 - Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
12. ASTM A392 - Zinc-Coated Steel Chain-Link Fence Fabric
13. ASTM A475 - Zinc-Coated Steel Wire Strand
14. ASTM A653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
15. ASTM A780 - Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
16. ASTM A924 - General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
17. ASTM B6 - Specification for Zinc

18. ASTM E536 - Test Methods for Chemical Analysis of Zinc and Zinc Alloys
19. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated
20. CAN/CSA G164-M92 - Hot Dip Galvanizing of Irregularly Shaped Articles.

1.05 DESCRIPTION

A. Tests

1. General: Samples of galvanized articles shall be taken as specified in the appropriate ASTMs listed in Table 1. Galvanized articles shall be tested to determine the following qualities of the coating:
   a. Thickness of coating
   b. Adherence
   c. Uniformity.
2. Thickness of the zinc coating may be tested either by the weighing or stripping methods in conformity with the requirements set forth in Table 1.
3. Adherence of zinc coating shall be tested by the method indicated in the appropriate ASTMs listed in Table 1.
4. Uniformity:
   a. Galvanized articles will be subjected to visual examination to determine uniformity of work.
   b. In the event the Engineer determines that such examination is not conclusive, the article shall be given the Preece test in conformity with ASTM A239.

1.06 QUALITY ASSURANCE

A. Qualifications

1. Galvanizing shall be done in a plant having sufficient facilities to produce the quality of coatings herein specified and ample capacity for the volume of work required.
2. The plant shall follow the procedures in the Quality Assurance Manual of the AGA.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings for approval by the Engineer. The submittals shall include, but not be limited to:

1. The producer's or supplier's certification that the galvanized articles were manufactured, sampled, tested and inspected in accordance with the applicable standards specified herein and that the articles meet these requirements.

B. A report of the test results shall be furnished to the Engineer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Handling

1. Galvanized articles shall be shipped and handled in a manner which will avoid damage to the zinc coating.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Zinc used for galvanizing shall conform to ASTM B6, and shall be at least equal to the grade designated as Prime Western.

B. Maximum amount of aluminum added to a galvanizing bath shall not exceed 0.01 percent.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Preparation of Materials

1. Structural steel products shall be safeguarded against embrittlement in accordance with ASTM A143.

2. Casting surfaces to be galvanized shall be sand blasted or ground smooth. When a smooth cast is required, castings shall be tumbled and all high spots ground flush. Castings shall be normalized to prevent cracking. Malleable iron shall be safeguarded against embrittlement by pre-annealling.

3. Steel work shall be pre-cleaned utilizing a caustic bath, acid pickle and flux or shall be blast cleaned and fluxed to obtain an acceptable surface for quality hot dip galvanizing.

3.02 IMPLEMENTATION

A. Hot-Dip Galvanizing Requirements

1. The Work shall conform to the requirements in Table 1 - Schedule of Hot-Dip Galvanizing Requirements.

2. Quality of Coating:

a. The zinc coating shall meet the standards set forth in Table 1, ASTM A385. The coating shall adhere firmly to the surface of the base metal, be continuous, uniform in thickness, and of the quality of finish specified.

b. When special galvanizing, such as heavier coating, flexibility to permit forming operations and similar work is required, it shall be so specified in the Contract.

c. All rejected materials shall be stripped and regalvanized before resubmitting for inspection and test.

B. Repair of Galvanized Coating

1. Galvanized coatings that are abraded or damaged shall be repaired in accordance with ASTM A780.

2. The extent of the area to be repaired and the method of repair to be used shall be approved by the Engineer.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

ATTACHMENT 1 -- SECTION 05 05 13.01 – GALVANIZING
CONTRACT CSO-FC-DF

TABLE 1 - SCHEDULE OF HOT-DIP GALVANIZING REQUIREMENTS							
CLASS OF WORK	ZINC		TEST OF ZINC COATING				COATING THICKNESS
	Slab and Chemical Analysis	Coating	Thickness By Weight	Thickness By Stripping	Adherence	Uniformity	Oz. Per Sq. Ft. Minimum
IRON & STEEL STRUCTURAL • Rolled, pressed and forged, shapes, castings, plates, bars and strips • Gratings, iron and steel	B6, E536	A123	A123	A90, G164-M92	A123	A123, A239	Table 1, A123
SHEETS • Iron and steel	B6, E536	A653	A653, A924	A90, A924	A653	A239	Table 1, A653
HARDWARE • Castings of malleable iron and steel • Rolled, pressed, forged articles • Threaded fasteners • Very small work: rivets, nails, tacks, pins, small bolts and screws, stove bolts • Turnbuckles and similar work • Chain	B6, E536	A153	A153	A90,	A153	A153, A239	Table 1, A153
WIRE							
• Line wire	B6, E536	A111	--	A90	A111	A111	Table 1, A111
• Fencing wire	B6, E536	A116	--	A90	--	--	Table 3, A116
• Fencing fabric, chain link	B6, E536	A392	--	A90	--	--	Tables 1 and 2, A392
• Barbed wire	B6, E536	A121	--	A90	--	--	Table 3, A121
• Strand wire	B6, E563	A475	--	A90	A475	A475	Table 4, A475

ATTACHMENT 1 -- SECTION 05 05 13.01 – GALVANIZING
CONTRACT CSO-FC-DF

TABLE 1 - SCHEDULE OF HOT-DIP GALVANIZING REQUIREMENTS							
CLASS OF WORK	ZINC		TEST OF ZINC COATING				COATING THICKNESS
	Slab and Chemical Analysis	Coating	Thickness By Weight	Thickness By Stripping	Adherence	Uniformity	Oz. Per Sq. Ft. Minimum
PIPE	B6, E536	A53	--	A90	A53	--	1.8 oz. per sq. ft
ELECTRICAL CONDUIT (Rigid Steel)	Shall comply with ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.						

Notes Applicable to Table1:
1. Prefixes A, B and E identify ASTM Specifications; prefix G identifies CSA Standard.
2. Galvanized articles shall not be subject to wiping or scraping processes which may reduce the thickness of zinc coating.
3. Small hardware items shall be centrifuged to remove excess bath metal.

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials and equipment required to perform all structural welding as specified herein, and as indicated on the Contract Drawings. The Work shall include, but not limited to, the following items:

1. Procedure specifications.
2. Procedure qualifications.
3. Welder, welding operator and tacker qualifications.
4. Inspection.
5. Testing and repair of defective welds.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 12 00 - Structural Steel Framing

1.04 REFERENCES

A. Definitions

1. Definitions of welding terms shall be in accordance with ANSI/AWS A3.0.

B. Reference Standards:

1. AISC-04 - Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design
2. ANSI/AWS A2.4 - Standard Symbols for Welding, Brazing and Nondestructive Examination
3. ANSI/AWS A3.0 - Standard Welding Terms and Definitions
4. ANSI/AWS D1.1 - Structural Welding Code - Steel
5. ANSI/AWS D1.4 - Structural Welding Code - Reinforcing Steel
6. AWS Z49.1 - Safety in Welding and Cutting and Allied Processes
7. American Institute of Steel Construction (AISC)
8. American Welding Society (AWS)
9. New York City Building Code (NYCBC)

1.05 DESCRIPTION

A. All welding shall be performed in accordance with ANSI/AWS D1.1 and ANSI/AWS D1.4. No welding shall be performed when the base metal temperature is lower than 32 degrees Fahrenheit.

B. Welding shall not be started until welding procedures, welders, welding operators and tackers have been qualified and copies of all records and reports submitted and approved by the Engineer.

C. The Contractor shall be responsible for the quality of welding and shall maintain records of the test results obtained from the welding procedure, welder, welding operator and tackers performance qualifications.

D. Each weld shown or indicated on the Contract Drawings shall be made as specified on the approved procedure specifications provided to cover each type of weld. Welding of any special steel shall conform to the written instructions of the steel manufacturer.

E. Test specimens shall be prepared by the Contractor for each type of welded joint as designated in Article 1.08, Welding Procedure Qualifications. Destructive tests of specimens for procedure and welder qualifications shall be conducted in accordance with ANSI/AWS D1.1, Section 4, Qualifications, and the requirements specified herein.

F. Symbols

1. Symbols on the Contract Drawings, shop drawings and erection drawings shall be in accordance with ANSI/AWS A2.4.

G. Safety Precautions

1. Safety precautions during welding shall conform to AWS Z49.1.

H. Welding Requirements

1. Contract Drawings will include the following information:

   a. Size, length, type and location of welds.

   b. Location of welds for which non-destructive testing is required. When location of non-destructive testing is not shown, it will be indicated by the Engineer in the field.

2. Workmanship and techniques for welded construction shall conform to the requirements of ANSI/AWS D1.1 and AISC-04. When ANSI/AWS D1.1 and AISC-04 are in conflict, the requirements of ANSI.AWS D1.1 shall govern.

3. Welding of steel reinforcing bars shall conform to the requirements of ANSI/AWS D1.4 and the Contract Documents. Welds shall develop a minimum of 85,000 psi tensile strength. Bars to be welded shall be cut by means of an oxyacetylene torch or by sawing. Ends shall be free of dirt, oxide scale, oil, grease, or other foreign matter. Sheared ends of bars shall be trimmed back at least 1/2-inch by sawing or flame cutting. Preheat and interpass temperature shall conform to ANSI/AWS D1.4. Bars having a carbon equivalent content in excess of 0.50 percent shall not be welded.

4. Where dissimilar strengths of steel are welded together, the procedure used shall be the same as the one used for the lower strength steel.

5. All groove welds shall be 100 percent complete penetration welds as defined in ANSI/AWS D1.1 or shown in ANSI/AWS D1.4 for reinforcing steel, regardless of whether a backup plate is shown or whether the supplementary backing weld or melt-through symbol is included, in each groove-weld symbol shown unless partial penetration is included in the weld symbol.

6. Gun welded studs shall conform to the requirements of ANSI/AWS D1.1, Section 7.

7. Upon completion of welding, all weld splatter, flux, slag and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance with uniform weld contours and dimensions. All sharp corners of material which is to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.

I. Standard of Acceptance

1. Dimensional tolerances for welded construction, details of welds, and quality of welds shall be in accordance with the applicable requirements of ANSI/AWS D1.1, ANSI/AWS D1.4 and the Contract Drawings.
2. The welding shall be subject to inspection and tests in the shop and at the Project Site. Inspection and tests in the shop will not relieve the Contractor of the responsibility to furnish weldments of satisfactory quality.
3. All welding exhibiting any cracks, either in the weld metal or the parent metal, will be rejected.
4. Incomplete fusion or lack of penetration will not be allowed, and the weld will be rejected.
5. Welds, other than stud welds, are acceptable if inspection indicates conformance within the following limitations:
    a. Undercut shall not be more than 1/32-inch deep.
    b. Convexity or reinforcement of a weld face shall not exceed the limits shown in ANSI/AWS D1.1, Section 3 and there shall be no overlap.
    c. Slag inclusions, porosity and other fusion defects less than 1/16-inch in greatest dimension will be allowed if well dispersed and the sum of the greatest dimensions in any linear inch of welded joint does not exceed 3/8-inch.
    d. Slag inclusions, porosity and other fusion defects 1/16-inch or larger in greatest dimension will be allowed providing such defects do not exceed the limits specified in ANSI/AWS D1.1.
6. When materials or workmanship do not conform to the acceptance requirements, the Engineer reserves the right to reject material or workmanship or both at any time before final acceptance of the structure containing the weldment.

J. Corrections and Repairs

1. General: In lieu of rejection of an entire piece or member containing welding which is unsatisfactory or which indicates inferior workmanship, the corrective measures listed hereinafter may be permitted by the Engineer. The Engineer's specific approval must be obtained before making each correction. Corrective measures shall be made at the Contractor's expense and to the satisfaction of the Engineer and/or to the satisfaction of an independent testing lab.
2. Defective or unsound welds or base metal shall be corrected either by removing and replacing the entire welds, or as follows:
    a. Excessive convexity and overlap shall be reduced by removal of excess weld metal.
    b. Any concavity of weld, crater, undersize welds or undercutting shall be corrected by cleaning and depositing additional weld metal.

c. Excessive weld porosity, slag, inclusions or incomplete fusion shall be repaired by removing defective portions and rewelding.

d. Cracks in weld or base metal shall be repaired by removing crack throughout its length, including sound weld metal 2 inches beyond each end of the crack and rewelding.

3. The removal of defective weld metal or portions of the base metal shall be done by chipping, grinding, oxygen cutting, oxygen gouging, or air carbon-arc and in such a manner that the remaining weld metal or base metal is not nicked or undercut. Defective portions of the weld shall be removed without removal of the base metal.

4. Additional weld metal shall be deposited using an electrode smaller than that used for making the original weld, and not more than 5/32-inch diameter. The surface shall be cleaned thoroughly before welding.

5. Caulking of welds shall not be permitted.

6. Improperly fitted parts may be cut apart and rewelded. Members distorted by welding shall be straightened by mechanical means or by carefully supervised application of a limited amount of localized heat.

a. The temperature of heated areas shall not exceed 1,200 degrees Fahrenheit (a dull red color). Temperature shall be carefully measured with temperature indicating crayons during the heating operation.

b. Parts to be heated for straightening shall be substantially free of stress and from external forces, except those stresses resulting from mechanical means used in conjunction with the application of heat.

7. No peening shall be done on the root or surface layers of a weld. Peening of intermediate weld layers may be used only if authorized by the Engineer and directed by him. Care shall be exercised to prevent overpeening which may cause overlapping, scaling, cracking, flaking, or excessive cold working of weld and base metal.

1.06 QUALITY ASSURANCE

A. Welding Procedure Qualifications

1. General: Except for prequalified or previously qualified procedures, the Contractor shall qualify the welding procedure specifications for any welding procedure performed in the fabrication of weldments. Qualifications of welding procedures shall conform to ANSI/AWS D1.1 and ANSI/AWS D1.4.

2. Welding procedure specification and the results of the procedure qualification test for each type of welding, which requires procedure qualifications, shall be submitted for approval. Approval of any procedure, however, will not relieve the Contractor of the sole responsibility for producing a finished structure meeting all the requirements of these

Specifications. This information shall be submitted on the forms in Annex E of ANSI/AWS D1.1.

a. Procedures, when qualified, become the welding procedure specifications and are to be followed in making welds on the subject materials and provide a means of assuring reproducible results and quality control.

b. Separate procedure specifications shall be prepared for each type of weld.

c. Welding procedure specifications shall be individually identified and shall be referenced on the Shop Drawings and erection drawings, or shall be suitably keyed to the Contract Drawings.

3. Previous Qualifications: Welding procedures previously qualified by test may be acceptable for this Contract without requalification if the following conditions are met:

a. Testing was performed by an approved testing laboratory.

b. The qualified welding procedure conforms to the requirements of this Section and is applicable to welding conditions encountered under this Contract.

c. The welder, welding operator and tacker qualification tests conform to the requirements of this Section and are applicable to welding conditions encountered under this Contract.

4. Prequalified Procedures: Welding procedures which are considered prequalified as specified in ANSI/AWS D1.1 and ANSI/AWS D1.4, will be accepted without further qualification.

a. The Contractor shall submit for approval a listing and an annotated drawing to indicate the joints not prequalified.

b. Procedure qualification shall be required for the joints not prequalified.

5. Retests: If welding procedure fails to meet the requirements of ANSI/AWS D1.1 or ANSI/AWS D1.4, the procedure specification shall be revised and requalified.

a. At the Contractor's option, with the Engineer's approval, welding procedure may be retested in accordance with the standards.

b. If the welding procedure is qualified through retesting, all test results, including those of test welds that failed to meet the requirements, shall be submitted with the welding procedure.

B. Welder, Welding Operator and Tacker Qualification

1. General Information: Each welder, welding operator and tacker assigned to work on this Contract shall be certified in conformance with ANSI/AWS

D1.1, Section 4. Welders shall also be New York City certified, and all welding shall be done in conformity with the NYCBC.

2. Certificates: Before assigning any welder, welding operator or tacker to work under this Contract, the Contractor shall submit to the Engineer the names of the welders, welding operators and tackers to be employed and certification that each individual is qualified as specified.

   a. The certification shall state the type of welding and positions for which the welder, welding operator or tacker is qualified, the code and procedure under which the individual is qualified, the date qualified, and the name of the firm and person certifying the qualification tests.

   b. The certification shall be kept on file at the job Site by the Contractor. The certification shall be kept current for the duration of the Contract.

3. Identification of Welds: The Contractor shall assign each welder, welding operator or tacker an identifying number, letter or symbol which shall be used to identify all welds made by that person. For identification, the welder, welding operator or tacker shall apply the assigned symbol adjacent to the weld by means of a rubber stamp, felt tipped marker with waterproof ink or other methods that do not cause an indentation in the metal. Identification with die stamps or electric etches shall not be allowed.

4. Record of Welds: The Contractor shall maintain a record of all welders, welding operators and tackers employed on the Contract showing the date and results of tests and the identification mark assigned to each person. These records shall be certified by the Contractor and copies of the records shall be furnished to the Engineer.

5. Previous Qualifications: At the discretion of the Engineer, welders, welding operators and tackers qualified by test within the previous 6 months may be accepted for this Contract without requalification if all of the following conditions are met:

   a. Copies of the welding procedure specifications, the procedure qualification test records, and the welder, welding operator, and tacker qualification test records are submitted and approved in accordance with the requirements shown on the Contract Drawings.

   b. Testing was performed by an approved testing laboratory.

   c. The previously-qualified welding procedure conforms to the requirements of this Section and is applicable to welding conditions encountered under this Contract.

   d. The welder, welding operator and tacker qualification tests conform to the requirements of this Section and are applicable to welding conditions encountered under this Contract.

6. Renewal of Qualifications: Requalification of a welder or welding operator shall be required under any of the following conditions:

   a. It has been more than 6 months since the welder or welding operator has used the specific welding process for which the welder or welding operator is qualified.

   b. There is specific reason to question the welder or welding operator's ability to make welds that meet the requirements of these Specifications.

   c. The welder or welding operator was qualified by an employer other than those firms performing Work under this Contract, and a qualification test has not been taken within the past 12 months. Records showing periods of employment, name of employer where welder, or welding operator, was last employed, and the process for which qualified shall be submitted as evidence of conformance.

   d. A tacker who passes the qualification test shall be considered eligible to perform tack welding indefinitely in the positions and with the processes for which he is qualified, unless there is some specific reason to question the tacker's ability. In such a case, the tacker shall be required to pass the prescribed tack welding test.

1.07 SUBMITTALS

A. The Contractor shall prepare and submit Shop Drawings for approval of the Engineer. Submittals shall include, but not be limited to, the following:

1. Erection drawings, and catalog data on welding equipment and materials.
2. Welding procedure specifications.
3. Welding procedure qualifications and test records.
4. Welder, welding operator and tacker qualifications and test records.
5. Records of tests and inspections of installed welds.
6. Testing or inspection agency selection.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. All welding equipment, electrodes, welding wire and fluxes shall be capable of producing satisfactory welds when used by a qualified welder or welding operator performing qualified welding procedures.

B. All welding equipment and materials shall comply with the applicable requirements of ANSI/AWS D1.1 and ANSI/AWS D1.4.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 APPLICATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Supervision

1. All shop and field welding shall be under the immediate supervision of a representative of a standard testing agency or an approved inspection agency reporting directly to, and under the control of, the Department of Environmental Protection.

2. Procedures and techniques for inspection shall be in accordance with the applicable requirements of ANSI/AWS D1.1. The Contractor shall submit the name of such agency to the Commissioner for approval before starting Work.

3. The costs of all welding inspections and tests shall be borne by the Contractor.

B. Inspection and Tests

1. The Engineer will make periodic checks of each welder to determine that welds are being made as specified in the approved procedure specifications. Welding speed may be estimated.

2. All welds will receive 100 percent visual inspection to determine weld size and profile, surface cracks, overlap, and undercut.
3. Welds shall receive non-destructive testing as required in Section 05 12 00 - Structural Steel Framing.
4. The Engineer reserves the right to perform any additional test on any weld, including liquid penetrant, magnetic particle, radiographic, and ultrasonic. The costs of such testing will be borne by the Contractor if unsatisfactory welds are discovered, or by the City if the welds are satisfactory.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 05 05 23.02 - MISCELLANEOUS METAL FASTENINGS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish all materials, labor, and equipment required to provide all metal fastening in accordance with the Contract Drawings and as specified herein.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

1. Section 05 05 13.01 - Galvanizing
2. Section 05 05 23.01 - Welding
3. Section 05 12 00 - Structural Steel Framing

1.04 REFERENCES

A. ASTM International (ASTM)

1. ASTM A 36 - Carbon Structural Steel.
2. ASTM A 307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
3. ASTM A 489 - Carbon Steel Lifting Eyes.
4. ASTM A 563 - Carbon and Alloy Steel Nuts.
5. ASTM D 1785 - Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120.
6. ASTM E 488 - Standard Testing Method for Strength of Anchors in Concrete Elements
7. ASTM E 1109 - Test Method for Strength of Power-Actuated Fasteners Installed in Structural Members
8. ASTM E 1512 - Test Method for Testing Bond Performance of Bonded Anchors
9. ASTM F 436 - Specification for Hardened Steel Washers Inch and Metric Dimensions
10. ASTM F 467 - Nonferrous Nuts for General Use.
11. ASTM F 593 - Stainless Steel Bolts; Hex Cap Screws, and Studs.
12. ASTM F 594 - Stainless Steel Nuts.
13. ASTM F 1554 - Specification for Anchor Bolts, Steel, 36, 55 and 105 ksi Inch and Metric Dimensions
14. ASTM F 3125 - Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated 120 ksi and 150 ksi, Minimum Tensile Strength Inch and Metric Dimensions

B. American Concrete Institute (ACI)

1. ACI 355.2 - Qualification of Post-Installed Mechanical Anchors in Concrete
2. ACI 355.4 - Qualification of Post-Installed Adhesive Anchors in Concrete

C. International Code Council – Evaluation Service (ICC-ES)

1. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements
2. ICC-ES AC58 - Acceptance Criteria for Adhesive Anchors in Masonry Elements

3. ICC-ES AC60 - Acceptance Criteria for Anchors in Unreinforced Masonry Elements
4. ICC-ES AC70 - Acceptance Criteria for Fasteners Power-Driven into Concrete, Steel and Masonry Elements
5. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements
6. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements
7. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements

D. American Welding Society (AWS)

E. AWS D1.1 - Structural Welding Code - Steel

F. American Society of Mechanical Engineers (ASME)

1. ASME B 18.2.1 - Square, Hex Bolts, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head and Lag Screws (Inch Series)
2. ASME B 18.2.2 - Square and Hex Nuts (Inch Series)
3. ASME B 18. 22.1 - Plain Washers

G. New York City Building Code (NYCBC)

H. NYC Buildings Bulletin 2009-019

I. American Institute of Steel Construction (AISC)

1. Steel Construction Manual
2. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges
3. AISC 360 - Specification for Structural Steel Buildings
4. RSCS Specification for Structural Joints Using High-Strength Bolts

J. Aluminum Association

1. Specifications for Aluminum Structures

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Fasteners not manufactured in the United States shall be tested and certification provided with respect to specified quality and strength standards. Certifications of origin shall be submitted for all U.S. fasteners supplied on the project. Fasteners to be tested shall be randomly selected by the Engineer in the field.

B. All welding shall be performed by welders certified in accordance with AWS. Certifications of field welders shall be submitted prior to performing any field welds as per Section 05 05 23.01 – Welding. Welding shall comply with, but not limited to the following:

1. AWS D1.1 for Steel

C. Inadequate welds shall be corrected or redone and retested to the satisfaction of the Engineer, at no additional cost to the City.

D. Fasteners and concrete anchors will be inspected in accordance with the Inspection Article in Part 3.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and material specifications for approval by the Engineer. Submittals shall include, but not be limited, to the following:

1. Shop Drawings providing the manufacturer, fastener type, certification of the fastener's material and capacity and product data such as:
   a. Product information
   b. Technical information
   c. Manufacturer’s Installation Instructions (MPII)
   d. ICC-ES Evaluation Report.
2. Copy of valid AWS certification for each person who is to perform field welding.
3. Certified weld inspection reports, when required.
4. Adhesive Anchors
   a. For all adhesive anchors, submit anchor sizes and location plan
   b. Testing methods, procedures and equipment.
   c. In the event that any adhesive anchors fail field testing, submit a detailed procedure for the removal and replacement of those anchors.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Materials stored outdoors shall be supported above ground surfaces and protected with approved effective and durable covers.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Expansion anchors shall be:

1. Power-Stud+SD1 as manufactured by DeWalt, Brewster, NY;
2. Kwik Bolt 3 (KB3) expansion anchor as manufactured by Hilti, Plano, TX;
3. Strong-Bolt 2 Wedge Anchor as manufactured by Simpson Strong-Tie, Pleasanton, CA;
4. Or approved equal.

B. Screw anchors shall be:

1. Type 316 stainless steel KH-EZ screw anchor as manufactured by Hilti, Plano, TX;
2. Type 316 stainless steel Wedge-Bolt screw anchor as manufactured by DeWalt, Brewster, NY;
3. Type 316 stainless steel Titen-HD screw anchor as manufactured by Simpson Strong-Tie, Pleasanton, CA;
4. Or approved equal.

C. Sleeve or drop-in anchors shall be as manufactured by:

1. Hilti Inc., Plano, TX;
2. DeWalt, Brewster, NY;
3. Simpson Strong-Tie, Pleasanton, CA;
4. Or approved equal.

D. Adhesive Anchors

1. Epoxy adhesive anchor system shall be:
   a. Pure 110+ as manufactured by DeWalt, Brewster, NY;
   b. HIT-RE 500-V3 as manufactured by Hilti, Plano, TX;
   c. Or approved equal.
2. Vinylester adhesive anchor system shall be:
   a. AC200+ as manufactured by DeWalt, Brewster, NY;
   b. HIT HY-200 as manufactured by Hilti, Plano, TX;
   c. A7+ as manufactured by ITW Ramset/Redhead, Glendale Height, IL;
   d. AT-XP as manufactured by Simpson Strong-Tie, Pleasnaton, CA;
   e. Or approved equal.

E. The wedge inserts shall be as manufactured by:

a. Hohmann & Barnard, Inc., Hauppauge, NY;

b. Or approved equal.

F. Anchor channel shall be as manufactured by:

a. Halfen Anchoring Systems, Tampa, FL;

b. Or approved equal.

G. Masonry Anchors

1. The adhesive system shall be as manufactured by:

a. Hit HY-70 by Hilti Inc., Plano, TX;

b. AC100+ Gold by DeWalt, Brewster, NY;

c. AT (acrylic) or SET (epoxy) by Simpson Strong-Tie, Pleasanton, CA;

d. Or approved equal.

H. Expansion Bolts in Structural Steel Connections shall be:

1. Type HB Hollo-Bolt as manufactured by Lindapter, Syracuse, NY;

2. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Anchor Bolts

1. Anchor bolts for miscellaneous framing and architectural elements attachments shall conform to ASTM A36 or ASTM A307 Grade A except where stainless steel or other approved anchor bolts are shown on the Contract Drawings. Anchor bolts shall be of the size and configuration shown on the Contract Drawings and shall be supplied with hexagonal nuts meeting the requirements of ASTM A563 Grade A.

2. Anchor bolts for equipment attachment shall be of stainless steel Type 316 with nitronic 60 stainless steel nuts and locknuts.

3. All underwater anchor bolts shall be Type 316 stainless steel with nitronic 60 stainless steel nuts.

4. Pipe sleeves around anchor bolts shall be of the size and configuration shown on the Contract Drawings.

5. Material for anchor bolts submerged in salt water or corrosive liquids for which stainless steel Type 316 is not suitable shall be as indicated in the Contract.

B. Bolts

1. Bolts, nuts and washers for miscellaneous framing and for attachment of architectural elements shall conform to Section 05 12 00 - Structural Steel Framing.

2. Where bolts are used to connect galvanized steel or are otherwise specified to be galvanized, bolts, nuts, and washers shall be hot-dip galvanized in accordance with Section 05 05 13.01 - Galvanizing.

C. Stainless Steel Bolts

1. Stainless steel bolts shall conform to ASTM F593. All underwater fasteners shall be Type 316 stainless steel. Unless otherwise specified, fasteners for aluminum members shall be Type 304 stainless steel. Fasteners for stainless steel members shall be of matching grade.

2. Stainless steel bolts shall have hexagonal heads with a raised letter or symbol on the bolts indicating the manufacturer, and be supplied with hexagonal nuts meeting the requirements of ASTM F594. Nuts shall be of the same alloy as the bolts and shall have a raised letter or symbol indicating the manufacturer.

3. Nuts for stainless steel bolts for elements which are indicated on the Contract Drawings to be removable shall be made of nitronic 60 alloy.

4. Material for bolts submerged in salt water or corrosive liquids for which stainless steel Type 316 is not suitable shall be as indicated in the Contract.

D. Post-Installed Anchors

1. Concrete anchors shall be one of the types listed below as indicated on the Contract Drawings. Unless otherwise noted, all concrete anchors which are submerged, or which are subject to vibration from equipment such as pumps and generators, shall be injected, adhesive anchors. The determination of anchors equivalent to those listed below shall be based on test data performed by a commercial testing laboratory.

   a. Mechanical Anchors

      1) Expansion anchors shall be wedge, sleeve, or drop-in mechanical anchors.

      2) Screw anchors shall be one-piece threaded anchor with a finished hexagonal head.

   b. Adhesive anchors shall be two part injection type.

   c. Where anchor type is not indicated on the Contract Drawings, the wedge expansion anchor shall be used.

2. Expansion anchors shall be fully threaded, medium duty, Type 316 stainless steel anchors. Shall be sized and embedded to depths as shown on the Contract Drawings. If embedment depth is not given, the standard embedment depth as recommended by the manufacturer shall be used.

   a. Manufacturer for Expansion anchor shall be as specified in this Section.

3. Screw anchors shall be a one piece, heavy duty anchor with a finished hexagonal head. Screw anchors shall be sized and embedded to depths as

shown on the Contract Drawings. If embedment depth is not given, the standard embedment depth as recommended by the manufacturer shall be used.

a. Manufacturer for screw anchor shall be as specified in this Section.

4. Adhesive anchors shall consist of Grade 60 reinforcing steel ASTM A 615, or Type 316 stainless steel ASTM F593 or Grade B7 high strength carbon ASTM A193 threaded rods or bolts anchored with a two-part injection type adhesive system into hardened concrete or grout-filled masonry. The adhesive system shall use a two-component adhesive mix and shall be injected with a static mixing nozzle following manufacturer's instructions. The anchor diameter, type, and embedment depth shall be as shown on the Contract Drawings.

   a. The embedment depth of the rod/bolt shall provide a minimum allowable bond strength that is equal to the allowable tensile capacity of the rod/bolt (see Table 1) unless noted otherwise on the Contract Drawings.

   b. Manufacturer for Epoxy adhesive and Vinylester adhesive anchor systems and shall be as specified in this Section.

   c. Adhesive anchoring system shall have an ICC-ES Evaluation Service Report issued in accordance with AC308.

   d. Adhesive for the anchors must qualify under ACI 355.4.

Table 1
Allowable Tensile Capacity (Kips) for Standard Manufacturer Embedment

Size	Concrete Anchors Wedge Type	Concrete Anchors with Injection Adhesive System
3/8"	1.3	2.1
1/2"	2.4	3.8
5/8"	3.3	5.9
3/4"	4.8	8.4
7/8"	5.6	11.0
1"	7.1	15.0

5. Concrete anchors shall be of Stainless Steel Type 316 unless noted otherwise. Concrete anchors for stainless steel attachments shall be of matching grade.

6. All underwater concrete anchors shall be Type 316 stainless steel and shall have nitronic 60 stainless steel nuts.

7. Material for concrete anchors submerged in salt water or other corrosive liquids for which stainless steel Type 316 is not suitable shall be as indicated in the Contract.

E. Concrete Inserts

1. Wedge Type Inserts:

a. The concrete inserts for attachment of shelf angles or brick relieving angles to the reinforced concrete beams or concrete encased steel beams, shall be wedge type inserts. The inserts shall have an askew head bolt to produce an automatic tightening action when a load is placed on the bolt.

b. The wedge inserts shall be of malleable iron, hot dipped galvanized. The askew bolt and the horseshoe shim plates shall be of stainless steel Type 304 or 316. The type of insert and size of bolts shall be as shown on the Contract Drawings.

c. Manufacturer for wedge inserts shall be as specified in this Section.

2. Anchor Channel Inserts: for the top attachment of the masonry wall panels to steel encased or concrete structures, the inserts shall be:

a. Manufacturer for anchor channel inserts shall be as specified in this Section.

b. The anchor channel shall be made from channel profiles with "I" anchors shop welded to the back of channels. Anchor channels shall be furnished with the head bolts, channel nuts, etc., for a complete installation. All material shall be stainless steel type 304.

c. The type and series of the anchor channel shall be as shown on the Contract Drawings.

d. Anchor channels can be used for other attachments if detailed on the Contract Drawings.

F. Masonry Anchors

1. Masonry anchors shall be injection adhesive anchors with screen tube for fastening to hollow block, clay tiles and brick with holes (see Table 2).

2. Manufacturer for adhesive system shall be as specified in this Section.

3. Masonry anchors shall be of stainless steel type 304 unless noted otherwise. Masonry anchors for stainless steel attachments shall be of the matching grade.

Table 2 Allowable Tensile Masonry (lbs) in Hollow Concrete Block	
Size	Masonry Anchors with Injection Adhesive System
1/4"	255
5/16"	370
3/8"	525
1/2"	525

G. Electrodes for Welding

1. Electrodes for welding carbon steel shall comply with Section 05 12 00 - Structural Steel Framing.

H. Eye Bolts

1. Eyebolts shall be of the size indicated on the Contract Drawings and shall conform to ASTM A489 unless noted otherwise.

2. Carbon steel eyebolts shall be galvanized in accordance with Section 05 05 13.01 - Galvanizing.

I. Expansion Bolts in Structural Steel Connections

1. Expansion bolts for connecting to hollow section steel or where access is restricted (blind-bolts) shall be Type 316 stainless steel with a hex head such as specified in this Section.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. The Contractor shall field verify all dimensions and condition of the materials to be connected, review the Drawings and report any discrepancies to the Engineer for clarification prior to starting fabrication.

3.02 INSTALLATION

A. Anchor Bolts and Concrete Anchors:

1. Anchor bolts shall be installed in accordance with AISC "Code of Standard Practice" by setting in concrete while it is being placed and positioned by means of a rigidly held template.
2. The installation of concrete anchors shall be done in strict conformance with the manufacturer's field demonstration and recommendations.
3. The holes drilled for adhesive anchors shall be cleaned by use of a fiber bristle brush and dry compressed air. The anchors shall be supported in the correct position until the adhesive sets and gains enough strength to prevent any dislocation. Adhesive anchors shall not be tightened or loaded until the adhesive has fully cured as recommended by the manufacturer.
4. No concrete anchor shall be installed before base concrete has attained specified 28-day strength.
5. Concrete anchors shall not be used in place of anchor bolts without Engineer's approval.

B. Bolts:

1. All steel bolts shall be installed in conformance with Section 05 12 00 - Structural Steel Framing.
2. Unless otherwise specified, where aluminum and steel members are connected together they shall be fastened with Type 304 stainless steel bolts and isolated with micarta, nylon, rubber, or approved equal.

C. Concrete Inserts: Provide concrete inserts where shown on the Contract Drawings. Inserts shall be firmly held in position in the forms and sealed from intrusion of concrete mortar during concrete placement.

D. Adhesive Anchors

1. Concrete is to be a minimum of 21 days old at time of anchor installation
2. Work shall be performed by certified ACI/CRSI Adhesive Anchor Installers under continuous special inspection
3. Shall be installed in accordance with Manufacturer’s Published Installation Instructions (MPII), the applicable ICC-ES ESR and in accordance with NYC Buildings Bulletin 2009-019
4. Adhesive anchoring installation shall be subject to special inspection requirements of NYCBC section BC 1704.32.
5. Adhesive anchor shall be identified by labels on the packaging including manufacturer’s name, product designation and the requirements specified in ICC-ES AC308, Annex A.

E. Welding

1. Welding shall comply with the requirements of Sections 05 12 00 - Structural Steel Framing and 05 05 23.01 - Welding.

3.03 FIELD TESTING / QUALITY CONTROL

A. Inspection

1. Inspection for high strength bolted connections shall conform to the requirements of Section 05 12 00 - Structural Steel Framing.
2. At least 25 percent of the concrete anchors required to be installed shall be proof tested to 1.33 times the allowable load specified by the manufacturer of the system.
3. Welding inspection shall be done in accordance with the requirements of Sections 05 12 00 - Structural Steel Framing and 05 05 23.01 - Welding.
4. Adhesive Anchors: Adhesive anchoring installation shall be subject to special inspection requirements of NYCBC section BC 1704.32.

B. Testing of Adhesive Anchors

1. Field testing:
   a. Testing to be performed by a NYC Buildings Department approved special inspection agency to perform field testing of the installed anchors in accordance with NYCBC BC 1704.32 and ICC-ES ESR and the applicable sections of ASTM E488 in the presence of the Engineer.
   b. Anchors that are to be tested are as indicated on the Contract Drawings.
2. Pull-out testing:
   a. A total of 15% of the adhesive anchors designated for testing are to be tested and no more than one (1) bolt is to be tested per connection.
   b. The Engineer will randomly choose the anchors to be tested.
   c. Testing of the adhesive anchors shall not begin until all the anchors are installed.
   d. If only one anchor fails, all the adhesive anchors will be accepted. If a second anchor fails, an additional 5% of the anchors shall be tested. If more than 20% of the total anchors tested fail, all the anchors shall be removed and replaced.
3. Removal and replacement of failed test anchors:
   a. Remove all anchors that fail the field test without damage to the surrounding concrete.
   b. Redrill holes to remove adhesive bonding material residue and clean in accordance with MPII.
   c. Reinstall new anchors that are the same size as the removed anchors and install the new anchors in the same exact location as the

removed anchor. Do not reuse the failed anchors, they shall be discarded.

d. Assign reinstalled anchors into batches only containing reinstalled anchors of the same diameter, embedment length and adhesive bonding material system, and field test in accordance with the above sections.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish, install and erect the stainless steel work as specified herein and shown on the Contract Drawings.

B. Stainless steel work shall be furnished complete with all accessories, mountings and appurtenances of the type of stainless steel and finish as specified or required for a satisfactory installation.

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3.05	Adjusting / Protection / Cleanup	13

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 05 23.01 - Welding.

1.04 REFERENCES

A. Definitions

1. Environmental Product Declaration - A third-party-verified International Organization for Standardization (ISO) Series 14025 Type III declaration that quantifies environmental information on the life cycle of a product to enable comparisons between products fulfilling the same function.

B. Reference Standards

1. ASTM A193 - Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
2. ASTM A194 - Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service.
3. ASTM A262 - Practice for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steel.
4. ASTM A276 - Stainless and Heat-Resisting Steel Bars and Shapes.
5. ASTM A314 - Stainless and Heat-Resisting Steel Billets and Bars for Forging.
6. ASTM A380 - Practice for Cleaning and Descaling Stainless Steel Parts, Equipment and Systems.
7. ASTM A473 - Stainless and Heat-Resisting Steel Forgings.
8. ASTM A666 - Austenitic Stainless Steel, Sheet, Strip, Plate and Flat Bar.
9. ASTM F593 - Stainless Steel Bolts, Hex Cap Screws and Studs.
10. ASTM F594 - Stainless Steel Nuts.
11. ASME B1.1 - Unified Inch Screw Thread (UN and UNR Thread Form).
12. ISO 14025 - Environmental labels and declarations - Type III environmental declarations

1.05 DESCRIPTION

A. Tests

1. All stainless steel materials including stainless test welds, shall be checked for compliance with tests for susceptibility to intergranular attack. Such tests shall be Practices A, B and E of ASTM A262.

Detailed procedures for the tests shall be submitted to the Engineer for approval prior to start of work. Practice A shall be used only for acceptance of materials but not for rejection of materials, and shall be used for screening material intended for testing in Practice B and Practice E. The maximum acceptable corrosion rate under Practice B shall be 0.004 inch per month, rounded off to the third decimal place. If the certified mill report indicates that such test has been satisfactory performed, the fabricator may not be required to repeat the test. Material passing Practice E shall be acceptable.

2. Sample selection for the susceptibility to intergranular attack tests shall be as follows:

   a. One (1) sample per each heat treatment lot for plates and forgings;

   b. One (1) sample per each Welding Procedure Qualification regardless of the joint design;

   c. If tests indicate a reduction in corrosion resistance, welding procedure shall be adjusted or heat treatment determined as needed to restore required corrosion resistance;

   d. The samples so chosen shall have received all the post-weld heat treatments identical to the finished part.

1.06 QUALITY ASSURANCE

A. Shop inspections may be made by the City representatives. The Contractor shall give ample notice to the Engineer prior to the beginning of any stainless steel fabrication work so that inspection may be provided. The Contractor shall furnish all facilities for the inspection of materials and workmanship in the shop, and the inspectors shall be allowed free access to the necessary parts of the works.

B. Inspectors shall have the authority to reject any materials or work which does not meet the requirements specified herein or of the Contract Drawings.

C. Inspection at the shop is intended as a means of facilitating the work and avoiding errors, but is expressly understood that it will in no way relieve the Contractor from his responsibility for furnishing proper materials or workmanship.

1.07 SUBMITTALS

A. The Contractor shall prepare and submit Shop Drawings for all stainless steel fabrication for approval by the Engineer. Submittals shall include, but not be limited to, the following:

   1. Certified test reports for susceptibility to intergranular attack.

2. Affidavit of compliance with type of stainless steel shown on the Contract Drawings or specified herein.

3. Certified weld inspection reports.

4. Cleaning and handling of stainless steel in accordance with Article "Cleaning and Handling" in this Section.

B. Samples of finish, on each type of stainless steel to be furnished, shall be submitted in accordance with the Quality Assurance requirements of the Contract.

C. Sustainability Submittals:

1. Environmental Product Declarations

a. The Contractor shall provide product-specific type III Environmental Product Declaration (EPD) conforming to ISO 14025, 14044.

2. Envision Submittals

a. The Contractor shall report information pertaining to the sustainable procurement, regional sourcing, and/or recycled content of new materials to be procured during the Work, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall coordinate with its vendor on sustainable product requirements as stipulated by the Contractor's approved New Materials Sustainable Implementation Plan, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall submit vendor shop drawings for review by the Engineer that clearly illustrate the vendor is meeting the requirements as approved in the Contractor's New Materials Sustainable Implementation Plan.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Mechanical damage (e.g., scratches and gouges) to the stainless steel material can occur during handling. Care shall be taken in the material handling since such mechanical damage will result in the passive oxide film being "punctured" leading to a possible lower resistance to the initiation of corrosion than the surrounding chemically-passivated surface. Corrosion in such areas can be accelerated by the galvanic corrosion effect due to the unfavorable relative area ratios which would exist.

B. Stainless steel plates and sheets shall be stored vertically in racks and not be dragged out of the racks or over one another. Racks shall be protected to prevent iron contamination.

C. Heavy stainless steel plates shall be carefully separated and chocked with wooden blocks so that the forks of a fork-lift could be inserted between plates without mechanically damaging the surface.

D. Stainless steel plates and sheets laid out for use shall be off the floor and be divided by wooden planks to prevent surface damage and to facilitate subsequent handling.

E. Plate clamps, if used, shall be used with care as the serrated faces can dig in, indent and gouge the surface.

F. Stainless steel fabrications shall be loaded in such a manner that they may be transported and unloaded without being overstressed, deformed or otherwise damaged.

G. Stainless steel fabrications and packaged materials shall be protected from corrosion and deterioration and shall be stored in a dry area. Materials stored outdoors shall be supported above ground surfaces on wood runners and protected with approved effective and durable covers.

H. Stainless steel fabrications shall not be placed in or on a structure in a manner that might cause distortion or damage to the fabrication. The Contractor shall repair or replace damaged stainless steel fabrications or materials as directed by the Engineer.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Materials and Finishes

1. Type and finish of stainless steel to be utilized for fabrication shall be the type and finish indicated on the Contract Drawings or as specified herein for the intended service and conforming to the applicable ASTM standard.

2. The basic mill forms (sheet, strip, plate and bar) are classified by size as shown on Table 1. Tables 2, 3 and 4 identify finishes and conditions in which sheet, bar and plate are available.

3. Tables 2, 3 and 4 show numbered finishes and conditions for sheet, bar and plate. While there are no specific designations for polished finishes on bar or plate, the sheet finish designations are used to describe the desired effect. This also applies to finishes on ornamental tubing.

4. There are three standard finished for strip, which are broadly described by the finishing operations employed:

   a. No. 1 Strip Finish is approximately the same as No. 2D Sheet Finish. It varies in appearance from dull gray matte to a fairly reflective surface, depending largely on alloy composition and amount of cold reduction.

   b. No. 2 Strip Finish is approximately the same as a No. 2B sheet finish. It is smoother, more reflective than No. 1, and likewise varies with alloy composition.

   c. Bright annealed finish is a highly reflective finish that is retained by final annealing in a controlled atmosphere furnace.

Table 1
CLASSIFICATION OF STAINLESS STEEL PRODUCT FORM

Item	Description	Dimensions		
		Thickness	Width	Diameter or Size
Sheet	Coils and cut length: Mill finishes Nos. 1, 2D and 2B Polished finishes Nos. 3, 4, 6, 7 & 8	 under 3/16" under 3/16"	 24" and over all widths	 -- --
Strip	Cold finished, coils or cut lengths Polished finishes Nos. 3, 4, 6,7 & 8	under 3/16" under 3/16"	under 24" all widths	-- --
Plate	Flat rolled or forged	3/16" and over	over 10"	--
Bar	Hot finished rounds, squares, octagons and hexagons Hot finished flats Cold finished rounds, squares, octagons and hexagons Cold finished flats	-- 1/8" to 8" incl. -- 1/8" to 4-1/2"	-- 1/4" to 10" incl. -- 3/8" to 4-1/2"	1/4" and over -- over 1/8" --
Wire	Cold finishes only: (in coil) Round, square, octagon, hexagon and flat wire	 under 3/16"	 under 3/8"	 --
Pipe and Tubing	Several different classifications, with differing specifications, are available.			
Extrusion	Not considered “standard” shapes. Currently limited in size to approximately 6-1/2" diameter or structurals.			

Table 2
STANDARD MECHANICAL SHEET FINISHES

Unpolished or Rolled Finishes: No. 1 A rough dull surface which results from hot rolling to the specified thickness followed by annealing and descaling.	No. 4 A polished surface obtained by finishing with a 120-150 mesh abrasive, following initial grinding with coarser abrasives. This is a general purpose bright finish with a visible "grain" which prevents mirror reflection.
No. 2D A dull finish which results from cold rolling followed by annealing and descaling, and may perhaps get a final light roll pass through unpolished rolls. A 2D finish is used where appearance is of no concern.	No. 6 A dull satin finish having lower reflectivity than No. 4 finish. It is produced by Tampico brushing the No. 4 finish in a medium of abrasive and oil. It is used for architectural applications and ornamentation where a high luster is undesirable, and to contrast with brighter finishes.
No. 2B A bright cold-rolled finish resulting in the same manner as No. 2D finish, except that the annealed and descaled sheet receives a final light roll pass through polished rolls. This is the general purpose cold-rolled finish that can be used as is, or as a preliminary step to polishing.	No. 7 A high reflective finish that is obtained by buffing finely ground surfaces but not to the extent of completely removing the "grit" lines. It is used chiefly for architectural and ornamental purposes.
Polished Finishes: No. 3 An intermediate polish surface obtained by finishing with a 100 grit abrasive. Generally used where a semi-finished polished surface is required. A No. 3 finish usually receives additional polishing during fabrication.	No. 8 The most reflective surface, which is obtained by polishing with successively finer abrasives and buffing extensively until all grit lines from preliminary grinding operations are removed. It is used for applications such as mirrors and reflectors.

Table 3
CONDITIONS AND FINISHES FOR BAR

Conditions	Surface Finishes[1]
Hot worked only	(a) Scale not removed (excluding spot conditioning) (b) Rough turned[2] (c) Pickled or blast cleaned and pickled.
Annealed or otherwise heat treated.	(a) Scale not removed (excluding spot conditioning) (b) Rough turned (c) Pickled or blast cleaned and pickled (d) Cold drawn or cold rolled (e) Centerless ground (f) Polished
Annealed and cold worked to high tensile strength[3]	(d) Cold drawn or cold rolled (e) Centerless ground (f) Polished

Table 4
CONDITIONS AND FINISHES FOR PLATE

Condition and Finish	Description and Remarks
Hot rolled	Scale not removed. Not heat treated. Plates not recommended for final use in this condition.[4]
Hot rolled, annealed or heat treated	Scale not removed. Use of plates in this condition is generally confined to heat resisting applications. Scale impairs corrosion resistance.[1]
Hot rolled, annealed or heat treated, blast cleaned or pickled	Condition and finish commonly preferred for corrosion resisting and most heat resisting applications.
Hot rolled, annealed, descaled and temper passed	Smoother finish for specialized applications.
Hot rolled, annealed, descaled cold rolled, annealed, descaled, optionally temper passed	Smooth finish with greater freedom from surface imperfection than the above.
Hot rolled, annealed or heat treated, surface cleaned and polished	Polished finishes refer to Table 2.
Notes: 1. Surface finishes (b), (e) and (f) are applicable to round bars only.	
2. Bars of the 4xx series stainless steels which are highly hardenable, such as Types 414, 420, 420F, 431, 440A, 440B and 440C, are annealed before rough turning. Other hardenable grades, such as Types 403, 410, 416 and 416Se, may also require annealing depending on their composition and size.	
3. Produced in Types 302, 303Se, 304 and 316.	
4. Surface inspection is not practicable on plates which have not been pickled or otherwise descaled.	

B. Fasteners

1. Stainless steel fasteners shall be used for joining stainless steel work.

2. Stainless steel fasteners shall be made of alloys that are equal to or more corrosion resistant than the materials they join.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Fabrication

1. Holes for bolts and screws shall be drilled. Fastenings shall be concealed where practicable. Joints exposed to the weather shall be formed to exclude water.
2. As far as practicable, all fabricated units shall be fitted and assembled in the shop, with all cuts and bends made to precision measurements in accordance with details shown on approved shop drawings.
3. Work shall be fabricated so that it is installed in a manner that will provide for expansion and contraction, prevent the shearing of bolts, screws and other fastenings, ensure rigidity, and provide close fitting of sections.
4. All finished and/or machined faces shall be true to line and level. Stainless steel sections shall be well formed to shape and size with sharp lines and angles; curved work shall be sprung evenly to curves.
5. All work shall be fitted together at the shop as far as possible, and delivered complete and ready for erection. Proper care shall be exercised in handling all work so as not to injure the finished surfaces.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Field Measurements

1. The Contractor shall verify all dimensions and shall make any field measurements necessary and shall be fully responsible for accuracy and layout of the work.
2. The Contractor shall review the Contract Drawings and any discrepancies shall be reported to the Engineer for clarification prior to starting fabrication.

3.02 IMPLEMENTATION

A. Installation

1. All stainless steel fabrications shall be erected square, plumb and true, accurately fitted, adequately anchored in place, set at proper elevations and positions.
2. All inserts, anchor bolts and all other miscellaneous work specified herein or shown on the Contract Drawings or required for the proper completion of the work, which are embedded in concrete, shall be properly set and securely held in position in the forms before the concrete is placed.

3. All stainless steel fabrications shall be installed in conformance with details shown on the Contract Drawings or on the approved shop drawings.

B. Welding

1. Welding shall be done in a manner that will prevent buckling and in accordance with Section 05 05 23.01 - Welding, and as modified hereinafter.

2. All welds exposed in the work shall be ground smooth and finished to match the finish of the adjacent stainless steel surfaces.

3. Select weld rods that provide weld filler metal having corrosion resistant properties as nearly identical or better than the base metal to insure preservation of the corrosion-resistant properties. Provide heat treatment at welds where testing of weld procedure indicates it is required to restore the corrosion resistance.

4. Thermal conductivity of stainless steel is about half that of other steels; and the following methods may be used to accommodate this situation:

   a. Use lower weld current setting.

   b. Use skip-weld techniques to minimize heat concentration.

   c. Use back-up chill bars or other cooling techniques to dissipate heat.

5. Edges of the stainless steel to be welded shall be cleaned of contaminants.

C. Cleaning and Handling

1. All stainless steel surfaces shall be precleaned, descaled, passivated and inspected before, during and after fabrication in accordance with the applicable sections of ASTM A380 and as detailed in the procedures to be submitted to the Engineer for approval prior to start of work. Degreasing and passivation of stainless steel articles shall be conducted as the last step after fabrication.

2. Measures to protect cleaned surfaces shall be taken as soon as final cleaning is completed and shall be maintained during all subsequent handling, storage and shipping.

   a. The Contractor shall submit for approval specific procedures listing all the steps to be followed in detecting contamination and in descaling, cleaning, passivation and protecting of all stainless steel.

   b. Area showing clear indications of contamination shall be recleaned, repassivated and reinspected.

3. At approved stages in the shop operations, contaminants such as scale, embedded iron, rust, dirts, oil, grease and any other foreign matter shall be

removed from the metal, as directed or approved by the Engineer. The adequacy of these operations shall be checked by the Engineer. Operations in the shop shall be conducted so as to avoid contamination of the stainless steel and to keep the metal surfaces free from dirt and foreign matter.

4. In order to prevent incipient corrosion during fabrication, special efforts shall be made at all times to keep all stainless steel surfaces from coming in contact with other metals.

   a. Stainless steel and stainless steel welds shall be cleaned with clean sand, stainless steel wool, stainless steel brushes, or other approved means and shall be protected at all times from contamination by any materials, including carbon steel, that shall impair its resistance to corrosion.

   b. Approved methods of cutting grinding and handling shall be used to prevent contamination. If air-arc, or carbon-arc cutting is used, additional metal shall be removed by approved mechanical means so as to provide clean, weldable edges. All grinding of stainless steel shall be performed with aluminum oxide or silicon carbide grinding wheels bonded with resin or rubber. Grinding wheels used on carbon steel shall not be used on stainless steel.

   c. Sand, grinding wheels, brushes and other materials used for cleaning stainless steel shall be checked periodically by the Engineer for contaminants. Cleaning aids found to contain contaminants shall not be used on the work.

D. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish all equipment, materials, and services for the fabrication, delivery, unloading, handling, storing, and erection of all structural steel Work as shown on the Contract Drawings and called for herein.

B. Unless otherwise shown, specified or required, design, workmanship and erection shall conform to or exceed the applicable requirements of the documents listed hereinafter in Article "References" included in this Section to the extent that the provisions of such documents are not in conflict with the requirements of this Section.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Requirements from the following sections also apply to this Section:

1. Section 05 05 13.01 - Galvanizing
2. Section 05 05 23.01 - Welding
3. Section 09 91 00 - Painting

1.04 REFERENCES

A. Definition:

1. Environmental Product Declaration - A third-party-verified International Organization for Standardization (ISO) Series 14025 Type III declaration that quantifies environmental information on the life cycle of a product to enable comparisons between products fulfilling the same function.

B. Reference Standards:

1. ASTM:

a. A6 - General Requirements for Rolled Structural Steel Bars, Plates, Shapes and Sheet Piling

b. A36 - Carbon Structural Steel

c. A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

d. A193 - Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service

e. A194 - Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service

f. A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

g. A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

h. A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

i. A563 - Carbon and Alloy Steel Nuts

j. A572 - High-Strength Low-Alloy Columbium-Vanadium Structural Steel

k. A588 - High-Strength Low-Alloy Structural Steel with 50 ksi Minimum Yield Point to 4-Inches Thick

l. A992 - Standard Specification for Steel for Structural Shapes for Use in Building Framing

m. F436 - Hardened Steel Washers, Inch and Metric Dimensions

n. F 594 - Stainless Steel Nuts

o. F3125 - High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi & 150 ksi Minimum Tensile Strength, Inch and Metric Dimensions

2. ANSI B18.2.1 - Square and Hex Bolts and Screws-Inch Series.

3. ANSI B18.22.1 - Plain Washers

4. ANSI/ASME B18.2.2 - Square and Hex Nuts (Inch Series)

5. American Welding Society (AWS):

a. D1.1 - Structural Welding Code

b. QC1 - Qualification and Certification of Welding Inspectors

6. New York City Building Code (NYCBC)

7. New York City Department of Buildings (NYCDOB)

8. American Institute of Steel Construction (AISC):

a. Steel Construction Manual

b. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges

c. AISC 360 - Specification for Structural Steel Buildings

d. RSCS Specifications for Structural Joints Using High-Strength Bolts

e. Design Guide 24 - Hollow Structural Sections

9. Steel Structures Painting Council (SSPC)

10. ISO 14025 - Environmental labels and declarations - Type III environmental declarations

1.05 DESCRIPTION

A. Definition

1. Structural Steel: The term structural steel shall be as defined in the Codes of Standard Practice for Steel Buildings and Bridges of the AISC. Included as structural steel shall be all stiffeners, plates, sag rods and other miscellaneous metal required for a complete installation.

1.06 QUALITY ASSURANCE

A. All fabrication and erection shall be performed by AISC Quality Certified Companies.

B. Shop inspections may be made by the City representatives. The Contractor shall give ample notice to the Engineer prior to the beginning of any fabrication Work so that inspection may be provided. The Contractor shall furnish all facilities for the inspection of materials and workmanship in the shop, and the inspectors shall be allowed free access to the necessary parts of the works.

1. Inspectors shall have the authority to reject any materials or work which does not meet the requirements of these Specifications.

2. Inspection at the shop is intended as a means of facilitating the work and avoiding errors, but is expressly understood that it will in no way relieve the Contractor from his responsibility for furnishing proper materials or workmanship under this Specification.

3. Obtain copies of Certified Materials Test Reports (both chemical and physical) and Manufacturer Certificates of Conformance.

C. All welding shall be performed by certified welders under the immediate supervision of a representative of a standard testing agency or a special inspection agency reporting directly to and under the control of the City and meeting the requirements of Section 05 05 23.01 – Welding.

D. The Contractor shall submit the name of such testing agency to the Commissioner for approval before starting Work.

1. All shop and field welds in structural steel shall be visually inspected by an AWS qualified welding inspector. The Contractor shall furnish a letter of certification for each welded connection stating that these requirements have been met.

2. The costs of all welding supervision and inspections shall be borne by the Contractor. The Contractor shall engage inspectors to inspect welded connections and to perform tests and prepare test reports.

3. Nondestructive testing such as radiographic testing or ultrasonic testing, when required, shall be as specified by the Engineer and performed in accordance with the applicable AWS or ASME code. Frequency of such testing shall also be as specified by the Engineer or indicated on the Contract Drawings.

4. Welds that are required by the Engineer and/or inspectors to be corrected shall be corrected or redone and retested as directed, at the Contractor's expense and to the satisfaction of the Engineer and/or an acceptable independent testing lab.

E. The Contractor shall engage an independent testing and inspection agency to inspect high-strength bolted connections. The agency shall report directly and be under the control of the City. The costs of all high-strength bolt inspections shall be borne by the Contractor.

1. Rejected bolts shall be either replaced or retightened as required. In cases of disputed bolt installation, the bolts in question shall be checked by a

calibrated wrench certified by an independent testing laboratory. The certification shall be at the Contractor's expense.

F. The Contractor shall be solely responsible for the correctness of all shop and field fabrication and fit.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Layout drawings indicating all materials, structural shapes, sizes, and dimensions.
2. Beam and column schedules.
3. Detail drawings indicating connection and anchoring details.
4. Anchor bolts and setting plans.
5. Erection drawings

B. No fabrication shall be started until Shop Drawings have been approved in writing by the Engineer.

C. The Contractor shall also submit the following:

1. Certified mill test reports
2. Affidavit of compliance with grade specified
3. Certified weld inspection reports
4. Certification for bolts
5. Paint certification
6. Quality certifications for fabricators and erectors.

D. The Contractor shall furnish samples for testing, if required by the Contract.

E. Sustainability Submittals:

1. Environmental Product Declarations
   a. The Contractor shall provide product-specific type III Environmental Product Declaration (EPD) conforming to ISO 14025, 14044.
2. Envision Submittals
   a. The Contractor shall report information pertaining to the sustainable procurement, regional sourcing, and/or recycled content of new materials to be procured during the Work, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall coordinate with its vendor on sustainable product requirements as stipulated by the Contractor’s approved New Materials Sustainable Implementation Plan, in

accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall submit vendor shop drawings for review by the Engineer that clearly illustrate the vendor is meeting the requirements as approved in the Contractor's New Materials Sustainable Implementation Plan.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Structural members shall be loaded in such a manner that they may be transported and unloaded without being over-stressed, deformed or otherwise damaged.

B. Structural steel members and packaged materials shall be protected from corrosion and deterioration. Material shall be stored in a dry area.

C. Materials stored outdoors shall be supported above ground surfaces on wood runners and protected with approved effective and durable covers.

D. Materials shall not be placed on the structure in a manner that might cause distortion or damage to the members or the supporting structures. The Contractor shall repair or replace damaged materials or structures as directed by the Engineer.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Structural Steel

1. The fabricator shall provide an affidavit stating that the structural steel furnished meets the requirements of the grade specified. All unidentified steel will be rejected and shall be removed from the site and replaced by the Contractor, at no additional cost to the City.

2. Structural steel for W shapes shall conform to ASTM A992 unless otherwise indicated.

3. Structural steel for S, M, and HP shapes and channels shall conform to ASTM A572 Grade 50 unless otherwise indicated.

4. Structural steel for angles and plates shall conform to ASTM A36 unless otherwise indicated.

5. Certified mill test reports or certified reports of tests made by the fabricator or a testing laboratory for structural steel in accordance with ASTM A6 and

the governing specification shall constitute evidence of conformity with the ASTM Specification.

6. Steel pipe shall be ASTM A53, Type E or S, Grade B.

7. Structural tubing shall be ASTM A500, Grade B. All members shall be furnished full length without splices unless otherwise noted or accepted by the Engineer.

8. Low alloy, high strength, high corrosion resistant steel shall conform to ASTM A 588.

9. High strength Columbium-Vanadium structural steel shall conform to ASTM A 572, Grade 50.

B. Bolts

1. High strength bolts shall conform to ASTM F3125. Other bolts shall conform to ASTM A307. Unless otherwise indicated, all bolts shall be ASTM F3125.

2. Galvanized high strength bolts shall conform to ASTM F3125, Type 1, nuts shall conform to ASTM A563. Galvanizing shall be by the hot-dip process and in accordance with Section 05 05 13.01 - Galvanizing.

   a. Nuts shall meet the requirements of either ASTM A563 for Grade DH, or ASTM A194 for Grade 2H.

   b. Flat circular washers and square or rectangular beveled washers shall conform to the requirements of ASTM F436.

   c. Bolt dimensions shall conform to the requirements for regular semi-finished hexagon bolts, ANSI B18.2.1., unless otherwise specified.

   d. Nut dimensions shall conform to requirements for heavy hexagon semi-finished nuts ANSI/ASME B18.2.2. Washers shall be flat and smooth and their dimensions shall conform to the requirements for heavy plain washers, ANSI B18.22.1.

3. Bolts used to connect dissimilar metals or located in a corrosive atmosphere, as indicated on the Contract Drawings or specified herein, shall be Type 316 stainless steel conforming to ASTM A193 and A194.

4. Bolts not manufactured in the United States shall be tested and certification provided with respect to specified and required quality and strength standards. Certification of origin shall be provided for all United States fasteners. Bolts to be tested will be randomly selected in the field by the Engineer.

C. Anchor Bolts

1. Anchor bolts for structural steel shall be of the size and configuration shown on the Contract Drawings and shall conform to ASTM A307 unless shown or noted otherwise on the Contract Drawings.

D. Welding Electrodes

1. Welding electrodes for ASTM A36 steel shall comply with ANSI/AWS A5.1 (minimum tensile strength of 72,000 psi) and shall be E70XX.

2. Welding electrodes for ASTM A588, ASTM A572, and ASTM A992 steel shall comply with ANSI/AWS A5.17 (tensile strength range of 70,000 psi to 95,000 psi) or ANSI/AWS A5.23 wire and flux, and shall be F7XX-EXXX or F7XX-EXX-XX.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Fabrication shall be in accordance with the AISC Code of Standard Practice for Steel Buildings and Bridges.

B. Anchor Bolts:

1. All anchor bolts for structural steel erection and other incidental items of the structural steel required to be built into concrete shall be properly set and securely held in position in the forms before the concrete is placed.

2. Anchor bolts and setting plans for steel columns shall be provided at the site, marked or tagged for ready identification.

3. Anchor bolts shall be accurately set to template and at elevation to provide suitable projection above concrete and/or grout as specified in AISC Code of Practice. Anchor bolts shall be set perpendicular to the theoretical bearing surface.

4. All holes in structural steel members required for anchors, anchor bolts, bolt holes, connection angles, supports and braces for stair stringers, equipment apparatus, sag rods, or other members noted on the Contract Drawings shall be provided by the fabricator and detailed on the shop drawings.

5. Where misalignment between anchor bolts and bolt holes in steel members is encountered, the Engineer shall be immediately notified. The Contractor shall submit a method to remedy the misalignment for review by the Engineer.

C. All materials shall be properly worked and match-marked for field assembly. Where finishing is required, assembly shall be completed including bolting of units before start of finishing operations.

D. Connections:

1. Unless noted otherwise on the Contract Drawings, all beam connections shall be designed for reaction values indicated on the Contract Drawings. Wherever beam reaction values or connection details are not shown, the connection shall be designed to support half the total uniform load capacity tabulated in the AISC tables for allowable loads for laterally supported beams for the given shape, span, and steel specified for the beam in question.

2. Unless noted otherwise on the Contract Drawings, all beam connections designed by the fabricator shall conform to tables for Framed Beam Connections in AISC Manual of Steel Construction.

3. Except where otherwise noted on the Contract Drawings or in this Specification, all shop connections shall be welded.

E. Where shop assembly of field connections is shown, specified or required, the unmatched holes shall be reamed and the pieces matchmarked before disassembly. The interchange of matching parts will not be permitted.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Field Measurement

1. The Contractor shall verify all dimensions and shall make any field measurements necessary and shall be fully responsible for accuracy and layout of the work.

2. The Contractor shall review the Contract Drawings and any discrepancies shall be reported to the Engineer for clarification prior to starting fabrication.

3.02 IMPLEMENTATION

A. Erection

1. The erection of all structural steel shall conform to the applicable requirements of the Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings of the AISC.

a. All temporary bracing, guys and bolts as may be necessary to ensure the safety of the structure until the permanent connections have been made shall be provided by the Contractor.

b. High strength steel bolts shall conform to the AISC Specifications for Structural Joints Using High-Strength Bolts.

2. All field connections shall be accurately fitted up before being bolted. Drifting shall be only such as will bring the parts into position and shall not be sufficient to enlarge the holes or to distort the metal. All unfair holes shall be drilled or reamed.

3. High Strength Steel Bolts

a. The furnishing and installation of high-strength bolts, washers and nuts shall be in conformity with:

1) Relevant sections of the NYCBC.

2) Latest issue of Rules Relating to High-Strength Bolts by the NYCDOB.

b. All bolted connections shall use high strength bolts in bearing-type connections according to the AISC Specification for Structural Joints Using High-Strength Bolts.

c. Where indicated, high strength bolts in slip-critical connections shall be used according to AISC Specification for Structural Joints Using High-Strength Bolts. The Engineer shall approve the procedure for calibration of wrenches and installation of bolts and, in general, shall satisfy himself that all requirements of the Specifications for Structural Joints Using High-Strength Bolts are met.

4. Cutting and Burning: The use of a gas cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. Its use may be permitted on minor members if the member is not under stress, and only after the written approval of the Engineer has been obtained.

a. No cutting of structural steel members in the field will be allowed except by written approval of the Engineer.

b. All cutting shall be done with an oxyacetylene torch in conformity with the NYCBC and AWS.

5. Grouting of Base Plates and Bearing Plates: All loose column base plates and billets shall be accurately set to the designated levels on steel wedges or angle screeds in preparation for grouting under this Section. Leveling plates grouted in place shall be installed under all structural steel columns.

a. Prior to the placement of non-shrink grout beneath base and bearing plates, the bottom surface of the plates shall be cleaned of all foreign materials, and concrete and masonry bearing surface shall also be cleaned of all foreign materials and roughened to improve bonding.

b. Anchor bolts shall be tightened after the supported members have been positioned and plumbed and the non-shrink grout has attained its specified strength.

c. Baseplates shall be grouted with non-shrink grout to assure full uniform bearing. Grouting shall be done prior to placing loads on the structure.

6. Welding:

a. Welding, where required, shall be performed in accordance with the requirements of:

1) Section 05 05 23.01 – Welding.

2) AWS D1.1 Structural Welding Code.

3) Relevant sections of the NYCBC when applicable.

b. In assembly and during welding the component parts of built-up Work shall be held in place by sufficient clamps, temporary bolts or other adequate means to keep parts in proper position. Where temporary bolts are used, to hold the parts together in steel plates or similar work, the temporary bolts shall be removed and the holes shall be filled with welding material where practical. Otherwise, the nuts shall be tightened and the bolt threads outside the unit shall be burned and the bolt peened to prevent the nut from loosening.

7. Misfits at Bolted Connections:

a. Where misfits in erection bolting are encountered, the Engineer shall be immediately notified. The Contractor shall submit a method to remedy the misfit for review by the Engineer. The Engineer will determine whether the remedy is acceptable or if the member must be refabricated.

b. Incorrectly sized or misaligned holes in members shall not be enlarged by burning or by the use of drift pins. The Contractor shall notify the Engineer immediately and shall submit a proposed method of remedy for review by the Engineer.

B. Frame Assembly

1. Structural frames shall be set accurately to the lines and elevations indicated on the Contract Drawings. The various members shall be aligned and adjusted to form a part of a complete frame or structure before being permanently fastened. Bearing surfaces and other surfaces which will be in permanent contact shall be cleaned before assembly. Necessary adjustments to compensate for discrepancies in elevations and alignments shall be performed.

2. Individual members of the structure shall be leveled and plumbed within AISC tolerances. The Contractor shall provide and install all temporary bracing required until structure is complete.

C. Painting

1. General Requirements:

a. Structural steel work shall be painted in accordance with Section 09 91 00 - Painting. All painting performed at the fabricator's shop shall be subject to inspection by the Engineer, and all parts of the work shall be made accessible to the Engineer.

1) All structural steel shall be given one prime coat before shipment to the field.

2) Structural steel encased in concrete shall not be painted.

3) Structural steel encased in masonry or which will be otherwise inaccessible in the finished work, shall receive two shop coats. After erection and before the steel is enclosed, all damaged surfaces shall be prepared and touched-up.

4) No paint shall be permitted on faying surfaces of slip critical joints unless it is qualified by test in accordance with AISC "Test Methods to Determine the Slip Coefficient for Coatings used in Bolted Joints" as adopted by the Research Council on Structural connections. Manufacturer's certification shall include a certified copy of the test report.

5) Prime coat shall be compatible with fireproofing system.

b. All structural steel work specified to be painted shall be sand blasted or wheel abraded by the fabricator, of loose mill scale, loose rust, weld slag or flux deposit, dirt and other foreign matter to satisfy the following specifications of the SSPC:

1) SSPC SP-6, Commercial Blast Cleaning, for all steel except steel subject to immersion.

2) SSPC SP-10, Near-White Blast Cleaning, for steels subject to immersion.

c. Cleaned steels shall be primed within 6 hours after cleaning to prevent formation of new rust.

2. Finished Surfaces: Machine finished surfaces with zero clearance metal to metal contact shall be protected against corrosion by rust-inhibiting coating that can be easily removed prior to erection or which has characteristics that make removal unnecessary prior to erection.

3. Field Welds: Surfaces within 2 inches of any field weld location shall be free of materials that would prevent proper welding or produce objectionable fumes while welding is being done.

4. Defective Work: The Contractor shall correct such work as found to be defective under this Article of the Sections.

D. Galvanizing

1. All steel noted to be galvanized on the Contract Drawings or specified herein shall be galvanized in accordance with Section 05 05 13.01 - Galvanizing.

2. All bolts and anchor bolts connecting galvanized steel members shall be galvanized.

3. Shop paint primer shall be omitted from steel to be galvanized.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 05 21 00 - STEEL JOIST FRAMING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the requirements for steel joists and joist girders and related items. Steel joists and joist girders shall conform to the requirements specified herein and as shown on the Contract Drawings.

B. Unless otherwise shown, specified or required, design, workmanship and erection shall conform to or exceed the applicable requirements of the documents listed hereinafter in Article titled "References" in this Section, to the extent that the provisions of such documents are not in conflict with the requirements of this Section.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 09 91 00 - Painting

1.04 REFERENCES

A. Definitions

1. Environmental Product Declaration - A third-party-verified International Organization for Standardization (ISO) Series 14025 Type III declaration that quantifies environmental information on the life cycle of a product to enable comparisons between products fulfilling the same function.

B. Reference Standards

1. ASTM A6 - General Requirements for Rolled Structural Steel Bars, Plates, Shapes and Sheet Piling
2. ASTM A36 - Carbon Structural Steel
3. ASTM A108 - Steel Bars, Carbon, Cold-Finished Standard Quality
4. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
5. ASTM A325 - Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
6. ASTM A572 - High Strength Low-Alloy Columbium - Vanadium Structural Steel
7. ASTM A588 - High Strength Low-Alloy Structural Steel with 50 ksi Minimum Yield Point to 4 in.
8. ANSI B18.2.1 - Square and Hex Bolts and Screws (Inch Series)
9. ANSI B18.22.1 - Plain Washers
10. ANSI/ASME B18.2.2 - Square and Hex Nuts (Inch Series)
11. ANSI AWS A5.1 - Carbon Steel Covered Arc Welding Electrodes
12. ANSI/AWS D1.1 - Structural Welding Code
13. ANSI/AWS QC1 - Qualification and Certification of Welding Inspectors
14. ISO 14025 - Environmental labels and declarations - Type III environmental declarations
15. NY Spec 20-S-35 - Steel Plated, Shapes, and Bars; Carbon Structural
16. New York City Building Code (NYCB)
17. New York City Board of Standards and Appeals (BS&A)
18. New York City Department of Buildings (NYDB)
19. American Institute of Steel Construction (AISC)

20. Code of Standard Practice for Steel Buildings and Bridges (AISC)
21. Specification for Design Fabrication and Erection of Structural Steel for Buildings (AISC)
22. Commentary of the AISC Specification (AISC)
23. Specifications for Structural Joints Using ASTM A325 or A490 bolts (AISC)
24. Steel Structures Painting Council (SSPC)
25. Detailing Steel for Construction (AISC)
26. Standard Specifications for Open Web Steel Joists, K-Series (SJI)
27. Standard Load Table - Open Web Steel Joists, K-Series (SJI)
28. Standard Specifications for Joist Girders
29. Design Guide Weight Table/Joist Girders, G-Series
30. Recommended Code of Standard Practice for Steel Joists and Joist Girders
31. American Iron and Steel Institute (AISI)

1.05 DESCRIPTION

A. Design

1. General: Steel joists and joist girders shall be as designated on the Contract Drawings in accordance with the standard designations of the Steel Joist Institute. The depth of steel joists and joist girders, for purpose of design, in all cases shall be the depth at the center of the span.
2. Steel joists shall be designed to develop the total and service live load uniformly distributed load-carrying capacities shown in the SJI "Standard Load Table for Open Web Steel Joists, K-Series, "for the spans and loadings indicated on the Contract Drawings. The furnished steel joists shall be capable of resisting the design service loads at the joist spacing indicated on the Contract Drawings. Live load deflection shall be limited to 1/360 of the span.
3. Joist girders shall be designed as simply supported primary members to support panel point loadings. All imposed loads shall be applied through joist girders and shall be equal in magnitude and evenly spaced along joist girder top chord unless otherwise indicated on the Contract Drawings. The furnished joist girders shall be capable of resisting, within allowable unit stress limits, all imposed concentrated service loads. Joist girders shall be designed to account for the magnitude and location of all loads and forces, other than equal concentrated gravity loadings, indicated on the Contract Drawings. Joist girders shall be proportioned such that they can be erected without bridging. Joist girders shall be cambered to account for full dead load as indicated on the Contract Drawings. Unless a roof surface is provided with sufficient slope toward points of free drainage or adequate

drains to prevent the accumulation of rainwater, the joist girder shall be investigated to assure stability under ponding conditions in accordance with Section 1.13.3 of the AISC Specification. Live load deflection shall be limited to 1/360 of the clear span. The slope of the top chord shall be provided as indicated on the Contract Drawings after dead load deflection has been taken into consideration. The nominal depth of sloping chord joist girders shall be the depth at mid-span.

4. The design of joists and joist girders chords and web sections shall be based on a yield strength of at least 36,000 psi, but not greater than 50,000 psi and shall conform to Steel Joist Institute requirements.

5. Accessories and fittings, including end supports and bridging, shall be designed and provided in accordance with the manufacturer's standard Specifications under which the joists and joist girders were designed.

6. Vertical or diagonal members shall be designed, and provided at all concentrated loads, where shown on the Contract Drawings.

7. Extended ends shall be designed in accordance with the magnitude and location of uniform or concentrated loads shown on the Contract Drawings. Where such design loads are not indicated, extended ends shall be designed in accordance with SJI requirements.

8. Ends of joist girders resting on the steel supports shall be attached thereto in accordance with SJI requirements and shall be anchored to resist uplift forces indicated on the Contract Drawings.

1.06 QUALITY ASSURANCE

A. Qualification of Manufacturer: Steel joists and joist girders shall be the product of an experienced manufacturer who is regularly engaged in the manufacturing and distribution of steel joists and joist girders and accessories.

B. Qualification of Welders: Welds shall be made only by welders, tackers and welding operators who have been previously qualified by tests, as prescribed in the Structural Welding Code, AWS D1.1, to perform the type of work required. Any welder shall be retested and recertified when the work of the welder creates a reasonable doubt as to his proficiency. Such tests shall be conducted at no additional expense to the City. Recertification of the welder shall be submitted only after the welder has taken and passed the required retest.

C. All shop and field welding shall be performed by certificated welders under the immediate supervision of a representative of a standard testing agency or an inspection agency reporting directly to and under the control of the City.

1. The name of such testing agency shall be submitted to the Engineer for approval before starting the work.

2. The costs of all welding supervision and inspections shall be borne by the Contractor. Inspectors shall be engaged to inspect welded connections and to perform tests and prepare test reports.

D. Responsibility for Errors: Responsibility for errors of detailing and fabrication and for the correct fit of the steel joist and joist girder units shall be borne by the Contractor.

E. Remedial Action: Materials, fabrications and workmanship found defective shall be promptly removed and replaced with new acceptable work in accordance with Contract requirements. The expense of removing and replacing welds of the steel joists and joist girders for testing purposes will be borne by the City if welds are found satisfactory.

F. Coordination: Work of this Section shall be coordinated with the work of other trades so that construction is not delayed.

G. Safety: Steel joist and joist girder erection procedures and health and safety of the work force shall be the total responsibility of the Contractor. The requirements of all authorities having jurisdiction shall be compiled with.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited, to:

1. Shop Drawings shall depict complete shop and erection details for fabrication and installation of all primary members and accessories. All connections, fasteners, holes, welds (both shop and field), camber, fabrication and erection tolerances, material designations, Joist and joist girder weights, critical clearances, types of surface preparation and surface finishes, and other pertinent data shall be indicated. Welds shall be indicated by AWS symbols, which show size, length and type of weld.

2. Shop Drawings showing the layout of joist and joist girder units and accessories, special connections, anchorage and jointing details, including mark, member, type, location and spacing of joist and joist girder units and bridging shall be submitted.

3. Setting diagrams, templates and directions for installation of anchor bolts, bearing plates and other fastening items shall be furnished.

4. Shop Drawings shall be reviewed and approved for Specification compliance. However irrespective of Shop Drawing review determination, final Specification compliance with requirements for materials, fabrication and erection shall be the exclusive responsibility of the Contractor.

B. Design Calculations: Complete engineering design and calculations for the joists and joist girders shall be prepared and stamped by a registered Professional Engineer in the State of New York certifying that the joists and joist girders have been designed in accordance with the SJI Load Tables and Specifications. For standard steel joists, K-series, certification that the engineering design and calculations have been investigated by the Steel Joist Institute and were found to conform to the standard Specifications may be submitted in lieu of the specified design computations.

C. Certifications:

1. General: Test requirements for materials as stated herein or incorporated in reference documents may be waived, except for specified field tests, provided that certified copies of test reports from approved laboratories performed on previously manufactured material are submitted.

2. Manufacturer's Certification shall be as follows:

a. Steel: Certification as required by the SJI Standard Specifications regarding the steel used shall be furnished for all joists and joist girders. Copies of mill test reports, covering the chemical and physical properties of the steel to show compliance with these Specifications, and specified standards shall be submitted. These reports shall include the names and locations of the mills and shops. Test reports shall be accompanied by notarized certificates from the manufacturer certifying that the previously tested material is of the same type, quality and manufacturer as that proposed for this project.

b. Joists and Joist Girders: Manufacturer's certifications that the joist and joist girder comply with SJI Specifications shall be submitted.

3. Welders: Certification that each welder has been qualified in accordance with AWS Code D1.1 within the previous 12 months shall be submitted.

D. Manufacturer's Data: For information only, producer's or manufacturer's specifications include painting, installation instructions for each type of joist and joist girder and accessories, quantity and marking of units, size and location of anchorages, erection procedures, including schedules, procedures and diagrams showing sequence of erection and bridging shall be submitted.

E. Sustainability Submittals:

1. Environmental Product Declarations

a. The Contractor shall provide product-specific type III Environmental Product Declaration (EPD) conforming to ISO 14025, 14044.

2. Envision Submittals

a. The Contractor shall report information pertaining to the sustainable procurement, regional sourcing, and/or recycled content of new materials to be procured during the Work, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall coordinate with its vendor on sustainable product requirements as stipulated by the Contractor’s approved New Materials Sustainable Implementation Plan, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall submit vendor shop drawings for review by the Engineer that clearly illustrate the vendor

is meeting the requirements as approved in the Contractor's New Materials Sustainable Implementation Plan.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Structural members shall be loaded in such a manner that they may be transported and unloaded without being over-stressed, deformed or otherwise damaged.

B. Structural members and packaged materials shall be protected from corrosion and deterioration. Material shall be stored in a dry area.

C. Materials stored outdoors shall be supported above ground surfaces on wood runners and protected with approved effective and durable covers.

D. Materials shall not be placed on the structure in a manner that might cause distortion or damage to the members or the supporting structures. Damaged materials or structures shall be repaired or replaced as directed by the Engineer.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Joists and Joist Girders: open web steel joists, K-series and joist girders, G-Series, shall be furnished in accordance with SJI Standard Specifications, as manufactured by:

1. Vulcraft Division of Nucor Corporation, Charlotte, NC;
2. Ceco Corporation, Rocky Mount, NC;
3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Steel Joists and Joist Girders: open web steel joists, K-series and joist girders, G-Series, shall be furnished in accordance with SJI Standard Specifications, as specified in this Section.

B. Steel used for chords and web sections shall be based on a yield strength of at least 36,000 psi, but not greater than 50,000 psi and shall conform to applicable ASTM requirements.

C. Bridging, bridging anchors, joist leg extension and end anchorage shall conform to the requirements of ASTM A36.

D. Bolts:

1. High strength bolts shall conform to ASTM A325, other bolts shall conform to ASTM A307.

E. Shear Stud Connectors shall conform to ASTM A108, Grade 1015, hooked or headed stud and shall be uncoated.

F. Welding Electrodes: Welding electrodes for manual shielded metal arc welding shall conform to the following:

1. Welding electrodes for ASTM A36 steel shall comply with ANSI/AWS A5.1 and shall be E60XX.

2. Welding electrodes for ASTM A572 and A588 steel shall comply with ANSI/AWS A5.1 or A5.5 and shall be E70XX.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Fabrication

1. General: Fabrication shall be in accordance with the AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings, American Iron and Steel Institute Specification for the Design of Cold-Formed Steel Structural Members and the SJI Standard Specifications and Load Tables.

2. Joist girders shall be furnished with pitched top chords where shown on the Contract Drawings.

3. Extended Ends: Top chord extended ends on joists and joist girders where shown on the Contract Drawings shall be provided in compliance with the manufacturer's standards and the requirements of SJI Specifications and Load Tables.

4. Holes in Chord Members: Holes in chord members shall be provided where shown on the Contract Drawings for securing other work to the steel joists and joist girders; however, the area of the chord shall be deducted when calculating the strength of the member.

5. Camber: Steel joists and joist girders shall be cambered in accordance with Steel Joist Institute recommendations.

6. Steel bridging for all steel joints and joist girders shall be provided in compliance with the more stringent requirements of the type, size, configuration and spacing shown on the Contract Drawings or as required by the SJI Standard Specification. In no case shall the number of rows of bridging be less than that specified therein, and shall not be less than three rows with diagonal bridging at the center of the span.

7. End Anchorage: End anchorages shall be provided to secure joists and joist girders to adjacent construction as shown on the Contract Drawings, but not less than the minimum anchorage specified by SJI. Positive anchorage shall be provided at the ends of each bridging line at both top and bottom chords.

Where uplift forces are indicated as a design consideration, steel joists and joist girders shall be adequately anchored to resist such forces.

8. Welding operations shall be in accordance with AWS D-1.1.

9. Shop Inspection: Joist and joist girder assemblies and accessories shall be inspected by the manufacturer before shipment to insure compliance of materials and workmanship with the requirements of these Specifications.

10. Material: All materials shall be properly worked and match-marked for field assembly. Where finishing is required, assembly shall be completed including bolting and welding of units before start of finishing operations.

11. Shop Assembly: Where shop assembly of field connections is shown on the Contract Drawings, specified or required, the unmatched holes shall be reamed and the pieces match marked before disassembly. The interchange of matching parts shall not be permitted.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Field Measurements

1. All dimensions shall be verified and any field measurements necessary shall be made. Accuracy and layout of the work shall be the full responsibility of the Contractor.

2. The Contract Drawings shall be reviewed and any discrepancies shall be reported to the Engineer for clarification prior to starting fabrication.

3.02 IMPLEMENTATION

A. Erection

1. General: Steel joists and joist girders shall be placed and secured in accordance with SJI Specifications, approved Shop Drawings and as herein specified.

2. Placing Joists: Placement of steel joists shall not be started until supporting girders are in place and secured. Joists shall be placed on supporting work, and shall be adjusted and aligned in accurate locations and spacing before permanently fastening. Shoes of joists shall be adjusted for uniform bearing within the limits of the AISC Code of Standard Practice. End anchorages shall be in accordance with the manufacturer's standard specification under which the joists were produced and in compliance with SJI Standard Specifications. Deviations from a straight line between ends of any installed joist shall not exceed 3/8-inch in 10 feet.

3. Placing Joist Girders: Means for the adequate distribution of concentrated loads shall be provided so that the load-carrying capacity is not exceeded.

Other loads shall not be placed on the joist girders until the steel joist bearing on the girder are in place and welded to the girder. If the ends of the bottom chord are not strutted between columns, bracing shall be provided near the first bottom chord panel points whenever uplift due to wind forces is a design consideration. Joist girders at column lines shall be field bolted to the column supports to provide lateral stability during construction.

4. Safety:

   a. Temporary bridging, connections and anchors shall be provided to ensure lateral stability during construction. Erection procedures, health and safety shall be responsibility of the Contractor. Requirements of all authorities having jurisdiction shall be complied with.

   b. Any temporary bridging loads shall be adequately distributed such that the load-carrying capacity of any joists and joist girders is not exceeded.

   c. Loads shall not be applied to bridging.

5. Bridging:

   a. Permanent bridging and anchoring shall be installed simultaneously with joist and joist girder erection and before any construction loads are applied. Ends of bridging lines shall be anchored at top and bottom chords where terminating at walls or beams.

6. Fastening Joists and Joist Girders: Joists and joist girders shall be field welded to supporting steel in accordance with SJI Standard Specifications. Welding sequence and procedure shall be coordinated with the placing of joists and joist girders.

7. Damage:

   a. Joists and joist girders shall be handled in such a manner as to avoid damaging the joists and joist girders. Damaged joists and joist girders shall be removed from the site, except when field repair is approved by the Inspection and Testing Agency or the Engineer and such repairs are satisfactorily made in accordance with the manufacturer's recommendations.

   b. The joists and joist girders shall not be damaged by the field welding. The total length of weld at any one cross-section on cold-formed members whose yield strength has been attained by cold working, and whose as-formed strength is used in the design, shall not exceed 50 percent of the overall developed width of the cold-formed section.

c. Cleaning and spot repair of field welds, abraded areas and rust spots shall be the responsibility of the Contractor. Painting surfaces shall be adequately protected until final acceptance of the work.

B. Painting

1. General Requirements:

a. Steel joists and joist girders shall be painted in accordance with Section 09 91 00 - Painting. All painting shall be performed at the fabricator's shop shall be subject to inspection by the Engineer, and all parts of the work shall be made accessible to the Engineer.

1) All steel joists and joist girders shall be given one prime coat before shipment to the field.

2) Steel joists and joist girders which are not embedded, but which are encased in concrete or other masonry or those which will be otherwise inaccessible in the finished work, shall receive two shop coats. After erection and before the steel is enclosed, all damaged surfaces shall be prepared and touched up.

b. All steel joists and joist girders specified to be painted shall be sand blasted or wheel abraded by the fabricator of loose mill scale, loose rust, weld slag, flux deposit, dirt and other foreign matter to satisfy SSPC SP-6, Commercial Blast Cleaning for all steel.

c. Cleaned steels shall be primed within 6 hours after cleaning to prevent formation of new rust.

2. Contact Surfaces: Contact surfaces shall be cleaned and primed in accordance with Paragraphs 3.02 B.1. b. and c, above, but shall not be painted.

3. Finished Surfaces: Machine finished surfaces with zero clearance metal to metal contact shall be protected against corrosion by rust-inhibiting coating that can be easily removed prior to erection or which has characteristics that make removal unnecessary prior to erection.

4. Field Welds: Surfaces within two inches of any field weld location shall be free of material that would prevent proper welding or produce objectionable fumes while welding is being done.

5. Painting Weld Surfaces (clean and paint): One shop coat over prime in the shop and one final coat in the field shall be provided.

6. Defective Work: Such work as found defective under this Section shall be corrected at no additional cost to the City.

3.03 FIELD TESTING / QUALITY CONTROL

A. Welded connections shall be inspected and tests and test reports shall be prepared by the Testing Laboratory. All testing shall be retained and paid for by the Contractor.

B. Inspection and Testing: Steel joist and joist girders shall be inspected and tested by the Testing Laboratory as follows:

1. Perform visual inspection of welds and bolts.

2. Check conformance of joists and joist girders in place with the accepted allowable tolerances indicated in the AISC Code of Standard Practice and in ASTM A6.

C. Such corrections as the Testing Laboratory may indicate shall be made at no additional cost to the City.

D. Cutting and Burning: The use of a gas cutting torch in the field for correcting fabrication errors shall not be permitted on any major member in the structural framing. Its use shall be permitted on minor members if the member is not under stress, and then only after the written approval of the Engineer has been obtained.

1. No cutting of structural steel members in the field shall be allowed except by the written approval of the Engineer.

2. All cutting shall be done with an oxyacetylene torch in conformance with the NYBC and the latest rules of the BS&A.

E. Misfits at Bolted Connections:

1. Where misfits in erection bolting are encountered, the Engineer shall be immediately notified. A method to remedy the misfit shall be submitted for review by the Engineer. The Engineer shall determine whether the remedy is acceptable or if the member must be refabricated.

2. Incorrectly sized or misaligned holes in members shall not be enlarged by burning or by the use of drift pins. The Engineer shall be notified immediately and a proposed method of remedy shall be submitted for review.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. The work specified in this Section consists of furnishing, fabricating and installation of cellular, non-cellular steel roof decking and appurtenant items. The work shall be completed in place as shown on the Contract Drawings and as specified herein.

B. The Work shall include all incidental and miscellaneous items not specified under another Section but required for completing the work of this Section, whether or not specifically required herein.

C. Unless otherwise shown, specified or required, design, workmanship and erection shall conform to or exceed the applicable reference standards listed hereinafter in this Section to the extent that the provisions of such documents are not in conflict with the requirements of this Section.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the

applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 09 91 00 - Painting

1.04 REFERENCES

A. Acronyms:

1. American Galvanizers Association (AGA)
2. Steel Deck Institute (SDI)

B. Definitions

1. Environmental Product Declaration - A third-party-verified International Organization for Standardization (ISO) Series 14025 Type III declaration that quantifies environmental information on the life cycle of a product to enable comparisons between products fulfilling the same function.

C. Reference Standards

1. ASTM A385 - Practice for Providing High Quality Zinc Coatings (Hot Dip)
2. ASTM A653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
3. ASTM A780 - Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
4. ASTM A924 - General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
5. ASTM B6 - Zinc
6. Specification for the Design of Cold-Formed Steel Structural Members (AISI)
7. Cold-Formed Steel Design Manual (AISI)
8. Design Manual for Composite Decks, Formed Decks and Roof Decks, and Cellular Metal Floor Deck with Electrical Distribution. No. 26 (SDI)
9. Diaphragm Design Manual (SDI)
10. ANSI/AWS D1.1 - Structural welding Code - Steel
11. ANSI/AWS D1.3 - Structural Welding Code - Sheet Steel
12. ISO 14025 - Environmental labels and declarations - Type III environmental declarations
13. SSPC-VIS-1 - Visual Standard for Abrasive Blast Cleaned Steel (SSPC)

1.05 DESCRIPTION

A. Design

1. The steel deck shall be designed in accordance with AISI Specification for the Design of Cold-Formed Steel Structural Members, except as specified otherwise herein. Deck units shall have ribbed sections providing a satisfactory surface for the reception of design loads. Wherever practicable, units shall have sufficient length to span three or more supports. The depth and gage of deck shall be as specified on the Contract Drawings.

2. Allowable Deflection: Roof deck shall be designed to support the superimposed dead load and design live load as indicated on the Contract Drawings with maximum deflection not to exceed 1/240 of the span under the following loading conditions:

   a. Uniform design live load.

   b. 200-pound concentrated load at midspan on a 1 foot wide section of deck during construction.

3. Attachments: Roof deck units shall be installed and anchored to supporting members to provide lateral stability and resist design horizontal and uplift loadings indicated on the Contract Drawings. Fastening requirements to resist horizontal loads shall be in accordance with SDI "Diaphragm Design Manual."

4. Section properties shall be determined in accordance with AISI "Specification for the Design of Cold-Formed Steel Structural Members." The properties of steel deck section shall be computed on the basis of the effective design width as limited by the provisions of the AISI Specifications. The section properties not less than shown on the Contract Drawings shall be provided for the specified steel deck section, including section modulus and moment of inertia per foot of width.

1.06 QUALITY ASSURANCE

A. Except as otherwise specified, the SDI "Design Manual" cited herein shall govern the work.

B. Qualification of Manufacturer: Steel roof deck units and accessories shall be provided where indicated on the Contract Drawings and shall be the products of a manufacturer who is regularly engaged in the manufacture of steel decking.

C. Qualification of Welders: Each welder shall be qualified in accordance with AWS D1.1. A welder shall be retested and recertified when the work of the welder creates a reasonable doubt as to his or her proficiency. Such tests when required, shall be conducted at no additional expense to the City. Recertification of the welder shall be submitted only after the welder has taken and passed the required retest.

D. Testing and Inspection: Material and fabrication procedures are subject to inspection and tests in the mill, shop and field. These tests shall be conducted by the Testing Laboratory in accordance with the requirements of General Conditions.

Such inspection and tests shall not relieve the Contractor of responsibility of providing materials and fabrication procedures in compliance with specified requirements.

E. Factory Inspection: Except as specified otherwise in this paragraph, factory tests and inspections of materials will not be required provided that certified copies of factory test reports are submitted to the Engineer for approval. These shall include manufacturer's certificates of compliance with all requirements of these specifications. When the test reports are on materials previously manufactured they shall be accompanied by notarized statements from the manufacturer certifying that the materials being furnished are identical with previously manufactured materials on which the factory test reports are based.

F. Shop Drawings Reviews: Such reviews shall be obtained before custom fabrication is started and before delivery of materials to the project site.

G. Coordination: Work of this Section shall be coordinated with the work of other trades so that construction is not delayed.

H. Safety: Steel roof deck erection procedures and health and safety of the work force shall be the responsibility of the Contractor. The requirements of authorities having jurisdiction shall be complied with.

I. Responsibility for Errors: Errors of detailing and fabrication and for the correct fit of the steel deck units shall be the responsibility of the Contractor.

J. Remedial Action: Materials, fabrications and workmanship found defective shall be promptly removed and replaced and new acceptable work shall be provided in accordance with Contract requirements at no additional expense to the City.

K. Design of roof deck layout, spans, fastenings, joints, and framed openings shall be under the direct supervision of a Professional Engineer experienced in structural design of decking and licensed in the State of New York.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Shop Drawings: Detailed Shop Drawings which indicate for each type of steel decking required, the material, steel thickness, designation and finish, a dimensional cross-sectional profile, and computed structural properties to verify compliance with the project requirements shall be submitted. Details of fabrication and erection, including various connections, layouts of deck units placement directions, bearing on structural supports, anchorage details, attachment of accessories, each condition requiring closure panels, supplementary framing, cut opening, special jointing and other accessories as required to complete the work shall be shown on the Shop Drawings. Details and layout shall show location of supporting members, quantity and marking of decking units, size and location of holes and openings to be cut and the location, type and sequence of welded connections.

2. Shop Drawings shall be reviewed and approved for Specification compliance. However irrespective of Shop Drawing review determination, final Specification compliance with requirements for materials, fabrication and erection shall be the exclusive responsibility of the Contractor.

B. Certifications:

1. General: Test requirements for materials as stated herein or incorporated in reference documents may be waived, provided that certified copies of test reports from approved laboratories performed on previously manufactured material are submitted.

2. Manufacturer's Certifications: Manufacturer's certifications as required to show compliance with these specifications shall be submitted. Copies of mill test reports, including names and locations of mills and shops, covering the chemical and physical properties of the steel sheet to show compliance with these specifications shall be submitted. Test reports shall be accompanied by notarized certificates of compliance from the manufacturer certifying that the previously tested material is of the same type, quality and manufacture as that proposed for this project.

3. Certification for Welders: Certification that each welder has been qualified within the previous 12 month period shall be provided in accordance with AWS D1.1.

C. Manufacturer's Data: Manufacturer's specifications and installation instructions for each type of required decking and accessory shall be submitted. These include sheet steel, steel deck units, galvanized mill finish, finished repair paint, welding electrodes, welding washers, fasteners, depressed steel roof deck pans, closure strips, cover plates, and similar items.

D. Sustainability Submittals:

1. Environmental Product Declarations

a. The Contractor shall provide product-specific type III Environmental Product Declaration (EPD) conforming to ISO 14025, 14044.

2. Envision Submittals

a. The Contractor shall report information pertaining to the sustainable procurement, regional sourcing, and/or recycled content of new materials to be procured during the Work, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall coordinate with its vendor on sustainable product requirements as stipulated by the Contractor’s approved New Materials Sustainable Implementation Plan, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall submit vendor shop drawings for review by the Engineer that clearly illustrate the vendor

is meeting the requirements as approved in the Contractor's New Materials Sustainable Implementation Plan.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Materials shall be delivered to the site in an undamaged condition and at such intervals as will avoid delay in the work.

B. Storage: Material shall be stored and protected in a clean, properly drained location. Material shall be kept off the ground under a weather-tight covering permitting good air circulation. Decking shall be stored on dry wood sleepers, pallets, platforms or other appropriate supports which have slope for positive drainage. Decking shall be protected from distortion, excessive stresses, corrosion and other damage.

1. Caution: Materials shall not be stored on the structure in a manner that might cause distortion or damage to the supporting structure. The maximum uniform distributed storage load shall not exceed 20 pounds per square foot.

C. Handling: Material shall be handled safely in a manner that will prevent distortion or other damage. Care shall be exercised at all times to avoid damage through careless handling during unloading, storing and erecting.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel roof deck units shall be as manufactured by:

1. United Steel Deck, Inc., Summit, NJ;

2. Vulcraft Corporation, Springfield, OH;

3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Galvanized Steel Roof Deck: ASTM A653, Grade 33, Coating Designation G90, type and thickness as shown on Contract Drawings but not less than 20 gage.

1. Galvanizing: ASTM A924, Commercial quality.

2. Galvanizing Repair Paint: ASTM A780, high zinc-dust/zinc oxide content paint for repair of damaged galvanized surfaces and field touch-up of welds.

3. Steel Closure Strips or Plates: ASTM A653, minimum 20 gage, galvanized (except as otherwise indicated).

4. Steel Cover Plates: ASTM A653, minimum 20 gage but not less than the steel deck thickness, galvanized.

5. Sheet Steel Accessories: ASTM A653, commercial quality, galvanized (thickness indicated or as suitable for use intended).

6. Ridge and Valley Plates: ASTM A653, galvanized (thickness not less than that of steel deck units).

7. Recessed Steel Roof Deck Pans: ASTM A653, galvanized, minimum 14 gage (0.071 inch).

B. Welding Washers: Standard type compatible with decking furnished.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. General: Deck units shall be manufactured in lengths to span three or more supports, where possible, with flush, telescoped or nested 2-inch end laps and nested side laps, unless otherwise indicated. End laps shall occur over supports. Deck configurations shall comply with SDI requirements and as specified herein.

B. Metal Roof Deck:

1. Galvanized Steel Roof Deck Units shall be manufactured from mill coated, extra heavy duty galvanized sheet steel conforming to ASTM A653. Configuration of roof deck units shall conform to standard SDI wide-rib fluted profile, of the depth, steel thickness or gage and section properties as indicated on the Contract Drawings.

C. Manufacturers for steel roof deck shall be as specified in this Section.

D. Steel Closure Strips: Steel closure strips of not less than 20 gage sheet steel of the same quality and material as the deck units shall be provided and shall form to the configuration required to provide tight-fitting closures at open ends and sides of decking.

E. Ridge and Valley Plates: Ridge and valley plates of sheet steel of the same quality and material as the deck units with each leg not less than 2-1/4 inches wide shall be provided and bent to provide tight-fitting closure with deck units. Plates shall be provided in 10-foot lengths where possible.

F. Recessed Roof Deck Pans shall be fabricated from a single piece of not less than 14 gage sheet steel of the same quality and material as the deck units, with level bottoms and sloping sides to direct water flow to the drain, unless otherwise shown on the Contract Drawings. Deck pans shall be of adequate size to receive roof drains, at least 2 feet by 2 feet, and have bearing flanges not less than 3 inches wide. Pans shall be recessed not less than 1-1/2 inches below the roof deck surface, unless otherwise shown or required by deck configuration. Holes for drains shall be cut in the field.

G. Painting of Deck: On the steel deck surface to be painted in the field, the galvanized surface shall be primed in accordance with the requirements of Section 09 91 00 - Painting.

H. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Field Measurements

1. Prior to commencement of the work, existing dimensions, elevations, locations and conditions applicable to the work shall be field verified. Variances and discrepancies from the Contract Drawings and potential interferences shall be reported promptly to the Engineer.

2. Sufficient field measurements shall be taken prior to preparation of Shop Drawings and fabrication of construction materials, where possible, to ensure proper fitting of the work. However, job progress shall not be delayed. Allow for adjustments and fittings wherever the taking of field measurements before fabrication may not be possible or might delay the work.

3. Actual field-verified conditions may require modifications to the fabrication and/or erection details indicated on the Contract Drawings. The work shall be performed to meet actual field conditions encountered.

B. Inspection

1. The areas and conditions under which work of this Section is to be performed shall be examined. Conditions detrimental to the proper and timely completion of the work shall be corrected. Work shall not be proceeded until satisfactory conditions have been corrected.

3.02 IMPLEMENTATION

A. Installation

1. General: Deck units and accessories shall be installed in accordance with manufacturer's recommendations, approved Shop Drawings and as specified herein.

a. Deck bundles shall be coordinated with structural steel erector in locating decking bundles to prevent overloading of structural members.

b. Deck Storage: Deck units shall not be used for storage or working platform until permanently secured.

2. Placing of Deck Units: Deck units shall be placed on supporting framework with edges up and flutes at right angles to supports. Decking shall be adjusted to final position with ends bearing lying at least 3 inches on supporting members. Also the decking ends shall be accurately aligned before being permanently fastened. Lap end shall not be less than 2 inches for welded construction of all roof decks. Side laps shall be one-half corrugation. The side lap interlock shall not be stretched or contracted. Deck units shall be placed flat and square, and shall be secured to adjacent framing without warp or excessive deflection and with close alignment between cells at ends of abutting deck units.

3. Cutting and Framing: Roof deck units and accessories shall be cut and fitted around other work projecting through or adjacent to the roof decking, as shown on the Contract Drawings. Neat, square and trim cuts shall be provided.

4. Welding: Steel roof deck units shall be permanently fastened to steel supporting members by not less than 5/8-inch-diameter fusion (puddle) welds or elongated welds of equal strength. Welding washer shall be used where recommended by the deck manufacturer. AWS requirements and procedures for manual shielded metal-arc welding appearance, quality and methods used in correcting welding work shall be complied with. The ambient temperature when welding is performed shall be 35 degree Fahrenheit or higher. Welds shall be free of cracks, craters and other defects. Units with burned holes or any other damage shall be replaced promptly with satisfactory units at no additional cost to the City. Steel accessories shall be securely welded in place.

5. Attachments: Steel roof deck units shall be fastened to the supporting members to resist horizontal and uplift loadings as indicated on the Contract Drawings in accordance with SDI "Diaphragm Design Manual." In no case shall the fastening requirements be less than the following:

   a. End Laps and Edge Supports: End laps and all edge supports shall be fastened at 6 inches on center.

   b. Intermediate Supports: Each sheet shall be anchored by welding at each intermediate support not less than 12 inches on center and at closer spacing where required for lateral force resistance, unless otherwise shown on the Contract Drawings.

   c. Side Laps: Side laps between adjacent deck units shall be locked at intervals not exceeding 18 inches on center by welding, unless otherwise shown on the Contract Drawings.

6. Steel Closure Strips: Steel closure strips shall be provided at all open uncovered ends, at edges of roof decking and at voids between decking and other construction and shall be welded into position to provide a complete decking installation.

7. Steel Cover Plates: Steel joint covers shall be provided at abutting ends of deck units, except where taped joints are required or permitted.

8. Reinforcement at Openings:

   a. Additional steel reinforcement and closure pieces required for strength, continuity of decking, and support of other work shall be provided, unless otherwise shown or specified.

   b. Roof decking around openings less than 6 inches in any dimension shall be provided by means of a steel sheet of the same profile as the deck placed over the opening and fusion welded to the top surface of the deck. Steel sheet of the same quality and material as the deck units, not less than 18 gage and at least 14 inches wider and longer than the opening shall be provided. Welds at each corner shall be provided and spaced not more than 6 inches on centers along each side.

   c. Openings larger than 6 inches in steel roof deck, where framing around the opening is not shown on the Contract Drawings, shall be reinforced by steel angles on each side of the opening. The design of the framing angles shall be based on the design live load of that floor area and in no case shall the angles be less than 3-1/2 x 3-1/2 x 3/8 inches. The angles parallel to the deck span shall be connected to the structural steel framing and to the angles on the other two sides of the opening by welding. The angles shall also be anchored to the deck by welding as required for supports.

9. Roof Insulation Support: Steel closure strips shall be provided for the support of roof insulation where the rib opening in the top surface of roof decking occur adjacent to edges and opening. These strips shall be welded into position.

10. Ridge and Valley Plates: Ridge and valley plates shall be welded to the top surface of the roof decking. End joints shall be lapped not less than 3 inches with laps made in the direction of water flow.

11. Recessed Roof Deck Pans: Roof deck pans shall be placed over openings provided in the roof decking. Pans with flanges bearing on top surface of deck shall be positioned and welded to the top deck surface. Each deck flute shall be fusion welded with at least one weld at each corner. Openings in the bottom of the roof deck pan shall be cut to accommodate the drain size required.

B. Galvanizing Repair

1. Decking and accessories shall be cleaned and touched-up where field cut, welded, burned or otherwise damaged. Spot repairs to galvanized or painting finish shall be made in accordance with ASTM A780 where required at no cost to the City.

C. Finish Painting

1. Exposed to view surfaces of steel roof deck units shall be field painted in accordance with the requirements of Section09 91 00 - Painting.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Protection

1. During installation, the steel decking shall not be used as a storage platform nor as a working platform until the deck have units been permanently fastened in position.
2. The surface of installed steel decking shall not be overloaded during the entire construction period.
3. Mechanical equipment or other loads, either temporarily or permanently, shall not be hung from steel roof decking unless otherwise detailed or permitted.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 05 50 00 - METAL FABRICATIONS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish all labor, materials and equipment required to fabricate and install all metal fabrications not specifically included in other Sections and required for the completion of the Work as shown on the Contract Drawings and as specified herein.

B. Metal fabrications shall be provided complete with all accessories, base attachments, fastenings and other appurtenances as specified and as may be required for a satisfactory installation.

C. Unless otherwise shown, specified or required, design, workmanship and erection shall conform to or exceed the applicable requirements of the documents listed hereinafter in Article 1.04 to the extent that the provisions of such documents are not in conflict with the requirements of this Section.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the

applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 05 13.01 - Galvanizing

B. Section 05 05 23.01 - Welding

C. Section 05 05 23.02 - Miscellaneous Metal Fastenings

D. Section 05 53 01.03 - Aluminum Floor Gratings

E. Section 09 91 00 - Painting

1.04 REFERENCES

A. ASTM A36 - Structural Steel.

B. ASTM A48 - Gray Iron Castings.

C. ASTM A276 - Stainless and Heat-Resisting Steel Bars and Shapes.

D. ASTM A480 - General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plates, Sheet and Strips.

E. ASTM A666 - Austenitic Stainless Steel, Sheet, Strip Plate and Flat Bar.

F. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

G. ASTM B221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.

H. ASTM B308 - Aluminum-Alloy 6061-T6 Standard Structural Profiles.

I. ANSI/ASSP Z359.16-2016 – Safety Requirements for Climbing Ladder Fall Arrest Systems

J. ANSI/AWS D1.1 - Structural Welding Code.

K. ANSI/AWS D1.2 - Structural Welding Code - Aluminum.

L. New York City Building Code (NYCBC).

M. American Institute of Steel Construction (AISC).

N. AISC Manual of Steel Construction.

O. AISC Specification for Design and Fabrication of Structural Steel for Buildings Including the Commentary.

P. Aluminum Association Specifications for Aluminum Constructions.

Q. Aluminum Company of America, "Welding and Brazing Aluminum".

R. Occupational Safety and Health Administration (OSHA), U.S. Department of Labor.

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Shop inspections may be made by the City's representatives. The Contractor shall give ample notice to the Engineer prior to the beginning of any fabrication Work so that inspection may be provided. The Contractor shall furnish all facilities for the inspection of materials and workmanship in the shop, and the inspectors shall be allowed free access to the necessary parts of the works.

1. Inspectors shall have the authority to reject any materials or Work which does not meet the requirements of these Specifications.

2. Inspection at the shop is intended as a means of facilitating the Work and avoiding errors, but is expressly understood that it will in no way relieve the Contractor from his responsibility for furnishing proper materials or workmanship under this Section.

3. Obtain copies of Certified Materials Test Reports (both chemical and physical) and Manufacturer Certificates of Conformance.

B. Design of Members and Connections:

1. All details shown are typical; similar details shall apply to similar conditions, unless otherwise shown or specified. Dimensions shall be verified at the Site without causing delay in the Work.

2. Each fabricator shall be responsible for the structural design of miscellaneous metal work within the requirements established by these Specifications.

C. Complete design calculation and Shop Drawings shall be prepared, signed and stamped with the seal of a Professional Engineer, licensed to practice in the State of New York with a minimum of 10 years of experience and recognized as an expert in the required work unless the design and details have been shown on the Contract Drawings.

D. "Pencil-line" thin butt joints shall be provided.

E. Shop Assembly: Items in the shop shall be preassembled to the greatest extent possible, so as to minimize field splicing and assembly of units at the Site. Units shall be disassembled only to the extent necessary for shipping and handling limitations. Units shall be clearly marked for reassembly and coordinated installation.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and other materials for the approval by the Engineer. Shop Drawings shall include, but not be limited to, the following:

1. Layout drawings shall indicate all structural shapes, sizes and dimensions.

2. Certifications, schedules, design calculations, detailed drawings, plans, elevations, and details of sections and connections
3. Detail drawings shall indicate jointing and anchoring details.
4. Anchor bolts and setting plans
5. Erection drawings

B. No fabrication shall be started until Shop Drawings have been approved by the Engineer.

C. The following shall also be submitted:

1. Manufacturer’s specifications, load table, installation instructions, setting drawings and templates for location and installation of miscellaneous metal items, appurtenances and anchorage devices.
2. Certified weld inspection reports.

D. Representative samples of bolts, anchors and inserts shall be submitted as requested by the Engineer. The Engineer's review shall be for type and finish only. Compliance with all other requirements shall be the exclusive responsibility of the Contractor.

E. Record Drawings: During progress of the Work, an up to date set of drawings showing field and Shop Drawing modifications shall be kept. Immediately upon completion of Work, Record Drawings showing the actual in-place installation of all Work constructed and/or installed under this Section shall be submitted to the Engineer. Drawings shall include all necessary plans, sections and details, with all reference dimensions and elevations required for complete Record Drawings of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Metal fabrications shall be handled in such a manner that they may be transported and unloaded without being over-stressed, deformed or otherwise damaged.

B. Metal fabrications and packaged materials shall be protected from corrosion and deterioration and shall be stored in a dry area. Materials stored outdoors shall be supported above ground surfaces on wood runners and protected with effective and durable covers approved by the Engineer.

C. Metal fabrications shall not be placed in or on a structure in a manner that might cause distortion or damage to the fabrication. The Contractor shall repair or replace damaged metal fabrications or materials as directed by the Engineer.

D. Materials shall be delivered to the Site at such intervals to insure uninterrupted progress of the Work. Anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry shall be delivered, in ample time not to delay that Work.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fall Prevention System

1. Ladder safety system shall be:

a. PeakWorks 2000 Series Climb-Rite Fixed Rail Ladder Safety System as manufactured by SureWerx.

b. Miller Saf-T-Climb System as manufactured by Honeywell.

c. Or approved equal.

2. Full body Harness shall be:

a. PeakPro Harness as manufactured by SureWerx;

b. Miller Saf-T-Climb Harness as manufactured by Honeywell;

c. Or approved equal.

3. Shuttle/Trolley shall be:

a. PeakWorks 2000 Climb-Rite Trolley as manufactured by SureWerx.

b. Miller Saf-T-Grip Shuttle as manufactured by Honeywell.

c. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Materials

1. Structural steel shapes shall be fabricated in accordance with the details shown on the Contract Drawings and shall conform to the requirements of Section 05 12 00 - Structural Steel Framing and ASTM A36 unless otherwise indicated. All steel shall be galvanized in accordance with the requirements of Section 05 05 13.01 - Galvanizing, and shop painted in accordance with Section 09 91 00 - Painting.

2. Aluminum shapes and plate shall be 6061-T6 aluminum alloy with mill finishes, and shall be fabricated into finished products with welded or bolted connections as detailed on the Contract Drawings. Extruded shapes shall conform to the requirements of ASTM B221 and ASTM B308; plate and sheets shall conform to ASTM B209.

3. Stainless steel shapes and plate shall be Type 316 stainless steel for bolted constructions and 316L for welded construction as detailed on the Contract

Drawings. Shapes shall conform to ASTM A276. Stainless steel plates shall conform to ASTM A480 and ASTM A666.

4. Bolting hardware shall be as specified in Section 05 05 23.02 - Miscellaneous Metal Fastenings.

5. Concrete anchors shall be as specified in Section 05 05 23.02 - Miscellaneous Metal Fastenings.

B. Access Stairs, Ship Ladders and Platforms

1. Platforms, associated access stairs and ship ladders shall have galvanized steel or aluminum structural members, aluminum stair treads, and aluminum platform gratings as specified herein unless shown otherwise on the Contract Drawings.

2. Structural steel sections shall conform to ASTM A36 and all work shall conform to the AISC Manual of Steel Construction.

3. Aluminum platform and stair tread gratings pattern shall be as specified in Section 05 53 01.03 - Aluminum Floor Gratings. Stair treads shall be designed to support a uniform live load of 175 pounds per square foot with a maximum deflection of 1/240 of the span. The stair treads shall have an abrasive nosing as shown on the Contract Drawings.

4. Aluminum platform grating shall be designed for the loads as specified herein or as shown on the Contract Drawings.

C. Galvanized Accessories

1. Galvanized lintel and shelf angles, angle door guards, floor curb, sill angles and guard posts (bollards), and brackets shall be fabricated from structural steel. Work shall conform to the details on the Contract Drawings and approved shop drawings. Where the material for lintels and shelf angles is not shown on the Contract Drawings, they shall conform to the requirements for “Stainless Steel Lintels and Shelf Angles” as specified herein.

2. Materials and fabrication shall conform to Section 05 12 00 - Structural Steel Framing and ASTM A36. All galvanizing shall be done after fabrication and shall conform to the requirements of Section 05 05 13.01 - Galvanizing.

D. Stainless Steel Lintels and Shelf Angles

1. Lintels and shelf angles shall be bent or rolled angles, fabricated of stainless steel Type 316. All angles shall conform to the sizes, shapes, dimensions and details as noted on the Contract Drawings. The lintels assembled by welding shall be fabricated of stainless steel Type 316L.

2. All mounting and assembly hardware shall be Type 316 stainless steel.

E. Anchor Bolts

1. Anchor bolts shall be as specified in Section 05 05 23.02 - Miscellaneous Metal Fastenings.

F. Vertical Ladders

1. Aluminum ladders shall be fabricated from aluminum 6061-T6 as detailed on the Contract Drawings.
2. Stainless steel ladders shall be fabricated from Type 316L stainless steel as detailed on the Contract Drawings.
3. Wall mounted ladders shall have welded brackets attached to the wall with concrete or masonry anchors.
4. Ladders shall comply with OSHA 1910.23.
5. A personal fall arrest system or ladder safety system shall be required on all fixed ladders that extend more than twenty-four feet above a lower level as specified in OSHA 1910.28.
6. The third rail required for the fall prevention system shall be of the same material as the ladder.

G. Fall Prevention System

1. All fixed ladders that extend more than twenty-four feet above a lower level shall be provided with a fall prevention system.
2. Fall prevention systems shall comply with OSHA 1910.28, OSHA 1910.29, and ANSI Z359.16.
3. All necessary components of the fall prevention system shall be furnished, including two trolley/shuttle and two full-body harnesses for each fall prevention installation, to provide a complete and fully operational fall prevention system. Full-body harnesses shall be size medium where not universally sized.

H. Stair Nosings

1. Provide non-slip nosings on all treads of interior stairs that are not scheduled for resilient flooring or rubber tile finishes.
2. Non-slip nosings shall be as manufactured by one of the following manufacturers:
   a. Wooster Products, Inc., Wooster, OH.
   b. Safe-T-Metal Co., Syracuse NY.
   c. Or approved equal.
3. Nosings shall be four inches wide and six inches less in length than the length of the tread.
4. Nosings shall be installed at the edge of each tread, landing, and platform. Top of surface shall be flush with concrete finish.

5. Each nosing shall utilize a minimum of three anchors into the concrete.

6. Nosings shall be cast aluminum, Alloy 356-T6.

I. Steel Bollards

1. Galvanized steel pipe bollards shall be fabricated to dimensions and details indicated in the Contract Drawings. Bollards shall be fabricated from 8-inch nominal outside diameter pipe, extra strong.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Fabrication of steel and stainless steel shall be in accordance with the Specification for the Design Fabrication and Erection of Structural Steel for Building of the AISC. Fabrication of aluminum shall be in accordance with the Aluminum Association Specifications for Aluminum Structures.

B. Holes for bolts and screws shall be drilled. Fastenings shall be concealed where practicable. Joints exposed to the weather shall be formed to exclude water.

C. As far as practicable, all fabricated units shall be fitted and assembled in the shop, with all cuts and bends made to precision measurements in accordance with details shown on approved Shop Drawings.

D. Work shall be fabricated so that it is installed in a manner that will provide for expansion and contraction, prevent the shearing of bolts, screws and other fastenings, ensure rigidity, and provide close fitting of sections.

E. Welding of carbon and low alloy steel shall conform to the applicable requirements of ANSI/AWS D1.1, and Section 05 05 23.01 - Welding. Welding of aluminum shall conform to the applicable recommendations of the Aluminum Company of America publication, "Welding and Brazing Aluminum"; ANSI/AWS D1.2 and Aluminum Association Specification for Aluminum Constructions. Welding shall be done in a manner that will prevent permanent buckling and all welds exposed in the finished Work shall be ground smooth.

F. All finished and/or machined faces shall be true to line and level. Steel and aluminum shall be standard, and well finished. Sections shall be well formed to shape and size with sharp lines and angles; curved work shall be sprung evenly to curves.

G. All Work shall be fitted together at the shop as far as possible, and delivered complete and ready for erection. Proper care shall be exercised in handling all Work so as not to damage the finished surfaces.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Field Measurements

1. The Contractor shall verify all dimensions and shall make any field measurements necessary and shall be fully responsible for accuracy and layout of the Work.

2. The Contractor shall review the Contract Drawings and any discrepancies shall be reported to the Engineer for clarification prior to starting fabrication.

B. Inspection

1. The Contractor shall examine the alignment of the substrate and conditions under which metal fabrication Work is to be performed and notify the Engineer in writing of unsatisfactory conditions. Do not proceed with the metal fabrication and installation Work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.

3.02 IMPLEMENTATION

A. Installation

1. All metal fabrications shall be erected square, plumb and true, accurately fitted, adequately anchored in place, set at proper elevations and positions.

2. All inserts, anchor bolts and all other miscellaneous metal work specified herein or shown on the Contract Drawings or required for the proper completion of the Work, which are embedded in concrete, shall be properly set and securely held in position in the forms before the concrete is placed.

3. All miscellaneous metal fabrications shall be installed in conformance with details shown on the Contract Drawings or on the approved Shop Drawings.

B. Galvanizing

1. All miscellaneous steel fabrications shall be galvanized after fabrication in accordance with Section 05 05 13.01 - Galvanizing.

2. Galvanized surfaces damaged during installation shall be touched up with a galvanizing repair paint applied in accordance with the manufacturer's instructions.

C. Painting

1. All miscellaneous metal fabrications other than aluminum or stainless steel, shall be painted in accordance with the requirements of Section 09 91 00 - Painting.

2. All galvanized metal fabrications, that have the surfaces exposed in the finish work, shall be painted in accordance with Section 09 91 00 - Painting.

3. Aluminum surfaces in contact with concrete or dissimilar metals shall be thoroughly protected with two coats of an epoxy paint with a total thickness of 16 mils or other approved isolating material.

4. Surface preparation shall be done in accordance with Section 09 91 00 - Painting.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish, fabricate, assemble and install all metal stairs, steel pan or steel stairs for the Work as required in the Contract Drawings and Specifications.

B. Metal stairs shall be furnished complete with all accessories, base attachments, fastening and other appurtenances as specified or as may be required for a satisfactory installation.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 05 13.01 - Galvanizing.

B. Section 05 05 23.01 - Welding.

C. Section 05 05 23.02 - Miscellaneous Metal Fastenings.

D. Section 05 52 13.07 - Aluminum Pipe Railings.

E. Section 05 53 01.03 - Aluminum Floor Gratings

F. Section 09 91 00 - Painting.

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Provide all labor, materials, equipment and incidentals as shown, specified and required to design, furnish and install aluminum stairs including treads and landings outside of chemical rooms.

1.06 QUALITY ASSURANCE

A. Quality Assurance Inspections:

1. Quality Assurance inspections may be made by NYC DEP Bureau of Engineering Design and Construction, Quality Assurance Section or its representative at the manufacturer's facility.

2. Quality Assurance inspections shall be in accordance with the requirements of the Contract Documents.

3. The Contract shall give ample notice to the Engineer prior to the beginning of any fabrication, so that Quality Assurance inspection may be made.

4. Quality Assurance inspections shall include (but are not limited to) the following activities:

a. Obtain copies of Certified Materials Test Reports (both chemical and physical) and Manufacturer Certificates of Conformance.

b. Perform visual inspection of welding, as per applicable welding code.

c. Perform visual and dimensional inspection of completed work.

B. Design of Members and Connections:

1) All details shown are typical; similar details shall apply to similar conditions, unless otherwise shown or specified. Dimensions shall be verified at the site without causing delay in the work.

2) Each fabricator shall be responsible for the structural design of miscellaneous metal work within the requirements established by these Specifications.

C. Complete design calculation and Shop Drawings shall be prepared, signed and stamped with the seal of a Licensed Professional Engineer, licensed and registered to practice in the State of New York and recognized as an expert in the required work unless the design and details have been shown on the Contract Drawings.

D. Shop Assembly: Items in the shop shall be preassembled to the greatest extent possible, so as to minimize field splicing and assembly of units at the site. Units shall be disassembled only to the extent necessary for shipping and handling limitations. Units shall be clearly marked for reassembly and coordinated installation.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and material specifications of the metal stairs for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Complete layout and installation drawings and schedules with clearly indicated dimensions for metal stairs.

2. All grating shop drawings shall clearly indicate the orientation of the bearing bars.

B. Samples shall include:

1. Aluminum stair nosings.

2. Metal stair treads.

1.08 DELIVERY, STORAGE, AND HANDLING

A. All materials shall be boxed or crated and suitably protected against damage from handling and the elements prior to shipment from the place of fabrication.

B. All materials shall be protected on the site and/or incorporated in the work free from damage or marring of any kind.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. General:

1. All materials shall be of the very best quality and entirely suited for the service to which they will be subjected.

2. Welding shall conform to the applicable requirements of Section 05 05 23.01 - Welding.

3. Fastening: Bolts, nuts and inserts shall be of the best quality mild steel conforming to the applicable requirements of Section 05 05 23.02 - Miscellaneous Metal Fastenings. Bolts shall have hexagonal nuts. All threads shall be clean cut of the American Standard size.

    a. Expansion shield anchors shall be used only where shown on the Contract Drawings. Power driven "pin" or "stud" type fasteners shall not be permitted. Anchors shall be sized and installed to the proper depths as required by the loads in accordance with manufacturer's recommendations.

    b. Carbon steel fasteners shall be galvanized in accordance with Section 0508 - Galvanizing and painted in accordance with Section 09 91 00 - Painting.

4. Aluminum railings, stair treads and platforms shall be fabricated into finished products as detailed on the Contract Drawings. Aluminum railings shall conform to the requirements of Sections 05 52 13.07 - Aluminum Pipe Railings, and 05 53 01.03 - Aluminum Floor Gratings for the stair treads and platforms.

B. Metal Stairs

1. The metal stairs and platforms shall be of aluminum construction with aluminum treads, landings and railings constructed to conform to the sizes and arrangements as shown on the Contract Drawings, required by the Contract and specified herein.

2. Entire stair assembly shall be constructed to support a minimum live load of 100 pounds per square foot. Metal framing, hangers, columns, struts, clips, brackets, bearing plates and other components shall be provided as required for the support of stairs and platforms.

3. Brackets and bearing surfaces shall be provided as detailed on the Contract Drawings and as required to anchor and contain the stairs on the supporting structure.

4. Where masonry walls occur, supporting struts shall be provided and shall be designed for the erection and support of stair components before installation of masonry.

5. Framing stringers shall be fabricated of structural shapes as shown on the Contract Drawings. Closure pieces shall be provided for exposed ends of stringers.

6. Platforms shall be constructed of structural channel headers and miscellaneous framing members as shown on the Contract Drawings. Headers shall be bolted to stringers and framing members shall be bolted to stringers and headers. Aluminum surfaces in contact with steel or concrete shall be properly isolated.

7. Aluminum stair treads shall have a 1-1/4 inch wide abrasive nosing. Stair construction shall be coordinated with the railing fabricator for location of post supports.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Aluminum and steel shall be standard, well finished, structural or bar aluminum or bar steel. Sections shall be well formed to shape and size with sharp lines and angles; curved work shall be sprung evenly to curves.

B. Welding shall be used for joining pieces together unless otherwise shown or specified. Units shall be fabricated so that bolts and other fastenings do not appear on finished surfaces. All joints shall be true and tight, and connections between parts light-proof tight. Continuous welds shall be provided and ground smooth where exposed.

C. Welding shall be done in a manner that will prevent permanent buckling and all welds exposed in the finished and/or machined faces shall be true to line and level.

D. Holes for bolts and screws shall be drilled. Fastenings shall be concealed where practicable. Joints exposed to the weather shall be formed to exclude water. Work shall be fabricated and installed in a manner that will provide for expansion and contraction, prevent the shearing of bolts, screws and other fastenings, insure rigidity, and provide close fitting of sections.

E. All work shall be fitted together at the shop as far as possible, and delivered complete and ready for erection. Proper care shall be exercised in handling all work so as not to injure the finished surfaces.

F. Assembly of system components shall be performed in strict accordance with the fabricator's recommendations for installation.

G. All carbon steel work shall be galvanized in accordance with Section 05 05 13.01 - Galvanizing and painted in accordance with Section 09 91 00 - Painting.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. All inserts, anchor bolts, and all other miscellaneous metal work specified and shown on the Contract Drawings or required for the proper completion of the work, which are embedded in concrete, shall be properly set and securely held in position in the forms before the concrete is placed.

B. All metal stair work shall be erected square, plumb and true, accurately fitted, adequately anchored in place, and set at proper elevations and positions.

C. All aluminum surfaces in contact with concrete shall be given a heavy coat of bituminous paint. Aluminum surfaces in contact with other metals shall be properly isolated.

D. All galvanized and painted surfaces shall be touched up as required in accordance with the fabricator's instructions.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the requirements for aluminum pipe railing systems. Aluminum pipe railing and auxiliary system components shall conform to the requirements specified herein and in the Contract, and shall be located and configured as shown on the Contract Drawings. Contractor shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and install all aluminum pipe railing.

B. Unless otherwise shown or specified, aluminum pipe railing shall consist of a system of two rails with totally concealed mechanical fasteners, internally threaded tubular rivets and adhesively bonded components fastened to posts spaced not more than 5 feet 0 inches on center and a system of handrails supported from adjacent construction by mounting brackets spaced at not more than 5 feet 0 inches on center.

1. All aluminum pipe railing system components shall be provided with an anodized finish after fabrication, as specified herein.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 05 23.02 - Miscellaneous Metal Fastenings

1.04 REFERENCES

A. NYCBC - New York City Building Code

B. ASTM B26 - Aluminum and Aluminum-Alloy Sand Castings, Standard Specification for

C. ASTM B117 - Operating Salt Spray (Fog) Apparatus, Standard Practice for

D. ASTM B136 - Stain Resistance of Anodic Coatings on Aluminum, Standard Method for Measurement of

E. ASTM B137 - Coating Mass per Unit Area of Anodically Coated Aluminum, Standard Test Method for Measurement of

F. ASTM B210 - Aluminum and Aluminum-Alloy Drawn Seamless Tubes, Standard Specification for

G. ASTM B221 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes, Standard Specification for

H. ASTM B241 - Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube, Standard Specification for

I. ASTM B244 - Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments, Standard Test Method for Measurement of

J. ASTM B247 - Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings, Standard Specification for

K. ASTM B429 - Aluminum-Alloy Extruded Structural Pipe and Tube, Standard Specification for

L. ASTM C1107 - Packaged Dry, Hydraulic-Cement Grout (Non-shrink), Standard Specification for

M. ASTM E329 - Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction, Standard Specification for

N. ASTM E488 - Strength of Anchors in Concrete and Masonry Elements, Standard Test Method for

O. ASTM E548 - General Criteria Used for Evaluating Laboratory Competence, Standard Guide for

P. ASTM E894 - Anchorage of Permanent Metal Railing Systems and Rails for Buildings, Standard Test Method for

Q. ASTM E935 - Performance of Permanent Metal Railing Systems and Rails for Buildings, Standard Test Methods for

R. ASTM E985 - Permanent Metal Railing Systems and Rails for Buildings, Standard Specification for

S. ANSI A1264.1 - Safety Requirements for Workplace Floor and Wall Openings, Stairs and Railing Systems

T. AA-ASD - The Aluminum Association, Aluminum Standards and Data

U. AA-SAAA - The Aluminum Association, Standards for Anodized Architectural Aluminum

V. AA- DAF-45 - The Aluminum Association, Designation System For Aluminum Finishes

W. AMP 521/NAAMM - Architectural Metal Products Division of the National Association of Architectural Metal Manufacturers - Pipe Railing Manual

X. AMP 500/NAAMM - Architectural Metal Products Division of the National Association of Architectural Metal Manufacturers, Finishes for Aluminum

Y. 29 CFR 1910.23 - Guarding Floor and Wall Openings and Holes

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Quality Assurance Inspections:

1. Quality Assurance inspections may be made by NYC DEP Bureau of Engineering Design and Construction, Quality Assurance Section or its representative at the manufacturer's facility.

2. Quality Assurance inspections shall be in accordance with the requirements of the Contract Documents.

3. The Contract shall give ample notice to the Engineer prior to the beginning of any fabrication, so that Quality Assurance inspection may be made.

4. Quality Assurance inspections shall include (but are not limited to) the following activities:

a. Obtain copies of Certified Materials Test Reports (both chemical and physical) and Manufacturer Certificates of Conformance.

b. Perform visual inspection of welding, as per applicable welding code.

c. Perform visual and dimensional inspection of completed work.

B. Manufacturer Qualifications:

1. Engage a single fabricator, with undivided responsibility for detailing and performance of the aluminum pipe railing systems.

2. Engage a firm which can show minimum of five years previous successful experience in detailing and fabrication of aluminum pipe railing systems of scope and type similar to the required work.

3. Materials and fabrication procedures shall be subject to inspection and tests in the mill, shop, and field, conducted by a qualified inspection agency in compliance with ASTM E329 and ASTM E548. Such inspections and tests shall not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

C. Installer Qualifications:

1. Engage a single installer skilled, trained and with successful and documented experience in the installation of aluminum pipe railing systems and with specific skill and successful experience in the erection of the types of materials required; and who agrees to employ only tradesmen with specific skill and successful experience in this type of work. Submit names and qualification to Engineer along with the following information on a minimum of three successful projects:

a. Names and telephone numbers of owner, architects or engineers responsible for projects.

b. Approximate contract cost of the aluminum pipe railing.

c. Amount of area installed.

D. Professional Engineer:

1. Engage a registered professional engineer legally qualified to practice in the State of New York and experienced in providing engineering services of the kind indicated.

2. Responsibilities include, but are not necessarily limited to, the following:

a. Carefully reviewing system performance and design criteria stated in the Contract Documents.

b. Preparing written requests for clarification or interpretation of performance or design criteria for submittal to Engineer by Contractor.

c. Preparing, or supervising the preparation of design calculations, and reviewing and approving related Shop Drawings prepared by the aluminum pipe railing system manufacturer prior to submission to Engineer; testing plan development, and test-result interpretations; and providing comprehensive engineering analyses verifying

compliance of the system with the requirements of the Contract Documents.

d. Signing and sealing all calculations and engineering analyses.

e. Certifying that:

1) It has performed the design of the aluminum pipe railing system in accordance with the performance and design criteria stated in the Contract Documents, and

2) The said design conforms to all applicable local, state and federal codes, rules and regulations and to the prevailing standards of practice.

E. Testing Agency Qualifications: To qualify for approval, an independent testing agency shall demonstrate to Engineer's satisfaction, based on evaluation of criteria submitted by testing agency, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the work in accordance with ASTM E329 and ASTM E548.

F. Performance Criteria:

1. Maintain the visual design concept shown, and the technical requirements specified, including modules, profiles, alignment of components and requirements for finish.

2. Contractor shall provide aluminum pipe handrail and railing system that conforms to the City of New York Building Code, ASTM E985 and CFR 29, Part 1910.23, including the 200 pound loading requirement, and including the requirement that specific types of occupancies and sizes of contributing protected areas shall incorporate greater design load resistance into aluminum pipe railing system, in compliance with ASTM E985, than that specified herein.

a. Completed handrail and railing shall withstand a uniform lateral force of 50 pounds per linear foot and a vertical uniform downward force of 50 pounds per linear foot, both applied simultaneously at the top of the handrail and railing, performance tested in accordance with Test Method A and B of ASTM E935.

b. Intermediate and bottom rails shall withstand simultaneously applied lateral uniform forces of 40 pounds per linear foot and a vertical load of 50 pounds per linear foot, however, lateral and vertical loads on intermediate and bottom railings need not be considered in the detailing and fabrication of posts and anchorages.

c. For railings having solid panels or picket balusters, the panels or picket balusters shall be detailed and fabricated to withstand a uniform lateral load of 50 pounds distributed over any round or square area of one square foot located anywhere within the infill area or a 50 pound per foot penetration cone, performance tested in accordance with Test Method C and D of ASTM E935.

d. Concentrated 200 pound load and uniform force conditions shall not be applied simultaneously.

e. Other pertinent requirements ceded to ANSI A1264.1 by governing authorities having jurisdiction at the Site.

f. Bending stresses shall not exceed 60 percent of the yield stress of the material. Applied loads shall not produce permanent residual deformation in the completed work when loads are removed. Load-deformation data shall be determined in accordance with ASTM E935.

g. Maximum allowable deflections shall be in accordance with ASTM E985.

h. Where computations make it possible to provide the needed information, testing, in compliance with ASTM E935, shall be performed for verification that aluminum pipe railing system and auxiliary system components comply with specified performance requirements and the requirements of governing authorities having jurisdiction.

3. Thermal Control: Provide adequate expansion within the fabricated system that allows for a thermal expansion and contraction caused by a material temperature range of 140 degrees F to -20 degrees F without warp or bow of system components. Distance between expansion joints shall be based on providing a 1/4 inch wide joint at 70 degrees F which accommodates a movement of 150 percent of the calculated amount of movement for the specified temperature range.

4. Provide expansion joints in handrail and railing system work where systems cross expansion joints in structure.

5. Configuration of all aluminum pipe handrail and railing systems shall be as shown on the Contract Drawings General Railing and Handrail Sheet. All details shown on the Contract Drawings are typical; similar details apply to similar conditions, unless specifically noted otherwise on the Contract Drawings.

6. Manufacturer is responsible for structural analysis and detailing of aluminum pipe handrail and railing system. Provide complete structural performance calculations and Shop Drawings for all aluminum pipe handrail and railing members, anchors and all other support system components prepared, signed and stamped with the seal of a registered professional engineer licensed to practice in the State of New York and recognized as an expert in the specialty involved.

G. Anchors and Supports:

1. Anchorage system shall be structurally analyzed based on results of tests in compliance with ASTM E488 and ASTM E894. Anchors shall be

tested for static, seismic, fatigue and shock loadings in series. Static tests shall include tension, shear, flexure, and torsion load resistance.

2. When the size, length or load carrying capacity of an anchor bolt, concrete anchor or concrete insert is not shown on the Contract Drawings, provide the size, length and capacity required to carry the design load times a minimum safety factor of four when installed in cast-in-place concrete and a minimum safety factor of six when installed in unit masonry construction.

3. Sizes shown on the Contract Drawings shall be considered minimum. Increase size to comply with design loadings and minimum safety factors specified.

4. All railing system posts shall be provided with a circular profile solid bar.

H. Allowable Tolerances:

1. Provide "pencil-line" thin butt joints.

2. Limit variation of cast-in-place inserts and sleeves to the following:

a. Spacing: ± 3/8 inch.

b. Alignment: ± 1/4 inch.

c. Plumb: ± 1/8 inch.

3. Minimum Railing System Plumb Criteria:

a. Limit variation of completed handrail and railing system alignment to 1/4 inch in 12 feet - 0 inches with posts set plumb to within 1/16 inch in 3 foot - 0 inches.

b. Align rails so variations from level for horizontal members and from parallel with rake of stairs and ramps for sloping members do not exceed 1/4 inch in 12 feet - 0 inches.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings for approval of the Engineer. Submittals shall include, but not be limited, to the following:

1. Samples:

a. Full size sample, 2 foot - 0 inches long, of assembled aluminum pipe railing system at post and rail intersections with all associated components including typical mechanical and adhesively fastened connections, mounted toe-board and sleeve, and handrail system at wall return complete with mounting brackets all with specified anodized finish.

b. Color Samples: Maximum range of anodized aluminum finish color variation that shall appear in finished work. Prepare range samples, to show the highest level of color control feasible for actual aluminum pipe railing and handrail system work, as determined by

the licensor of the finishing process selected, on actual extrusions and castings of the work.

c. Samples will be reviewed by Engineer for color, finish, joinery appearance and workmanship only. Compliance with all other requirements is the responsibility of Contractor.

2. Shop Drawings:

a. Drawings for the fabrication and erection of aluminum pipe railing and handrail systems with sizes of members, components and anchorage devices, all based on specified requirements. Indicate that Shop Drawings have been reviewed by the professional engineer preparing, signing and stamping its seal on design calculations and engineering analyses, verifying that the manufacturer's proposed fabrication, installation methods and details adequately translate the results of the design calculations and engineering analyses into the work, before submitting Shop Drawings to Engineer for review.

b. Include copies of manufacturer's specifications, standard and custom detail drawings and installation instructions and manufacturer's catalogs showing complete selection of standard and custom components, auxiliary system components and miscellaneous accessories for selection by Engineer. Include all plans and elevations identifying the location of all railing and handrails, and all expansion joints.

c. Profiles of aluminum pipe railing and handrail system components, and the details of forming, jointing, sections, connection, internal supports, trim, and accessories. Show details of the aluminum pipe railing and handrail drawn at 1-1/2 inch scale.

d. Calculations for the complete design and engineering analysis of the aluminum pipe railing and handrail system, auxiliary system components and anchorages, including calculations showing compliance with performance criteria specified, prepared, signed and stamped with the seal of a registered professional engineer licensed to practice in the State of New York and recognized as an expert in the required work.

3. Maintenance Manuals (O&M Manuals): Upon completion of the installation of the aluminum pipe railing and handrail systems, submit the following:

a. Product name and manufacturer.

b. Name, address and telephone number of manufacturer and local distributor.

c. Detailed procedures for routine maintenance and cleaning, including recommended cleaning materials, application methods and

precautions as to use of materials that may be detrimental to finish when improperly applied.

4. Certificates:

a. Copies of material purchase receipts, for this job, signed by a certified and licensed Notary Public, verifying that material purchased for the Work complies with material designations specified as confirmed by approved Shop Drawings.

b. Furnish certification that laboratory loading tests have been performed on the handrail, railing and anchorage systems verifying compliance with performance criteria specified, and that it conforms to all applicable CFR, ANSI and ASTM requirements for loads and deflections and that the data derived from such tests has been used by the registered professional engineer in the design calculations and engineering analyses of the aluminum pipe railing and auxiliary system components.

c. Registered professional engineer who prepares, signs and stamps its seal shall provide a written statement confirming responsibility for the design and attesting that the design prepared meets the performance criteria required by the Contract Documents, the requirements of governing authorities having jurisdiction, and conforms to prevailing standards of practice.

d. Finish: Furnish a written certificate confirming specified anodized coating film thickness, coating weight, sealing treatment and stain test performance.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Deliver aluminum pipe railing and handrail and all accessories dry and undamaged, with manufacturer's protective coating intact, bearing original intact factory labels.

2. Aluminum pipe railing systems which are damaged during delivery or while being unloaded shall not be stored on Site. Remove such units from Site and replace panels with new, undamaged material.

B. Storage of Materials:

1. Store aluminum pipe railing and accessory materials in a dry location and in a manner that will protect strippable coating from exposure to sun and condensation; with good air circulation around each piece and with protection from windblown rain.

2. Store aluminum pipe railing and accessory materials under tarpaulin covers and in an area protected from dirt, damage, weather and from the construction activities of all Contractors. Do not store outside or allow items to become wet or soiled in any way while on Site.

3. Do not store in contact with concrete, earth or other materials that might cause corrosion, staining, scratching or damage to finish. Do not install system components which become dented, scratched or damaged in any way. Remove such components from Site and replace with new, undamaged material.

C. Handling of Materials:

1. Do not subject aluminum pipe railing and accessory materials to bending or stress.

2. Do not damage edges or handle material in a manner that will cause scratches, warps or dents.

3. Keep on-Site handling to a minimum.

4. Maintain protective covering on railings and handrails. All surface protective coverings such as non-adhesive papers, adhesive papers and strippable plastic films shall be removed after receipt at the Site as soon as there is no longer a need for the protection.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

1. Railings

a. Custom Fabricated Connectorail System as manufactured by Julius Blum & Company, Inc., Carlstadt, NJ.

b. Custom Fabricated Series 500 Non-Welded Aluminum Pipe Railing as manufactured by Superior Aluminum Products, Inc., Russia, OH.

c. Or approved equal.

2. Finishes

a. Alumilite 215 Clear as manufactured by Aluminum Company of America, Inc., New York, NY

b. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Extruded Aluminum Architectural and Ornamental Shapes: ASTM B221, Alloy 6063-T52.

B. Aluminum Forgings: ASTM B247.

C. Extruded or Drawn Aluminum Pipe and Tube:

1. ASTM B429 or ASTM B241, Alloy 6063-T5, 6063-T52 or 6063-T832 as required by loadings, deflections and post spacing's specified.

2. Provide Schedule 40 pipe minimum, unless conditions of detail and fabrication require extra heavy pipe to comply with performance criteria specified.

3. Provide all rails and posts with minimum outside diameter of 1.900-inches; nominal size of 1-1/2-inches.

D. Reinforcing Bars:

1. Solid 24-inch long 6061-T6 circular cross section aluminum reinforcing bars with outside diameter same as inside diameter of post.

E. Toe-boards:

1. Provide extruded ASTM B429 6063-T5 or T52 alloy aluminum toe-boards, unless railing is mounted on curbs or other construction of sufficient height and type to meet the requirements of 29 CFR 1910.23. Bars or plates are not acceptable and shall not be approved by Engineer.

2. Unless otherwise specified, toe-boards shall meet requirements of 29 CFR Part 1910.23, Section (e).

3. Securely fasten toe-board in place with not more than 1/4-inch clearance above floor level. Provide for thermal expansion and contraction in toe-boards over the entire range of temperatures specified. Thermal movement shall not cause warping or buckling of toe-boards.

4. Provide manufacturer's toe-board detail which accommodates storage for removable socket covers.

F. Anchors and Fastenings:

1. Type 316 stainless steel.

2. Provide minimum of four bolt fasteners per post where surface mounted posts are shown. Components shall be in accordance with manufacturer's recommendations and as acceptable to Engineer as shown on approved Shop Drawings.

3. Concrete and masonry anchors shall be as specified in Section 05 05 23.02 - Miscellaneous Metal Fastenings.

4. Anchors shall be of stainless steel Type 316 and a minimum size of 1/2-inch diameter.

5. Bolting Materials: As specified in Section 05 05 23.02 - Miscellaneous Metal Fastenings.

G. Castings:

1. Provide high strength aluminum alloy brackets, flanges and fittings suitable for anodizing as specified.

2. Aluminum-Alloy Sand Castings: ASTM B26.

H. Concealed Connector Sleeves: Schedule 40, 5-inches long by 1.610-inches diameter.

I. Brackets and Flanges: Provide manufacturers complete selection of standard and custom brackets and flanges for railing posts and for handrail supports.

J. Sockets: Provide 6-inch deep by 2-1/2-inch outside diameter aluminum sockets with 3-1/2-inch wide socket cover on bottom of all sockets and on top and bottom of removable post sockets.

K. Hinges: Provide two self-closing aluminum hinges for each railing system gate.

L. Gate Latches and Stops: Provide one latch and stop with rubber bumper and 1-inch diameter plastic knob for each railing system gate.

M. Chain, Snaps and Eye Bolts: Provide oblong 0.250-inch aluminum link, Type 316 stainless steel chain weighing 57 pounds per cubic foot, each link 1-1/8-inch by 7/16-inch. Provide stainless steel eyebolts, 1/4-inch stainless steel threaded quick links and heavy duty swivel snaps with spring loaded latch.

N. Custom Cover Flanges: Provide 1/4-inch high by 4-inch diameter aluminum cover flanges for all non-removal posts and 3-1/2-inch wide by 1-1/8-inch high aluminum pipe collars with 1/4-inch set screws for all removable posts.

O. Auxiliary System Components and Miscellaneous Accessories: Provide a complete selection of manufacturer's standard and custom aluminum handrail and railing components and miscellaneous accessories including, but not limited to, fascia flanges, post brackets, interlocking panel clips, clamps, end caps, post caps, adapters and similar items.

P. Adhesive: Two-part waterproof epoxy-type as recommended by railing and handrail manufacturer.

Q. Non-Shrink, Non-Metallic Grout:

1. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and is recommended by the manufacturer for exterior use.

2. Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous, cementitious grout, complying with ASTM C1107, requiring only the addition of water at the Site.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Fabrication

1. Unless otherwise shown or specified in the Contract Documents provide typical non-aluminum construction details and fabrication techniques as recommended by AMP/NAAMM publications specified.

2. Railings

a. Form exposed Work true to line and level with accurate angles, surfaces and straight edges. Fabricate all corners without the use of fittings. Form bent-metal corners to the radius shown without causing grain separation or otherwise impairing the Work. Form all change in handrail and railing direction with radius bends. Provide not less than 4 inch outside radius.

1) Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail or railing components.

b. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges and ease exposed edges to a radius of approximately 1/32 inch.

c. Form elbow bends and wall returns to uniform radius, free from buckles and twists, with smooth finished surfaces, or use prefabricated bends.

d. Locate intermediate rails equally spaced between top rail and finished floor.

e. Close aluminum pipe ends by using prefabricated fittings.

3. Chains

a. Chains shall be provided across openings in aluminum pipe railing where shown on the Contract Drawings. One end of each chain shall be attached to a 1/4-inch eye bolt in the post and the other end shall be attached by means of an approved heavy stainless steel swivel eye snap hook to a similar eye bolt in the opposite post.

B. Weep Holes

1. Fabricate joints which will be exposed to the weather so as to exclude water.

2. Provide 15/64 inch diameter weep holes at the lowest possible point on all railing system posts.

3. Provide pressure relief holes at closed ends of handrails and railings.

C. Toe-boards

1. Provide toe-boards to the dimensions and details shown on the Contract Drawings and as follows:

a. Provide manufacturer's toe-board detail which accommodates movement caused by thermal change specified without warping or bowing toeboards.

b. Provide manufacturer's toe-board detail which accommodates storage for removable socket covers.

c. Coordinate and cope toe-board as required to accommodate cover flanges at posts.

d. Toe-boards shall follow curvature of aluminum pipe railing. Where aluminum pipe railing is shown to have curved contours at corners, or other locations, the toe-board shall likewise be curved to follow line of aluminum pipe railing system.

D. Reinforcing Bars

1. Provide circular profile solid reinforcing bar friction-fitted at all railing system posts. Extend reinforcing bars 6-inches into cast-in-place sleeves or other types of supporting brackets.

E. Mechanically Fitted Component Pipe Handrail and Railing

1. Use a nonaluminum pipe handrail and railing system with posts, top and intermediate rail(s) and flush joints.

2. Provide a top and two intermediate horizontal rails, equally spaced.

3. Blind rivets, pop rivets or other exposed fastening devices shall not be used in the Work. Fasteners used for side mounting fascia flanges where shown or specified may be exposed in the Work. Provide internally threaded tubular aluminum rivets, stainless steel through bolts with lock nuts, stainless steel sheet metal screws with lock-washers and epoxy adhesive for fastening all components of the Work.

4. Provide for expansion and contraction in the railing system as required by performance criteria. At each side of expansion joints located in the structure to which the railing system is attached, provide an end post and railing return located 16 inches from the joint. Separation between returns shall match the width of the structure expansion joint.

F. Finishes

1. General:

a. Prepare surfaces for finishing in accordance with recommendations of the aluminum producer and the finisher or processor.

b. Adjust and control the direction of mechanical finishes specified to achieve the best overall visual effect in the work.

c. Color and Texture Tolerance: Provide uniform color and continuous mechanical texture for all aluminum components of the work. Engineer reserves the right to reject aluminum materials because of color or texture variations, which are visually objectionable, but only where the variation exceeds the range of variations established by the manufacturer prior to the work, by means of range samples which have been accepted by Engineer.

d. Anodize all aluminum components of the work.

2. Mechanically finish aluminum by wheel or belt polishing with aluminum oxide grit of 180 to 220 size, using peripheral wheel speed of 6,000 feet per minute; Aluminum Association Designation - M32 Medium Satin Directional Texture.

a. Hand Rubbed Finish: Where required to complete the work and provide uniform, continuous texture, provide hand rubbed finish to match medium satin directional texture specified in order to even out and blend in satin finishes produced by other means.

3. Provide non-etching chemical cleaning by immersing the aluminum in an inhibited chemical solution, as recommended by the coating applicator, to remove all lard oil, fats, mineral grease and other contamination detrimental to providing specified finishes. Clean and rinse with water between steps as recommended by the aluminum manufacturer.

4. Exposed Aluminum Anodic Coating: Provide anodic coatings as specified which do not depend on dyes, organic or inorganic pigments, or impregnation processes to obtain color. Apply coatings using only the aluminum alloy, temperature, current density and acid electrolytes to obtain specified colors in compliance with the designation system and requirements of the Aluminum Association and AMP 501 of AMP/NAAMM. Comply with the following:

a. Provide Architectural Class I high density anodic treatment by immersing the components in a tank containing a solution of 15 percent sulfuric acid at 70 F with 12 amperes per square foot of direct current for minimum of sixty minutes; Aluminum Association Designation A41 - Clear (natural).

b. Physical Properties:

1) Anodic Coating Thickness, ASTM B244: Minimum of 0.7 mils thick.

2) Anodic Coating Weight, ASTM B137: Minimum of 32 mg/sq. in.

3) Resistance to Staining, ASTM B136: No stain after 5 minutes dye solution exposure.

4) Salt Spray, ASTM B117: 30,000 hours exposure with no corrosion or shade change.

c. Seal finished anodized coatings using deionized boiling water to seal the pores and prevent further absorption.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Source Quality Control:

1. Obtain all aluminum pipe railing and handrail system components and accessories from the same manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. The Contractor shall examine the alignment of the substrate and conditions under which the aluminum pipe railing system work is to be performed and notify Engineer in writing of unsatisfactory conditions. Do not proceed with the aluminum pipe railing system work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

B. Protection: Protect cast-in-place sleeves and field-drilled holes from debris and water intrusion by use of temporary covers or removable foam inserts that completely fill the cast-in-place sleeve.

C. Coordinate installation of anchorages for handrails and railings. Furnish setting drawings, templates, and installation instructions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in cast-in-place concrete or masonry. Deliver to Site in time for installation.

D. Verify dimensions by taking measurements at the Site without causing delay in the work. Where measurements cannot be taken at the Site without delaying the work, establish dimensions and proceed with fabrication of handrails and railings without Site measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

E. Verify to Engineer gage of aluminum pipe railing posts and rails brought to the site by actual measurement of on-Site material in the presence of Engineer.

3.02 INSTALLATION

A. Fastening to In-Place Construction

1. General:

   a. Do not erect components which have become scarred, dented, chipped, discolored or otherwise damaged or defaced. Railing and handrail system components which have holes, cuts, gouges, deep scratches or dents of any kind shall be removed from the site before installation. Repairs to correct such Work shall not be approved by Engineer. Remove and replace with new material.

   b. Comply with installation and anchorage recommendations of AMP/NAAMM publications specified in addition to the requirements specified herein.

2. Posts and rail sections shall be brought into final alignment by aluminum pipe railing installer.

3. Provide anchorage devices and fasteners where necessary for securing railing and handrail items to in-place construction, including threaded fasteners for concrete and masonry inserts, through-bolts and other connectors as required. Use only Type 316 stainless steel devices and fasteners.

4. Flanged fittings shall be secured to steel with nuts, bolts and washers; to hollow glazed structural tile and masonry with masonry anchors; and to solid grouted masonry and concrete with concrete anchors. Flanges not bearing on metal shall be set in non-shrink grout.

5. Anchor posts in concrete by means of sockets and side mounted fascia flange brackets, set and anchored into the concrete floor slabs and sides of concrete walls and raised walkways. Provide closure secured to the bottom of sleeve. Before installing posts remove all debris and water from sleeves. Verify that reinforcing bars have been inserted into posts before installation. Do not install posts without reinforcing bar. For all non-removable railing sections, after the posts have been inserted into the sockets, fill the annular space between posts and sockets solid with grout.

6. Anchor posts to stair stringers with stringer or support flanges, angle type or floor type as required by conditions, shop connected to posts and bolted to the supporting members. Flanges shall be as recommended by manufacturer. Verify that reinforcing bars have been inserted into posts before installation. Do not install posts without reinforcing bar.

7. Provide removable railing sections where shown. Removable railing posts shall be provided with friction fitted reinforcing bar in each post. Provide sockets with socket covers stored in extruded toe-board. Provide aluminum pipe collars for all removable posts. Accurately locate sleeves to match post spacing's.

8. All posts set in concrete shall be provided with an aluminum floor cover flange.

9. Provide end posts and railing returns at 16-inches on each side of structural expansion joints. Separation between returns shall match the width of the structural expansion joint.

B. Cutting, Fitting and Placement

1. Perform cutting, drilling and fitting required for installation. Set the Work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

2. Fit exposed connections accurately together to form tight hairline joints. Do not cut or abrade the surface of units which have not been finished after fabrication, and are intended for field connections.

3. Permanent field splice connections shall be made using manufacturer's recommended epoxy adhesive and 5-inch minimum length connector sleeves. Tight press-fit all field splice connectors and install in accordance

with manufacturer's written instructions as provided on approved Shop Drawings. Follow epoxy manufacturer's recommendations for requirements of installation and conditions of use. Make all splices as near as possible to posts but not exceeding 12 inches from nearest post.

4. Handrails supported from walls, partitions and similar construction shall be supported by brackets located within 18 inches of handrail terminations and at intermediate points spaced not more than 5 feet on center. Drill wall plate portion of the mounting bracket to receive one bolt, unless otherwise shown on the Contract Drawings as concealed anchorage. Provide flush-type wall-return fittings with the same projection as that shown for mounting brackets. Secure mounting brackets and wall-return fittings to building construction as follows:

   a. For concrete and solid masonry anchorage, use bolt anchor expansion shields and lag bolts.

   b. For hollow masonry anchorage, use toggle bolts having square heads.

5. Space posts 5 feet - 0 inches on center and connect sections as shown on Shop Drawings approved by Engineer.

6. Provide expansion joints with slip joint internal sleeve extending 2 inches minimum beyond joint on each side. Fasten internal sleeve on only one side of expansion joint.

7. Where details show post location requirements at or near end of runs, uniformly space intermediate posts as required to meet loading and deflection criteria specified but not greater than maximum spacing specified.

   a. At walkways and other locations where welded pipe railing system is provided on each side, locate railing system posts aligned opposite each other and with the same on center spacing.

8. Provide hinged railing sections where shown on the Contract Drawings. Provide hinges and latch for connection to adjacent railing.

9. Provide chain sections as shown. Provide one chain length with fastening accessories for top and each intermediate railing.

10. Securely fasten toe-boards in place with not more than 1/4 inch clearance above floor level.

11. Drill one 15/64 inch diameter weep hole not more than 1/4 inch above the top of location of circular profile solid reinforcing bar in each post.

12. Protection from Dissimilar Materials:

    a. Coat all surfaces of aluminum in contact with dissimilar materials such as concrete, masonry and steel as specified in Section 09900.

13. Remove coating where exposed in the finished work.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting

1. Adjust railings and handrails prior to securing in place to ensure proper matching at butting joints and correct alignment throughout their length. Plumb posts in each direction.

B. Protection

1. Protect aluminum pipe railing system from damage by the work of all contractors.

2. Remove defective aluminum railing system components immediately upon discovery of damage, and replace with material that meets specification requirements, so that all aluminum pipe railing system components will be without damage or surface blemish at the time of Substantial Completion

C. Cleaning

1. Clean exposed surfaces of aluminum pipe railing Work of every substance before leaving the site after completion of installation. Comply with recommendations of both the aluminum pipe railing and finish manufacturer. Do not use abrasives or non-approved solvent cleaners. Test cleaning techniques on an unused section of railing before employing cleaning technique in the Work.

a. Remove protective plastic as recommended by manufacturer.

b. Remove all stains, dirt, grease and other substances by washing railings and handrails thoroughly using clean water and soap. Rinse with clean water.

c. Do not use acid cleaning solutions, steel wool or other harsh abrasives.

d. If stains remain after washing, remove finish and restore in accordance with recommendations of the manufacturer.

2. At the completion of the work, replace adjacent work, marred by the work of this Section.

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish and install all aluminum floor gratings as indicated on the Contract Drawings and specified herein.

B. Gratings shall be complete with frames, anchors, fastening devices and miscellaneous appurtenances.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 05 23.01 - Welding

B. Section 09 91 00 - Painting

1.04 REFERENCES

1. NAAMM MBG 533 - Welding Specifications for Fabrication of Steel, Aluminum, and Stainless Steel Bar Grating.
2. Aluminum Association, Inc. (AA).
3. National Association of Architectural Metal Manufacturers (NAAMM).
4. New York City Building Code (NYBC).

1.05 DESCRIPTION

A. Design Requirements

1. General Design Criteria:
   a. The design live load for grating covering floor openings shall be that designated for the adjacent floor area but not less than a uniform load of 150 pounds per square foot or a concentrated load of 300 pounds distributed over a 12-inch square area at the center of span, whichever produces the greater stress.
   b. The design live load for grating on platforms shall be as designated on the Contract Drawings but not less than a uniform load of 100 pounds per square foot.
   c. Grating in areas subject to vehicular traffic shall be designed for the maximum weight vehicle which can access the area. Forklifts or other similar wheeled vehicles shall have maximum wheel loads defined by the manufacturer. When wheel loads are not defined by the manufacturer, the wheel load shall be defined as 40 percent of the gross loaded weight of the maximum size vehicle to be accommodated.
   d. The maximum allowable deflection due to dead load plus live load shall not exceed the span divided by 240, but not more than 1/4 inch.
   e. Gratings shall be designed in accordance with the design criteria specified herein and the Aluminum Association specifications, unless otherwise noted on the Contract Drawings or as required by the NYBC.
2. Design Criteria for Grating: The maximum flexural stress shall be 12,000 pounds per square inch.

1.06 QUALITY ASSURANCE

A. Quality Assurance Inspections

1. Quality Assurance inspections may be made by NYC DEP Bureau of Engineering Design and Construction, Quality Assurance Section or its representative at the manufacturer's facility.
2. Quality Assurance inspections shall be in accordance with the requirements of the Contract Documents.

3. The Contract shall give ample notice to the Engineer prior to the beginning of any fabrication, so that Quality Assurance inspection may be made.

4. Quality Assurance inspections shall include but are not limited to the following activities:

a. Obtain copies of Certified Materials Test Reports (both chemical and physical) and Manufacturer Certificates of Conformance.

b. Perform visual inspection of welding, as per applicable welding code.

c. Perform visual and dimensional inspection of completed work.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and material specifications of all gratings for the approval of the Engineer.

1. Gratings shall not be manufactured until the Contractor's Shop Drawings have been approved by the Engineer.

2. Samples of grating and fastening devices shall be submitted for approval by the Engineer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Type of Gratings

1. Unless otherwise shown on the Contract Drawings or specified, gratings shall be one of the following types and shall be the product of one manufacturer:

a. Swage Locked Grating.

b. Pressure Locked Grating.

2. Other designs of equal strength, rigidity and serviceability may be submitted to the Engineer for approval. Gratings shall be the product of one manufacturer and only one type of grating shall be used exclusively throughout the work.

B. Materials

1. Floor gratings and appurtenances shall conform to the requirements specified herein and to the following aluminum alloys and tempers, provided with a mill finish:

a. Gratings

1) Main Bars - AA 6061-T6

2) Cross Bars - AA 6063-T5

b. Angles

1) Extruded - AA 6063-T5

2) Structural - AA 6061-T6

c. Anchors - AA 6061-T6

2.03 FABRICATION / ASSEMBLING / FINISHES

A. General

1. Gratings shall be accurately fabricated, free from warps, twists or other defects which affect the appearance and serviceability of the grating.

2. Gratings shall have a mill finish unless otherwise noted on the Contract Drawings.

3. All welds shall be ground smooth and conform to the requirements of Section 05 05 23.01 - Welding and NAAMM MBG 533.

4. Openings in and edges of all grating sections shall be banded with bearing bars. Bars shall be welded to all intersecting members.

B. Grating Fabrication

1. All grating sections shall be cut so that no one section will weigh more than 100 pounds.

2. Swage Locked Grating:

a. Swage locked assembly shall consist of main bearing bars, spaced not more than 1 inch apart (clear distance) joined by cross bars that are locked at right angles to, and located in the upper half of bearing bars. Cross bars shall be spaced 2 inches on center, to form rectangular openings.

3. Pressure Locked Grating:

a. Pressure locked assembly shall consist of parallel bearing bars spaced not more than 1 inch apart (clear distance) joined by cross bars spaced not more than 4 inches on centers to form rectangular openings. Cross bars and bearing bars shall be slotted for joining. Slots in the bearing bars shall terminate with dovetail recesses above the neutral axis. Slots in the cross bars shall terminate below the

neutral axis. The cross bars shall be forced down into the slots of the bearing bars and their bottoms spread into the dovetail recesses to make tight rigid joints.

4. Minimum bearing bar size shall be 1-1/2" deep by 3/16" wide.

C. Grating Cut-Outs

1. Cut-outs shall be provided in the grating for the passage of pipe, valve stems, columns and similar work. Where more than two bearing bars are included in the cut-out, banding bars of the same dimensions as the bearing bars shall be provided around the opening and welded or electric-forged to the component parts of the grating.

D. Grating Stair Treads and Landings

1. Grating stair treads shall be 1 inch wider than tread widths shown on the Contract Drawings and shall be securely fastened to angles or carrier bars which in turn shall be fastened to stringers. The outer edge or nosing of stair treads shall be so constructed as to make it distinctly visible and contrasting with the other part of the tread. Non-slip nosings shall be furnished on all the stair treads and landings.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Filed Measurements

1. The Contractor shall check all dimensions in the field after all piping and equipment are set in place and determine the exact dimensions and locations of openings and cut-outs.

2. Templates shall be made where required for location and size of openings and cut-outs.

3. The Contractor shall field verify all pertinent dimensions prior to grating fabrication.

3.02 INSTALLATION IMPLEMENTATION

A. Installation

1. Gratings shall be installed with each section readily removable and replaceable. Adjacent units shall be neatly fitted together.

2. The clearance at the ends or between sections of gratings shall be a maximum of 1/4 inch.

3. Tops of gratings shall be set flush with surrounding construction.

4. Gratings shall be set with a full and uniform end bearing on the supports to preclude rocking movement; wedges or similar shimming devices shall not be used.

B. Fastening Devices

1. Approved aluminum fastening devices, with stainless steel screws, shall be installed to hold the gratings rigidly to the supports with means for easy removal.

2. Fastening devices shall not protrude above the walking surface of the grating.

3. Fasteners shall be installed in accordance with the manufacturer's recommendations.

C. Coating and Contact Surfaces

1. Aluminum surfaces in contact with concrete or dissimilar metals shall be thoroughly protected with two coats of an epoxy paint with a total thickness of 16 mils or other approved isolating material in accordance with the requirements of Section 09 91 00 - Painting.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to furnish, install, and test all metal castings complete and operational.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

1. Section 05 56 00.01 – Miscellaneous Metal Castings
2. Section 09 91 00 – Painting

1.04 REFERENCES

A. Abbreviations and Acronyms:

1. NDE: Non Destructive Evaluation

B. Definitions:

1. Heat: The total molten metal output from a single heating in a batch melting process or the total molten metal output from essentially a single heating in a continuous melting operation using basically constant charge and processing conditions and targeted at a fixed metal chemistry at the furnace spout (a heat is a unique material batch.).

C. Reference Standards:

1.	ASTM A370	Standard Test Methods and Definitions for Mechanical Testing of Steel Products
2.	ASTM A380	Standard Practice for Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems
3.	ASTM A609	Standard Practice for Castings, Carbon, Low-Alloy, and Martensitic Stainless Steel, Ultrasonic Examination Thereof
4.	ASTM A802	Standard Practice for Steel Castings, Surface Acceptance Standards, Visual Examination
5.	ASTM E8	Standard Test Methods for Tension Testing of Metallic Materials
6.	ASTM E94	Standard Guide for Radiographic Examination
7.	ASTM E125	Standard Reference Photographs for Magnetic Particle Indications on Ferrous Castings
8.	ASTM E165	Standard Test Method for Liquid Penetrant Examination
9.	ASTM E305	Standard Practice for Establishing and Controlling Spectrochemical Analytical Curves
10.	ASTM E351	Standard Test Methods for Chemical Analysis of Cast Iron--All Types
11.	ASTM E433	Standard Reference Photographs for Liquid Penetrant Inspection
12.	ASTM E689	Standard Reference Radiographs for Ductile Iron Castings
13.	ASTM E709	Standard Guide for Magnetic Particle Examination
14.	ASTM E802	Standard Reference Radiographs for Gray Iron Castings Up to 4½ in. (114 mm) in Thickness

15.	MSS-SP55	Quality Standards for Steel Castings, Visual Method for Evaluation of Surface Irregularities

1.05 DESCRIPTION

A. Metal castings shall include all ferrous and non-ferrous metal castings to be furnished and installed by the Contractor, except as noted below.

1. Included are cast metal components for equipment shown or specified in the Contract Documents (such as valves, pumps, sluice gates, pipes, flanges, etc.).

2. Excluded are items specified in Section 05 56 00.01 - Miscellaneous Metal Castings, or items as noted in the Contract Documents.

B. Metal Castings shall be designed for the tensile strength, hardness, dimension, microstructure, surface finish, etc. designated in the Contract Documents and/or the applicable reference standards as required for their intended use.

1. In cases of conflict between the Contract Specifications and reference standards, the more stringent requirements shall be applicable, as determined by the Engineer.

C. All castings shall conform to the compositional requirements for named elements in the applicable reference standards and/or Contract Documents.

1.06 QUALITY ASSURANCE

A. Shop inspections may be made by the Engineer or by the Engineer's representatives. The Contractor shall give notice as required to the Engineer prior to the beginning of any casting work so that inspection may be scheduled and performed. The Contractor shall furnish all facilities and equipment required for the inspection of materials and workmanship in the shop. The Contractor shall provide all approved Shop Drawings as deemed necessary by the Engineer to conduct the shop inspections. The inspectors shall be allowed free access at all times, to all parts of the manufacturers' plants where relevant manufacturing operations, inspections, and tests are being performed.

B. Inspectors shall have the authority to reject any materials or Work which does not fully meet the requirements of the Contract Documents or approved Shop Drawings.

C. Inspection at the shop is intended as a means of facilitating the work by early identification of non-conformances; it is expressly understood that inspection does not in any way relieve the Contractor from its responsibility to furnish proper materials and workmanship under the Contract Specification.

D. The Contractor shall meet all the specified requirements including, but not limited to: hardness, chemical composition, physical properties, microstructure, pressure tightness, radiographic soundness, magnetic particle inspection, dimensions, and surface finish, as set forth in the Contract Documents and reference standards. In cases of conflict between the Contract Documents and reference standards, the

more stringent and/or costly requirements shall be applicable, as determined by the Engineer.

E. The surface of the metal castings shall be free of adhering refractory, sand, scale, cracks and hot tears. Other surface discontinuities shall meet either Level II Acceptance Criteria of ASTM A802 or the acceptance standards of MSS-SP55.

F. Traceability requirements applicable to both castings and machining shall be as follows:

1. For component items designated by the Engineer at the time inspection instructions are issued as requiring material traceability, material traceability codes shall be permanently applied to the component and annotated on test reports for each individual heat/heat treatment of material supplied.

a. Traceability marking shall be a foundry heat number to maintain complete traceability of each unique material batch to the Certified Material Test Reports provided. Traceability shall be maintained throughout all process operations, including any subcontracted operations, to the finished component.

b. Traceability codes shall be raised cast letters for cast items or, for machined items, shall be indelible markings made by engraving, etching, or stamping.

c. The code shall be readily accessible and shall not be in an area that may be removed or hidden during machining, assembly, or service.

d. The traceability code shall be designated on all component certification documents, thus allowing complete component to material certification traceability.

e. Where marking of individual component parts is not possible due to size, the traceability code shall be clearly marked on all packaging.

f. Material traceability of cast materials to original heat numbers shall be maintained throughout all stages of manufacture.

1) Unless otherwise approved by the Engineer, the size of the heat numbers cast into the surface and shall be 1-in. high × ⅛-in. thick.

2) In castings where the size and/or configuration do not allow for this size to be used, all lettering/numbers shall be of approved height and thickness so that legibility of original markings is maintained after final coatings are applied.

g. Representative samples from each heat shall be provided for the components and identified to ensure traceability back to the heat. Identification of the sample shall include as a minimum the unique material heat number (batch code), relevant component part name

and number, name of supplier/manufacturer, and date of manufacture. Heat numbers shall be cast on the body of the samples.

2. Except as noted herein below and/or except if explicitly shown otherwise on the Contract Drawings, in addition to the traceability code:

   a. All castings shall also have "NYCDEP" cast into the surface.

   b. Unless otherwise approved by the Engineer, the size of the "NYCDEP" logo shall be a minimum of 1-in. high × ⅛-in. thick, and located in a conspicuous location.

   c. Any and all rejected castings shall have the "NYCDEP" designation ground off in the presence of the DEP inspector,

   d. The "NYCDEP" designation shall not be used on any castings not specifically intended for a particular NYCDEP order.

      1) Any manufacturer and/or foundry using the "NYCDEP" designation for work that is not part of an NYCDEP order may be subject to rejection of current work and/or disqualification from future work.

   e. The following shall not have "NYCDEP" cast into the surface, and instead shall be cast as per the latest edition of the NYCDEP Sewer Design Standards and/or the Contract Documents:

      1) Manhole covers.

      2) Curb gratings and curb pieces.

      3) Catch basin hoods.

G. Representative samples and certified material test reports indicating physical properties and chemical composition are required for all major components identified by the Engineer. Three (3) samples of approved size to produce standard specimens per the specified material designation for tensile testing shall be provided for each heat. Samples shall be sent, as soon as possible, from the foundry directly to the NYC DEP or to a location designated by the Engineer.

H. As a minimum, the Engineer or its representatives may elect to perform inspection activities during foundry pour operations, including but not limited to:

   1. Assessing pattern condition prior to mold preparation (visually inspect for defects such as dents, cracks, chips, etc.).

   2. Assessing sand condition.

   3. Assessing mold and core condition prior to assembly procedures.

   4. Reviewing molding and casting processes (e.g. sand mold).

   5. Reviewing resin type, mold coating ("mold wash") type, and core reinforcement.

6. Reviewing melting and casting procedures.

7. Reviewing chemical requirements.

8. Reviewing heat treatment procedures (note: test samples shall be subjected to the same thermal treatment as the castings they represent).

9. Witnessing Chemical Analysis:

   a. Initial ladle analysis to determine correct charge (ladle chemical composition).

   b. Chemical analysis of tensile test bars or chemical coupons.

10. Witnessing Testing for Mechanical Properties:

    a. Testing of tensile test specimens machined from keel or Y-block for mechanical properties including ultimate strength, yield strength, elongation, hardness, impact, transverse bend, and microstructure, as applicable, per Contract Documents, and applicable reference standard requirements. (Note: Tensile test bars shall be poured after filling the mold and shall be from the same ladle and subjected to the same heat treatment, if applicable, as the castings they represent.)

11. Performing visual inspection of castings:

    a. Dimensional verification per Shop Drawings and visual inspection for defects such as metallic projections, shrinkage cavities, incomplete casting, inclusions, porosity, slag, discontinuities, etc.

    b. Verify that stainless steel castings have been cleaned, descaled and passivated.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to the following:

1. Action Submittals:

   a. Weld procedure specifications and supporting procedure qualification records; if permission for welding repair is granted by the Engineer.

   b. Procedures (with acceptance criteria) for the non-destructive evaluation of castings and welds: visual, ultrasonic, liquid penetrant, magnetic particle, and radiographic, as applicable.

   c. Representative samples of cast components as required by the designated material specification for independent chemical and physical verification testing.

2. Information Submittals:

   a. Certified Material Test Reports.

b. Heat Treatment Certification and Heat Treat Charts.

c. Results of Certified Shop Tests.

d. Complete records of all additional tests and inspections shall be submitted for review and acceptance by the Engineer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. The cleaning, preservation and packing of the cast metal for shipment shall be in accordance with the manufacturer's commercial practice subject to the approval of the Engineer.

2. The packaging and marking shall be adequate to identify the contents and to ensure acceptance and safe delivery to the Site.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. Metal castings shall be handled in such a manner that they may be transported and unloaded without being over-stressed, deformed or otherwise damaged.

2. Metal castings shall be protected from corrosion and deterioration and shall be stored in a dry area.

a. Materials stored outdoors shall be supported above ground surfaces on wood runners and protected with effective and durable waterproof covers approved by the Engineer.

3. Store packaged materials in manufacturer's unopened containers, marked with manufacturer's name and product brand name.

a. Immediately reseal containers after partial use.

4. Metal castings shall not be placed in or on a structure in a manner that might cause distortion or damage to the material.

5. The Contractor shall repair or replace damaged metal castings as directed by the Engineer.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metallic polymer type repair products:

1. Belzona Industrial Protective Coatings and Composites as manufactured by Belzona New York LLC, Glen Cove, NY.

2. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Metal castings shall conform to the requirements of the material specified in the Contract Documents.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Mechanical Properties:

1. Sound casting practices shall be maintained to meet the necessary tensile strength, yield strength, elongation and hardness requirements of the cast metal.

2. Mechanical property requirements of the metal castings shall be as stipulated in Contract Documents and/or referenced standards, where the more stringent requirement shall be applicable.

B. Pour Time:

1. Ductile iron castings shall be poured within 15 min. of the inoculation/nodularization process to avoid fading of the inoculant.

2. Any casting poured more than 15 min. after inoculation/nodularization treatment may be subject to rejection.

3. All representative samples shall be poured from the same ladle immediately after the castings have been poured, and shall not contain bottom sediments.

C. Integrity of Castings:

1. Castings shall be true to pattern in form and dimensions without sharp unfilled angles or corners, free from pouring faults, sponginess, cracks, blow holes and other defects in positions affecting their strength.

2. Castings shall be made accurately to the dimensions shown on the Contract Drawings and shall be machined to secure perfectly true surfaces. Allowance shall be made in patterns so that specified thicknesses will not be reduced as a result of machining.

3. Plugging and filling will not be allowed where the physical strength of the casting will be impaired.

a. Where the Engineer decides that plugging and filling will not impair the strength of the casting, the casting may be plugged and filled only upon written permission from the Engineer.

b. Superficial non-structural cracks and small defects can be repaired subject to the Engineer's approval with approved metallic polymer type repair (filler) products.

4. All castings shall be thoroughly cleaned, inside and outside, free from adhering refractory, sand, scale, non-metallic inclusions (such as ceroxides and slag), cracks and hot tears.

a. Wire brushes, scrapers or other approved mechanical appliances shall be used for this purpose.

b. Acid or other corrosive liquids shall not be used in cleaning castings (except stainless castings).

5. Minimum wall thickness of castings shall be as specified in the designated equipment specification. When wall thickness tolerances are not included in the designated specification, tolerances shall be as follows:

a. For metal castings with a nominal wall thickness less than 0.8-in., the wall thickness shall not be 0.08-in. less than the nominal wall thickness nor 0.12-in. greater than the nominal wall thickness.

b. For metal castings with a nominal wall thickness 0.8-in. or greater, the wall thickness shall not be 10% less than the nominal wall thickness nor 15% greater than the nominal wall thickness.

c. However, acceptable deficiencies in wall thickness shall not exceed one half the area of any casting.

D. Visual Acceptance: The surface of the metal castings shall be free of adhering refractory, sand, scale, cracks and hot tears. Other surface discontinuities shall meet either Level II acceptance criteria of ASTM A802 or the acceptance standards of MSS-SP55.

1. Defects that exceed the acceptance limits may be ground down and blended into the surrounding metal, provided it is meets the minimum wall thickness requirements.

E. Weld repair is not permitted for cast iron or ductile iron. For other materials, no repair of surface defects by welding, plugging, brazing, filling, impregnation, etc., shall be permitted where the physical strength of the casting will be impaired. Additionally, no such repairs shall be permitted without the prior approval of the Engineer, in writing. Castings which have been repaired prior to receiving approval from the Engineer will be subject to rejection. If the manufacturer believes a casting may be repaired by welding, he shall excavate all defects to sound metal by a method approved by the Engineer and verify removal of the defect with PT, MT, or RT (as directed and approved) in the presence of the DEP inspector. He shall then prepare a defect map which identifies all defects by final size (surface dimensions and depth) and location. The defect map, repair procedure, and post repair evaluation procedure shall be submitted to the Engineer for approval.

F. If permission for repair by welding is granted by the Engineer, the amount and type of NDE and acceptance criteria to be performed on the weld repairs of the castings shall be as approved by the Engineer. All weld repairs shall be preheated per approved Welding Procedure Specification (WPS) and repaired castings shall be post weld heat treated. The acceptance criteria for such NDE of weld repairs shall be as follows:

1. Acceptance Criteria for Radiographic Tests: The following weld defects shown by radiography shall be unacceptable:
    a. Any cracks, linear indications, or zone of incomplete fusion or incomplete penetration.
    b. Any elongated indication which has a length greater than:
        1) ¼-in. (6.4mm) for weld thicknesses up to ¾-in. (12.7mm),
        2) ⅓-T for weld thicknesses from ¾-in. to 2¼ in., or
        3) ¾-in. for weld thicknesses over 2¼-in.
        4) Note: Indications not characterized as being a crack or zone of incomplete fusion or penetration shall be evaluated as being elongated indications if the length is three or more times the width.
    c. Any group of aligned indications per 6 in. (152mm) of weld length greater than
        1) ½-in. (12.7mm) for weld thicknesses up to ½-in.
        2) 1-in. (25.4mm) for weld thicknesses ½-in. or greater.
    d. Any rounded indications exceeding ⅛-in. (3.2mm) in diameter.
    e. Any group of rounded indications with diameters $^{1}/_{32}$ in. (0.8mm) or greater, when the sum of their diameters exceeds ¼-in. (6.4 mm) per square in. (645 mm2).
2. Acceptance Criteria for Magnetic Particle and Dye Penetrant Tests: All surfaces to be examined shall be free of:
    a. All linear indications.
    b. Rounded indications greater than $^{3}/_{16}$ in.
    c. Four or more rounded indications greater than $^{1}/_{16}$-inch in a line separated by $^{1}/_{16}$ in. or less (edge to edge).
3. Acceptance Criteria for Visual Tests: All weld surfaces to be examined shall:
    a. Be free of crater cracks or surface cracks.
    b. Have complete fusion and required penetration between the weld metal and the base metal.

c. Have undercut not exceeding $^{1}/_{32}$ in.

d. Have excess reinforcement not exceeding $^{1}/_{64}$ in.

G. Heat Treatment: Castings requiring heat treatment to improve their mechanical properties shall be carried out in accordance with the product material specifications or by written permission from the Engineer. Metal castings shall be heat-treated by full annealing, normalizing, normalizing and tempering, or quenching and tempering. Unless otherwise specified in the Contract Documents, the castings may be heat-treated by any one or combination of these heat treatment processes.

1. Heat treatment shall be performed after castings have been allowed to cool from the pouring temperature to below the transformation range.

2. Furnace temperatures for heat treating shall be regulated by the use of pyrometers.

3. Heat treatment certification report shall be submitted to the Engineer.

4. Heat Treatment Certification shall include:

a. The material traceability code of the heat-treated item

b. The preheat treatment material batch number (heat lot #)

c. Heat treatment batch number

d. Date of heat treatment

e. Process type

f. Process temperature

g. Process duration

h. Quenching details

i. Heat treatment temperature chart

j. Measured surface hardness (and test method)

k. Post heat treatment CMTRs (Certified Material Test Reports)

H. Painting:

1. Where metal castings are required to be painted, such work shall be done in accordance with Section 09 91 00 - Painting. Painting of stainless steel castings is not permitted.

I. Descaling, Cleaning and Passivation of Stainless Steel Castings

1. Stainless steel castings shall be descaled, cleaned and passivated and shall show no rust spots when tested by the Water Wetting and Drying method of ASTM A380 or no free iron indications when tested by the Copper Sulfate Test method of ASTM A380.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. General:

1. All tests required by the Contract Specifications shall be performed by a NYCDEP approved Testing Laboratory whose services have been contracted by the manufacturer.

a. Complete records of all tests and inspections shall be maintained by the manufacturer. The supplier shall monitor and measure the characteristics of the product to verify that the product requirements as specified on component drawings and Contract Documents, including hardness, where applicable, have been met.

b. Records demonstrating compliance with the acceptance criteria shall be maintained, and the records shall indicate the person(s) authorizing the release of the product.

c. A casting log shall also be maintained.

1) The information contained in the casting log shall include, quantity poured, part description, casting serial number, foundry heat number, heat treat number, material designation, material type, material properties, hardness and percent nodularity if applicable.

2. In the event of a disparity between the manufacturer's test results and the NYC DEP's verification test results or should the manufacturer's test results be deemed questionable by the Engineer, the NYCDEP reserves the right to require retesting or additional "referee" testing at an approved testing laboratory.

B. Mechanical Testing: Mechanical testing of the castings shall comply with the sampling methods, dimensional requirements, number of tests and retests, etc. as per the referenced standards, the Contract Drawings and the Contract Specifications.

1. Tensile Tests shall be performed in accordance with the requirements of the individual product specification. If the product specification does not provide requirements for testing, ASTM E8 with definitions provided by ASTM A370 shall be used. Except as otherwise specified in the Contract Documents, one tension test shall be performed on each heat.

2. Hardness measurement at the specified locations on the castings, or as designated by the Engineer, shall be made in accordance with the applicable ASTM or approved standard.

C. Non-Destructive Testing (NDE): Non-Destructive testing shall be performed per the requirements of the referenced standards, the Contract Drawings and the Contract Specifications.

1. Magnetic Particle Testing (MT) shall be performed in accordance with the requirements of ASTM E709. The type and degrees of discontinuities

considered shall be judged by reference photographs in ASTM E125 for ferrous castings; and the basis of acceptance shall be Severity Level 2 or better for any type of discontinuity.

2. Radiographic Examination (RT) for internal defects shall be performed in accordance with ASTM E94. In these cases, radiographic examination of the castings may be performed before or after any heat treatment. The type and degree of discontinuity shall be judged by the applicable reference radiographs. The basis of acceptance shall be Severity Level 2 or better for any type of discontinuity as referenced by ASTM E689 or E802, as applicable.

3. Liquid Penetrant examination (PT) for surface discontinuities shall be performed in accordance with ASTM E165. The type and class of surface discontinuity indications shall be judged by reference standard ASTM E433. Penetrant indications of surface discontinuities shall be accepted or rejected based on the severity level of surface discontinuities in the zones of inspection, and the indicated depth of such discontinuities. Linear defects revealed by liquid penetrant inspection shall be explored by grinding or other suitable means approved by the Engineer. Depth of defects shall not exceed the dimensional tolerance of the material.

4. Ultrasonic Inspection (UT) for internal defects shall be carried out in accordance with ASTM A609. Ultrasonic examination of castings shall be performed after at least one heat treatment above the critical temperature but need not be repeated after subsequent heat treatment. Acceptance standards shall be as designated in the Contract Documents and the relevant reference standards.

5. The technicians carrying out these tests should be American Society for Nondestructive Testing (ASNT) Level I or II certified in the appropriate practice. However, for individuals interpreting test results, a minimum ASNT Level II certification is required.

D. Chemical Testing: The chemical composition of the heat shall be controlled such that the required metallurgical phase(s) and elemental contents shall conform to the compositional requirements for the named elements as specified in the Contract Documents and the relevant reference standards. A product analysis shall be made from material representing each heat. Spectrographic or other methods such as those specified in ASTM E305 and E351 may be used for chemical analysis.

E. Re-certification of material is required when material is subjected to a heat treatment process that alters its properties. All material samples shall be heat treated along with the component parts they represent. When only the mechanical properties are altered, the original certification for chemical composition shall be over-stamped and/or annotated with the unique material traceability code used with the altered material physical properties.

F. Unless otherwise approved, hydrostatic tests on cast components containing pressure boundaries (casting across which a pressure differential can or will occur while in service) shall be performed after shakeout cleaning and/or machining but prior to surface preparation and coating of the surfaces. The cast component shall be under the full test pressure at a minimum of 2-times the rated pressure or 1½-times the maximum service condition (whichever is greater) or as designated in the applicable reference standards for the duration of the hydro test. Any casting that leaks or does not withstand the test pressure shall be rejected. The hydro test report shall be traceable to the item tested and shall accompany all shipment made against the purchase order. The test report shall include supplier's name, test fluid temperature, hold time, pressure, and procedure number.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used.

3.02 ERECTION

A. All castings shall be assembled and erected to accurate grades and alignment and, when placed in concrete or other surrounding materials, shall be carefully supported to prevent movement during placement of concrete or other materials.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 05 56 00.01 – MISCELLANEOUS METAL CASTINGS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor and materials as shown, specified, and required, to furnish and install all miscellaneous metal castings, complete and operational.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 09 91 00 - Painting.

1.04 REFERENCES

A. ASTM A36 - Standard specification for carbon structural steel

B. ASTM A47 - Ferritic Malleable Iron Castings

C. ASTM A48 - Gray Iron Castings

D. ASTM A536 - Ductile Iron Castings.

E. ASTM B584 - Copper Alloy Sand Castings for General Applications

REFERENCES

1.05 DESCRIPTION

A. Miscellaneous metal castings shall include all miscellaneous ferrous and non-ferrous castings to be furnished and installed by the Contractor.

Included in this classification are manhole frames, covers and grades, stop plank grooves, cast iron brackets or other cast iron supports for piping, floor drains, traps, cleanouts, special malleable iron castings and inserts, concrete trench box cover plates, and other special castings of any nature or material, and all necessary bolts, nuts, washers, gaskets and other appurtenances required to join sections of castings.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Submit Shop Drawings and material specifications for all castings furnished as part of the Work.

1) Shop Drawings shall be submitted under separate cover for each type of casting.

2) If a metal casting is a component or part of Work specified or shown elsewhere:

a) The Contract may elect to include the submittal information for the metal casting required herein under that separate submittal.

b) If the Contractor elects to include the metal casting submittal as part of another submittal, the Contractor shall submit a stand-alone, separate informational submittal for the metal casting indicating as such.

2. Information Submittals:

a. Certificate of conformance to applicable reference standards.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Iron Castings

1. Castings shall be as manufactured by:

a. Neenah Foundry Company, Neenah, WI

b. Campbell Foundry, Harrison, NJ

c. Or approved equal

2.02 MATERIALS / EQUIPMENT

A. Design Requirements

1. Castings exterior to structures shall be designed for an AASHTO H-20 truck loading, unless otherwise noted on the Contract Drawings.

2. Interior castings shall be designed for the loading designated on the Contract Drawings for the adjacent floor area. If no loading is designated, castings shall be designed for a minimum load of 300 pounds per square foot or as required for their intended use.

B. Metal castings shall conform to the requirements specified herein and to the following standards:

1. Gray Iron: ASTM A48

2. Ductile Iron: ASTM A536

3. Malleable Iron: ASTM A47

Manganese Bronze: ASTM B584

4. Carbon Structural Steel: ASTM A36

C. Where these metals are designated by class, grade, type, alloy, temper or coating, they shall conform to the requirements specified herein or as shown on the Contract Drawings.

D. Iron Castings

1. Iron Castings shall include, but not be limited to frames, covers, and grates for trench drains, catch basins, and inlets; and stop log grooves.
   a. Castings shall be of gray iron of uniform quality, free from defects, smooth and well cleaned by shotblasting.
   b. Catalog numbers on the Drawings are provided only to show required types and configuration. All covers shall be cast with raised letters as designated on the Drawings.
2. Covers and Grates
   a. Covers and grates shall be provided with matching frames. Cover shall fit flush with the surrounding finished surface. The cover shall not rock or rattle when loading is applied.
   b. Round covers and frames shall have machined bearing surfaces.
   c. Design loadings:
      1) Where located within a structure, a minimum design loading of 300 psf shall be used, unless noted otherwise.
      2) At all locations not within a structure, the design loading shall be a standard AASHTO H-20 truck loading, unless otherwise noted.
   d. Manhole frames and covers and grates shall be Class 35 unless otherwise specified in the Contract.
3. Pier cleats, bollards, and machinery castings shall be Class 20 or 25.
4. Ductile iron castings shall be grade 80-55-06 unless otherwise specified in the Contract.

E. High Strength Yellow Brass: Commercial designation for this alloy is leaded manganese bronze and castings shall conform to the requirements of ASTM B584, copper alloy UNS No. C86500 or C86700.

F. Watertight gasketing, bolting, locking devices, patterns, lettering, pickholes, vents, or self-sealing features shall be as detailed on the Drawings.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Castings shall be true to pattern in form and dimensions without sharp unfiltered angles or corners, free from pouring faults, sponginess, cracks, blowholes and other defects in positions affecting their strength.

B. All castings shall be made accurately to the dimensions shown on the Contract Drawings and shall be planed or ground where marked or where otherwise necessary to secure perfectly flat and true surfaces. Allowance shall be made in patterns so that specified thicknesses will not be reduced.

C. Manhole covers and floor plates shall conform to the details shown on the Contract Drawings or in their absence to the standards of the Department of Environmental Protection and shall be true and seat evenly at all points.

D. Catalog numbers indicated on the Contract Drawings are given to show required types and configurations. All covers shall be cast with raised letters as designated on the Contract Drawings.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Install products in complete accordance with the manufacturer's printed instructions and the approved shop drawings. In addition:

1. All castings shall be erected to accurate grades and alignment and when placed in concrete or other surrounding materials, shall be carefully supported to prevent movement during placement of concrete or other materials.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Provide field touch up painting of scratched or damaged surfaces, using primer, intermediate and finish paints provided by the manufacturer, in accordance with the requirements of this Section and Section 09 91 00 – Painting. In addition:

1. Non-ferrous castings shall be painted only when specifically required in the Contract.
2. Outdoor manhole frames and covers and grates are not required to be painted.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 05 59 16 – FABRICATED METAL ACCESS HATCHES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish, fabricate and install aluminum and stainless steel fabricated metal access hatches as shown on the Contract drawings and specified herein. The hatches shall be provided complete with all accessories and fastenings required for a complete and operational installation.

1. Access hatches shall be installed horizontally and used for access in floors or decks and have a hinge cover with springs, hold-open arms, locking mechanism and a fall protection system.

B. Fabricated metal access hatches specified herein shall include sidewalk, roadway and floor access hatches that are intended to be mounted into cast concrete.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in

the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A.	Section 01 43 10	-	Quality Assurance Inspections
B.	Section 05 05 13	-	Shop Applied Coatings for Metals
C.	Section 05 05 13.01	-	Galvanizing
D.	Section 05 05 23.01	-	Welding
E.	Section 05 05 23.02	-	Miscellaneous Metal Fastening
F.	Section 05 12 00	-	Structural Steel Framing
G.	Section 05 50 00	-	Metal Fabrications
H.	Section 05 52 13.07	-	Aluminum Pipe Railing
I.	Section 06 74 13	-	Pultruded Fiberglass Reinforced Gratings and Plates
J.	Section 09 91 00	-	Painting

1.04 REFERENCES

A. AAMA 611 - American Architectural Manufacturers Association Specification for Anodized Architectural Aluminum

B. ASTM B209 - Specification for Aluminum and Aluminum-Alloy Sheet and Plate

C. ASTM A240 - Specification for Chromium and Chromium Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications

D. ASTM A262 - Standard Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels

E. ASTM A276 - Specification for Stainless Steel Bars and Shapes

F. ASTM A313 - Specification for Stainless Steel Spring Wire

G. ASTM A480 - Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plates, Sheet and Strips

H. ASTM A666 - Specification for Annealed or Cold Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar

I. ASTM B221 - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

J. ASTM B308 - Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles

K. ASTM B632 / B632M - Specification for Aluminum-Alloy Rolled Tread Plate

L. ASTM C1802 - Standard Specification for Design, Testing, Manufacture, Selection and Installation of Fabricated Metal Horizontal Access Hatches for Utility, Water and Wastewater Structures

M. ANSI/AWS D1.1 - Structural Welding Code – Steel

N. ANSI/AWS D1.2 - Structural Welding Code – Aluminum

O. ANSI/AWS D1.6 - Structural Welding Code – Stainless Steel

P. New York City Building Code (NYCBC)

1.05 DESCRIPTION

A. The Contractor shall supply Fabricated Metal Access Hatches as follows:

1. Type 1 – ASTM C 1802 Load Level 1 – Light Pedestrian Load

a. Intended for use in areas restricted to pedestrians that are totally inaccessible to all vehicle traffic.

b. A design loading of 150 PSF and a concentrated design load of 300 LBF is required.

c. Deflection shall not exceed the lesser of the span divided by 200 or 3/16 inch.

2. Type 2 – ASTM C 1802 Load Level 2 – Pedestrian Load

a. Intended for use in areas restricted to pedestrian that are totally inaccessible to all vehicle traffic.

b. A design loading of 300 PSF and a concentrated design load of 600 LBF is required.

c. Deflection shall not exceed the lesser of the span divided by 200 or 3/16 inch.

3. Type 3 – ASTM C 1802 Load Level 5 – Off Street Truck Traffic

a. Intended for use in unrestricted parking access lanes and alleyway where the traffic speed is limited to 15 mph.

b. A concentrated design load of 16,000 LBF plus a 30% dynamic (impact) allowance – H20 loading is required.

c. Deflection shall not exceed the lesser of the span divided by 300 or 3/16 inch.

4. Heavy duty access hatches designed to withstand wheel loading in excess of H20 loading and suitable for use in locations subjected to high density traffic or heavier loading applications shall meet the requirements of ASTM C 1802 Load Levels 6, 7, 8, 9 or 10.

5. Access hatch types other than ones listed in this Specification shall be as indicated in the Contract Documents.

B. Access hatch sizes shall be as shown on the Contract Drawings.

C. Covers shall be equipped with hold-open arm(s), springs, hinges and locking mechanism.

D. Lifting Mechanism:

1. Access hatches shall be designed to provide the proper amount of lift assist to assure access hatch cover(s) can be opened by one person with no more than 35 pounds of vertical lifting force.

E. Fall Through Protection

1. All access hatches shall have permanent means of fall protection complying with OSHA 29 CFR 1910.23 and NYCDEP EHS.

a. Furnish and install fall protection grating system on access doors, where specified or indicated on the Contract Drawings, fall protection grating system. The grating system shall be fabricated as part of the access hatch assembly.

b. Fall through protection shall consist of fiberglass or aluminum grating panel(s), lift assist, hold open arm and hardware, and locking mechanism.

2. Removable Safety Barrier Chains

a. Stainless steel safety chains with latches shall be provided and attached to the railing system for additional safety.

3. Safety Railings

a. Safety railings shall be installed in cases where grating panels are not installed or as indicated on the Contract Drawings.

F. Access hatches in sidewalk areas shall comply with the NYCBC.

1.06 QUALITY ASSURANCE

A. Access hatches shall be detailed and fabricated based on calculations prepared by the manufacturer and sealed by a NYS Registered Professional Engineer, indicating that the access hatch is capable of withstanding loads to meet the specified types of access hatches.

B. The Contractor shall require that the manufacturer of the hatches furnish the fall through protection and be responsible for the integration and compatibility of all equipment components provided under this Section.

C. Quality Assurance (QA) Inspections

1. QA inspections may be made by NYC DEP Bureau of Engineering Design and Construction, Quality Assurance Section or its representative at the manufacturer's facility.

2. The Contractor shall give ample notice to the Engineer prior to the beginning of any fabrication, so that the QA inspection may be made.

3. QA inspections may include but not be limited to the following activities:

a. Obtain copies of certified materials test reports, both chemical and physical, Manufacturer Certificates of Conformance and test report for susceptibility to intergranular corrosion of the stainless steel material, as applicable.

b. Perform visual inspection of welding, as per applicable welding code.

c. Perform visual and dimensional inspection of completed work.

1.07 SUBMITTALS

A. The Contractor shall submit shop drawings for approval by the Engineer.

B. Shop Drawings shall be signed and sealed by a NYS Registered Professional Engineer. At minimum each detailed drawing and calculation packet shall be signed and sealed.

C. Shop drawings shall include the following:

1. General layout drawings showing overall frame dimensions, opening at the base of the frame, clear opening size, thickness of the frame and the overall height of the frame, profiles, accessories, location adjacent construction interference and all dimensions and details.

   a. Accessories include drain location, fall through grating details with clearances, and safety barrier chain locations.

2. A list of material manufacturer(s) with the products they manufacture or fabricated, including but not limited to mill test reports.

3. All materials used during the access hatch manufacturing shall be identified by thickness, size, and grade to assure that the appropriate materials are used specific to the hatch design being manufactured.

4. Copies of specifications, installation instruction and general recommendations for each access hatch supplied. Manufacturer's data substantiating that all materials comply with the requirements of this specification.

5. Design calculations and manufacturer's Engineering/product data including prototype test results, design details.

6. Certifications, structural calculations, detailed drawings, plans, elevations, and details of sections and connections

7. Calculations verifying compliance with the performance criteria.

8. Shop drawings shall indicate jointing and anchoring details.

9. Welding procedure specifications and welder and welder operator Certifications shall be as per AWS D1.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Access hatches shall be handled in such a manner that they are transported, unloaded and stored without being over-stressed, deformed or otherwise damages.

B. Shall be transported, handled and stored as per the manufacturer's instruction and recommendations.

1. The access hatches and components shall be stored and covered in a dry, protected and clean location off the ground.

2. All unfinished surfaces are to be protected from exposure and damage.

C. Coatings shall be applied in the shop; the units are to be delivered ready for installation.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor obtain from the manufacturer and provide a manufacturer's warranty, in an acceptable and beneficial form, that access hatches will be free of defects in material and workmanship for a period of 10 years from the date of Substantial Completion. Under the terms of this warranty, should a part fail to function in normal use within this period, the manufacturer shall furnish a new part at no charge.

B. The Contractor shall obtain from the manufacturer and provide a manufacturer's 10-year warranty, in an acceptable and beneficial form, for the fall protection grating system.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Access hatches shall be manufactured by:

1. The Bilco Company, New Haven, CT;

2. Acudor Products, Inc. brand, manufactured by USF Fabrication, Hiaheah, FL;

3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Aluminum

1. Shapes and plates shall be 6061-T6 aluminum alloy with mill finishes and shall be fabricated into finished products with welded or bolted connections as detailed in the Contract Drawings or approved Shop Drawings.

2. Extruded shapes shall meet the requirements of ASTM B221 and B308.

3. ASTM B209 and B632 / B632M, alloys 5052 or 5086.

4. The covers and frame of all hatches shall have a clear anodized shop finish.

B. Stainless Steel

1. Stainless steel shapes and plates shall be Type 316 for bolted construction and Type 316L for welded construction as detailed on the Contract Drawings or approved Shop Drawings.

2. Shapes shall meet the requirements of ASTM A276.

3. Plates shall meet the requirements of ASTM A480 and A666.

4. Type 316L stainless steel shall meet the requirements of ASTM A240, UNS S31603.

C. Access hatch

1. Personnel access hatches shall be a minimum size of 4 feet by 4 feet and be double leaf. Non-personnel access hatches for openings less than 4 feet long shall be single leaf.

2. Hatch leaf shall be manufactured of minimum ¼ inch thick aluminum or stainless steel diamond-pattern plate designed to withstand a live load as indicated on the Contract Drawings for the adjacent floor or deck area.

D. Frame

1. Channel or tee type frame shall be aluminum with an anchor flange around the perimeter and with a 1-1/2 inch drainage coupling where required.

E. Hinges

1. Hinges shall be heavy duty forged Type 316 stainless steel hinges, having a minimum ¼ inch diameter Type 316 stainless steel pin.

2. Hinges shall be specifically designed for horizontal installation and shall be through bolted to the covers with tamperproof Type 316 stainless steel bolts and locknuts.

F. Drain Coupling

1. Provide a 1-1/2 inch drain coupling located in the right front corner of the channel frame or located as indicated on the Contract Drawings.

G. Lifting Mechanism

1. Manufacturer shall provide the required number and size of compression spring operators, enclosed in telescopic tubes, to provide smooth, easy and controlled cover operation throughout the entire arc of opening and to act as s check in retarding downward motion of the cover when closing. The upper tube shall be outer tube to prevent accumulation of moisture, grit and debris inside the lower tube assembly. The lower tube shall interlock

with a flange support shoe fastened to a formed ¼ inch gusset support plate.

2. Springs shall be sufficient to provide the appropriate amount of lift for each door. Spring shall also be designed to counterbalance the specific cover weight throughout arc and to resist downward force when closing.

3. Compression spring tubes shall be an anti-corrosive composite.

H. Hold-open Arms

1. A Type 316 stainless steel hold open arm shall be provided to lock the cover in the fully open 90 degree position. A release handle shall be provided to allow the grating panel to be closed.

I. Hardware

1. Hatches shall be equipped with recessed padlock hasps. All hardware, including but not limited to mounting brackets, heavy forge hinges, torsion rod, hold open arm with release handle, snap lock, padlock hasp and fasteners shall be Type 316 stainless steel.

2. Locks shall be included as part of the hatch.

3. The locations of hinges and hold-open arm with release handle shall be as shown on the Contract Drawings and approved Shop Drawings.

J. Fall Through Protection

1. Grating panels shall be provided as shown on the Contract Drawings.

a. Grating panel(s) shall be manufactured of fiberglass reinforced plastic (FRP) or aluminum.

1) FRP grating panels shall comply with the following:

a) UV and corrosion resistant construction

b) FRP panels shall be molded in one piece or fabricated of 6061-T6 aluminum grating, with load bearing bars in both directions to allow for use without continuous side support.

c) Grating shall be permanently installed and designed to support a 300 PSF live load.

d) Aluminum grating panels shall be powder coated with high visibility safety yellow finish.

b. Grating panels shall have a provision for locking to prevent unauthorized opening.

c. Hardware and hold-open devices shall be Type 316 stainless steel.

d. Lift assistance shall be provided for ease when opening the grating panel.

e. The grate openings shall be 2-inch x 4-inch on center.

f. Grating panels shall lock in the fully open position.

g. Grating panels shall open in the same orientation as the hatch doors.

2. Removable safety barrier chains and latches shall be provided.

a. Chain shall be Type 316 stainless steel.

b. Safety chains shall be capable of withstanding 1,000 pound of working load and 5,000 pounds of breaking load.

c. Safety chains shall be removable at both open ends with a maximum 3-inch sag when the hatch is open.

3. When grating panels are not applicable or feasible, a Safety Railing System shall be built into the access hatch, such as pop-up or fold up or built into the leafs. Any other options shall be in the Contract Documents and specified herein.

a. Safety railing system shall be fabricated of 1.25-inch diameter (1.6-inch O.D.) schedule 40 Type 6061 T-6 aluminum or Type 316 stainless steel. Safety railing system shall be manufactured of the same material as the access hatch.

b. Safety railings shall extend to 42 inches height per OSHA 1910.23;

c. Safety railings shall be retractable and fully contained inside the cover leaf(s) for easy access and storage.

d. Safety railings shall be fitted with ½ inch diameter safety pins to lock the system in either the open or closed position. Safety pins shall be permanently attached to the hatch.

K. Provide materials for all hatch components as specified in table below according to the specified leaf material:

COMPONENTS	HATCH LEAF MATERIAL	
	STAINLESS STEEL	ALUMINUM
Forged Hinges & Hardware	316 Stainless Steel	316 Stainless Steel
Lift Assist Spring Operators	Stainless steel spring enclosed in Type 316 SS housing, ASTM A313.	Spring enclosed in ¾" 316 stainless steel tube
Hold Open Arm	Automatic with release handle Minimum 2 per leaf – one at each end	
Drainage Channel	Minimum cross-sectional area of 7.5 square inches to allow for adequate water drainage	
Diamond plate cover &	Minimum ¼ inch thick	Minimum ¼ inch thick

frame	mill finish	with clear anodized coating
Frame Finish (dissimilar materials)	None	Factory applied bituminous/coating to bond breaker aluminum to concrete
Lock	Recessed padlock hasps. Snap lock with removable handle	
Covers	Min ¼ inch thick mill finish that has been bead blasted to clean the door	Min ¼ inch thick aluminum diamond pattern with anodized coating.
Frame finish	none	Factory applied bituminous/coating

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Finishes

1. Aluminum sidewalk access hatches shall be coated with an anodized finish in accordance with the requirements of AAMA 611 Class 2, with a minimum dry film thickness of 0.7 mils, or as specified or indicated on the Contract Drawings.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. The access hatch manufacturer shall have and perform quality control operations based on a written quality control program that includes the following:

1. Review and rejection of incoming materials based on certified mill test reports and visual inspections.

2. Frequency of inspection and inspection requirements for cut or cut and bent assemblies and part for hatch construction, assembly welding and completed hatch assemblies.

3. All quality control inspection reports shall be dated and maintained by the hatch manufacturer for a minimum period of seven years.

4. All prototype test records for custom hatches and all production test records shall be dated and maintained by the hatch manufacturer for a minimum period of seven years.

5. All prototype test records for the manufacturer’s standard access hatch designs shall be permanently archived.

6. When requested by DEP at the time of request for quotation the written quality control program and the quality control inspection reports during the period of DEP's access hatch, manufacturing shall be provided.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Number, sizes and location of all access hatches shall be provided as shown on the Contract Drawings and approved Shop Drawings.

B. Install the access hatches in accordance with manufacturer's instructions and approved submittals.

1. Test units for proper function and adjust until proper operation is achieved.

2. Repair finishes damaged during installation.

3. Restore finishes, so no evidence remains of corrective Work.

C. Access hatches and their components shall be adjusted for proper alignment and operation.

D. Protective coatings shall be provided for the exterior protection of aluminum frames that are to be cast in fresh concrete to prevent corrosion.

E. Immediately after installation, the Contractor shall clean all the access hatches using products and procedures that are not detrimental to the finishes and as recommended by the manufacturer.

3.03 FIELD TESTING / QUALITY CONTROL

A. All stainless steel materials shall be checked for compliance with tests for susceptibility to intergranular corrosion. Such tests shall be Practices A, B and E of ASTM A262. Detailed procedures for these tests shall be submitted to the Engineer for approval prior to the start of work. If the certified mill report indicates that such tests have been satisfactorily performed, the fabricator may not be required to repeat the test. Material passing Practice E shall be acceptable.

B. Tolerances

1. Maximum tolerance allowances shall be as outlined in ASTM C 1802, unless indicated on the Contract Documents or by the Engineer.

C. Inspection and Field Verification

1. The Contractor shall verify that the area to receive the access hatch is properly prepared and set to the proper elevation.

2. Contract shall meet the requirements of the manufacturer's installation recommendations and approved Shop Drawings.

D. Repairs

1. Repairs are to be performed as per manufacturer's recommendations and meet the requirements of ASTM C 1802.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 06 05 73.33 – PRESERVATION WOOD TREATMENT
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide wood treatment as shown on the Contract Drawings, specified in the Contract or required for the Work.

B. The following index of this Section is presented for convenience:

C.

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D. The following table, attached after the End of Section designation, is a part of this Section:

1. Table 1 - Pressure Treatment of Timber and Lumber with Water-Borne Preservatives

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

1. Section 05 05 13.01 - Galvanizing

2. Section 06 10 00 - Rough Carpentry

1.04 REFERENCES

A. Abbreviations and Acronyms

1. AWPA – American Wood Protection Association
2. GS – Green Seal

B. Reference Standards:

1. ASTM D245 - Standard Practice for Establishing Structural Grades and Related Allowable Properties for Visually Graded Lumber.
2. AWPA M4 - Standard for the Care of Preservative Treated Wood Products.
3. AWPA M6 - Brands Used on Forest Products
4. AWPA T1 - Use Category System: Processing and Treatment Standard
5. AWPA U1 - Use Category System: User Specification for Treated Wood
6. GS-36 - Adhesive for Commercial Use

1.05 DESCRIPTION

A. Preservative treatment processes and wood species, the combination must provide the required protection for the conditions of exposure and life of the structure. Preservative effectiveness shall be influenced not only by the protective value of the preservative chemical, but also by the method of application and extent of penetration and retention of the preservative in the treated wood. For satisfactory treatment and good performance, the timber must be sound and suitably prepared.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. The following shall be submitted for each type specified:
   a. Certification by treating plant stating chemicals.
   b. Processes used.
   c. Net amount of salts retained.
   d. Conformance with applicable standards.
   e. Certification by treating plant that treatment material complies with governing ordinances
   f. Evidence that treatment will not bleed through finished surfaces.

g. Copies of a certificate, signed by producer, certifying that the softwood lumber producer complies with quality grades and other requirements specified. The certificate shall be submitted in a form recommended by applicable standards, written by the certifying organization.

2. Tests of pressure treated timber and lumber for retention of preservatives shall conform to the requirements of AWPA U1, Paragraph 3, Results of Treatment.

3. Letter of Certification for Pressure Treatment: Submit Certification from treating plant stating chemicals and process used and net amount of preservatives retained are in conformance with specified standards.

B. Sustainability requirements:

1. Product data. Unless otherwise indicated, submit the following for each type of product provided under this Section:

a. Local/Regional Materials:

1) Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.

2) Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.

3) Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.

4) Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

b. VOC data:

1) Adhesives:

a) Submit manufacturer's product data for adhesives. Indicate VOC limits of the product. Submit MSDS highlighting VOC limits.

b) Submit Green Seal Certification to GS-36 and description of the basis for certification.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Treated timber and lumber shall be stored on raised platforms and shall be stacked and supported to prevent warp.

B. B. Treated timber and lumber having a specified moisture content shall be set on raised platforms and covered with suitable weatherproof protective coverings, such as tarpaulins or heavy polyethylene film. Covers shall be battened down to prevent the covers from blowing off.

C. C. All treated timber and lumber shall be carefully handled to avoid splitting or damage to the surface and edges.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Preservative Pressure Treatment:

1. Toxicity/IEQ: Products containing chromium will not be permitted. Products containing arsenic will not be permitted.

2. Waterborne Wood Preservatives:

a. Wood products shall be treated with waterborne wood preservatives listed in Section 4 of AWPA Standards U1, excluding those which contain arsenic and/or chromium.

b. Pressure treatment of wood products shall conform to the requirements of AWPA Standards U1 and T1.

c. Retention of preservatives as prescribed in AWPA Standard U1 for the following Use Categories (material conforming to a higher AWPA Use Category may be specified):

1) UC1: Interior construction - above ground, dry conditions.

2) UC2: Interior construction - above ground, damp conditions.

3) UC3A: Exterior construction - above ground, coated and with rapid water runoff.

4) UC3B: Exterior construction - above ground, uncoated or poor water runoff.

5) UC4A: General purpose soil or fresh water contact - heavy duty above ground.

6) UC4B: Heavy duty soil or fresh water contact - critical or difficult to replace components.

7) UC4C: Extreme duty soil or fresh water contact - critical structural components.

3. Boron-based preservatives:

a. Impregnate lumber with preservative treatment conforming to AWPA Standard U1.

B. Fire Retardant Treatment:

1. All wood designated to be fire-retardant treated shall be pressure-impregnated with a flame-proofing complying with the requirements of AWPA Type A, and with U.L., Inc. requirements for flame spread of 25 or less, with no evidence of significant progressive combustion when tested in accordance with ASTM E 84. Each piece of wood shall bear the U.L., Inc. FRS Label or the U.L., Inc. label indicating complete compliance with the fire hazard classification.

2. Toxicity/IEQ: Fire retardant treated wood products shall be free of halogens, sulfates, ammonium phosphate and formaldehyde.

3. Fire Retardant Formulations:

a. Wood products shall be treated with fire retardants listed in AWPA Standard U1.

b. Fire retardant treatment of wood products shall conform to the requirements of AWPA Standard U1, Commodity Specification H and AWPA Standard T1, Section H.

C. Timber and Lumber. Timber and lumber for pressure preservative treatment shall be:

1. Southern yellow pine.

2. Douglas fir.

3. Tree Species as indicated in the Contract Documents.

D. Timber and lumber shall be of the form, structural grade and dressing as shown on the Contract Drawings, specified in Section 06 10 00 - Rough Carpentry or required for the work.

E. All timber and lumber shall be graded in accordance with ASTM D245.

F. Conditioning of Timber and Lumber

1. Timber and lumber shall be conditioned for treatment by either air-seasoning, kiln drying, steaming, heating in the preservative at atmospheric pressure or under vacuum or by a combination of the methods, in such a manner as will not cause damage to the timber for the use intended.

2. Conditioning of timber and lumber for pressure treatment shall conform to the requirements of AWPA U1.

G. Treatment of Timber and Lumber

1. All timber and lumber shall be pressure treated with wood preservative in accordance with these Sections for the service conditions to which the treated timber and lumber will be exposed. Pressure treatments shall conform to the AWPA standards.

2. Timber and lumber used in tidal water structures such as sheet piles, low water braces and other members existing in the tidal zone shall be pressure treated by the full cell process of impregnation.

3. Treatment of timber and lumber shall conform with Table 1, attached to this Section.

4. The minimum net final retention of preservative in pounds per cubic foot of timber and lumber shall comply with the requirements of Table 1 – Pressure Treatment of Timber and Lumber with Water-Borne Preservatives, attached to this Section.

H. Fasteners

1. Timber and lumber shall be fastened with nails, spikes, bolts, rods, plates, washers and all other hardware shall be of the type, size and spacing to meet the conditions encountered.

2. Fasteners in marine installation or exposed to the weather shall be hot dip galvanized in accordance with Section 05 05 13.01 - Galvanizing, unless other materials are indicated on the Contract Drawings or specified in the Contract.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

Table 1

PRESSURE TREATMENT OF TIMBER AND LUMBER WITH WATER-BORNE PRESERVATIVES

CODE	PRESERVATIVE NAME	RETENTION FACTOR lb/ft³			
		UC2	UC3B	UC4A	UC4B
ACC	Acid Copper Chromate	0.25	0.25	0.50	--
ACQ	Alkaline Copper Quaternary (Type B or C)	0.25	0.25	0.40	0.60
ACQ	Alkaline Copper Quaternary (Type A or D)	0.15	0.15	0.40	0.60
ACZA	Ammoniacal Copper Zinc Arsenate	0.25	0.25	0.40	0.60
CA-B	Copper Azole, Type B	0.10	0.10	0.21	0.31
CA-C	Copper Azole, Type C	0.060	0.060	0.15	0.31
CuN-W	Waterborne Copper Naphthenate	0.070	0.070	0.11	--
CX-A	Copper HDO	0.206	0.206	--	--
SBX	Inorganic Boron (Formosan Termites)	0.28	--	--	--

PART 1 GENERAL

1.01 SUMMARY

A. Rough carpentry as specified herein shall include, but not be limited to, wood centers, furring, grounds, blocking, temporary protection of all kinds, and all accessories and appurtenances.

B. Rough carpentry shall be provided where shown on the Contract Drawings, specified herein and as required otherwise for a complete installation.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 05 13.01 - Galvanizing

B. Section 06 05 73.33 - Preservation Wood Treatment

1.04 REFERENCES

A. Abbreviations and Acronyms

1. AWPA – American Wood Protection Association
2. AWC – The American Wood Council

B. Reference Standards:

1. ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials
2. AWPA T1 – Use Category System: Processing and Treatment Standard
3. AWPA U1 – Use Category System: User Specification for Treated Wood
4. AWC – National Design Specification for Wood Construction

1.05 DESCRIPTION

A. Sustainability requirements:

1. Certified Sustainably Harvested Lumber: Dimensional lumber derived from a Well Managed Forest as certified by one of the following certification organizations:
   a. Scientific Certification Systems (SCS)
   b. Forest Stewardship Council (FSC)
   c. Institute for Sustainable Forestry (ISF)
   d. Or other verifiable high-quality forestry management program
2. Salvaged Lumber: Lumber from deconstruction or demolition of existing buildings or structures. Unless otherwise noted, salvaged lumber shall be delivered clean, de-nailed, and free of paint and finish materials, and other contamination. Provide documentation certifying products are from salvaged lumber sources.

1.06 QUALITY ASSURANCE

A. Contractor shall provide products from acceptable manufacturers which have been used in satisfactory used is similar service for at least three years.

B. Mark each piece of lumber or each bundle of small pieces of lumber with the grade mark of a recognized association or independent inspection agency. Such association or agency shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings, catalog cuts and reference materials for approval of the Engineer. Submittals shall include, but not be limited to:

1. Rough Wood Carpentry: The following shall be submitted:
   a. Copies of the chemical treatment manufacturer's instructions for proper use of each type of treated material.

b. For water-borne preservatives, the submittal shall include the statement that moisture content of treated materials was reduced to a maximum of 19 percent prior to shipment to project site.

c. Submittal shall indicate compliance with specified standards and other specified requirements for materials and workmanship.

2. Wood Preservative:

a. Submittals shall be as specified in Section 06 05 73.33 - Preservation Wood Treatment.

3. Sustainability:

a. Recycled Content:

1) Engineered Wood Products:

a) Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.

b) Indicate relative dollar value of recycled content product to total dollar value of product included in project.

c) If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.

d) If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.

2) Salvaged Lumber: Provide documentation certifying products are from salvaged lumber sources.

b. Local/Regional Materials:

1) Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.

2) Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.

3) Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.

4) Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Rough carpentry materials shall not be delivered to the project site before the time of installation.

2. Materials shall, however, be delivered in sufficient quantities to allow continuity of the Work.

B. Storage of Materials:

1. Materials shall be stored with manufacturers' labels and seals intact.

2. Lumber shall be stored indoors at the site on raised platforms. If outdoor storage is temporarily incorporated, material shall be set on raised platforms and covered with suitable weatherproof protective coverings, such as tarpaulins or heavy polyethylene film. Covers shall be battened down with sufficient weights, ties or anchors to prevent blow-offs.

3. Damage to materials shall be prevented during storage primarily by minimizing the amount of time they are stored at the site before being incorporated into construction systems.

C. Handling of Materials:

1. Materials shall be handled carefully in order to avoid damage or breakage.

2. Materials shall be handled in a manner which prevents inclusion of foreign materials.

3. Materials shall not be exposed to detrimental conditions or physical damage. Materials which are so exposed shall be removed from the site and shall not be incorporated into the Work.

4. Do not open packages or containers until all preparatory Work is complete and installation will begin immediately. Do not allow materials to become wet or soiled or covered with ice or snow.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. General: All natural wood lumber used in the Work shall be verified as obtained from a certified sustainable natural wood lumber source using sustainable forest management practices.

B. Rough Carpentry: Lumber for rough carpentry such as nailers, grounds, blocking and framing shall be of Sustainably Managed Construction Grade, thoroughly seasoned dry No. 1 white fir, ponderosa pine, spruce or hem-fir.

C. Preservative Treatment: All lumber for rough carpentry which is incorporated into the finished structures shall be pressure-treated lumber complying with the requirements as shown on the Contract Drawings, specified in Section 06 05 73.33 - Preservation Wood Treatment or required for the Work. All lumber shall be seasoned lumber with a maximum moisture content of 19 percent at time of dressing. Water-borne preservative shall be as specified in Section 06 05 73.33 - Preservation Wood Treatment. All lumber shall be branded accordingly.

D. Fire Retardant Treatment: All wood designated on the Contract Drawings or specified to be fire-retardant treated shall be pressure impregnated with flame-proofing as specified in Section 06 05 73.33 - Preservation Wood Treatment.

E. Code Conformance: Materials shall conform to the requirements of the National Design Specification for Wood Construction as recommended by the American Wood Council, unless otherwise indicated.

F. Plywood Standards: Plywood shall conform to the requirements of the American Plywood Association.

G. Grading: Each panel of plywood shall be identified with the appropriate DFPA grade mark of the American Plywood Association.

H. Exterior Plywood Uses: Exterior type plywood shall be installed where plywood is used for roof sheathing or decking, or in areas where it may be exposed to moisture.

I. Temporary Protection: Exterior type southern yellow pine plywood, APA Grade C, plugged fir shall be used for temporary protection.

J. Accessories

1. Anchors, connectors, and fastenings, not indicated or specified otherwise, shall be provided and installed and shall be of the type, size and spacing necessary to suit the conditions encountered and as recommended by National Forest Products Association. Sizes, types, and spacing of nails, screws, or bolts for installation of manufactured building materials shall be as recommended by the product manufacturer, unless indicated or specified otherwise.

    a. Steel rough hardware exposed to the weather shall be zinc-electroplated unless indicated otherwise. Zinc-electroplated steel bolts, nuts, washers, hangers, and straps, and all other rough hardware embedded in, or in contact with exterior walls or slabs, and located in humid areas, shall be provided and installed, except as indicated otherwise.

    b. Rough hardware shall be formed and punched before coating. Common steel wire nails, bright finish, shall be used, unless specified otherwise.

c. Bolt heads and nuts bearing on wood shall be provided with standard steel washers.

d. Galvanized fasteners for treated wood shall be in accordance with the requirements contained in Section 05 05 13.01 - Galvanizing.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. The Contractor shall verify that areas to receive rough carpentry which is to be incorporated into the finished Work are properly prepared and completed to final elevations.

3.02 INSTALLATION

A. General: Rough carpentry shall be installed in accordance with the manufacturer's recommendations and approved shop drawings.

B. Erection: All carpentry shall be correctly laid out. All items of woodwork, hardware, and any other work in connection with carpentry shall be carefully fit and erected, accurately located, and shall be plumb, level, and properly aligned, and rigidly secured in place.

C. Blocking: Blocking shall be furnished and installed where required for the attachment of copings, roof ventilators, ducts and other sheet metal work. Wood grounds for other work shall be provided and installed and as shown and required.

D. Securing Finished Work: Wood blocks, strips, plugs and similar items shall be provided and installed as required to secure finished work to concrete and masonry.

E. Centers: Centers shall be provided, where required, for brick and other masonry at the exterior and interior openings.

F. Protection of other Work: Jambs of finished door frames and finished masonry openings shall be protected to a height of 6 feet above the floor. Protection shall be erected in a manner to facilitate cleaning, painting and similar work without damage to finished work.

G. Preservative Coating: All field-cut edges and surfaces of treated lumber shall be liberally coated with a concentrated solution of preservative.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting

1. System components which are dislodged, damaged, expanded, broken, penetrated or crushed by subsequent installation operations or by detrimental weather shall be immediately replaced with undamaged material in compliance with the Sections and properly protected as specified.

B. Protection

1. All components of the work shall be protected from detrimental weather and damage until construction operations are completed.

2. Work which cannot be covered with complete construction systems before the onset of weather detrimental to the work shall be completely covered and protected in such a manner as to deflect water and weather from the installation without damaging adjacent work.

3. Rough carpentry shall be protected from all damage and abuse until Final Acceptance by the City.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 06 51 05 – PULTRUDED FRP STRUCTURAL SHAPES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the general requirements for fiber reinforced polymer (FRP) structural shapes, including channels, I-Beams, W-Beams, angles and other shapes produced using the pultrusion process and shall conform to the requirements specified herein and as shown on the Contract Drawings.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 05 23.02 - Miscellaneous Metal Fastenings

B. Section 06 74 13 - Pultruded FRP Gratings and Plates

C. Section 06 81 13 - Glass-Fiber Reinforced Plastic Railings

1.04 REFERENCES

A. ASTM A 666 - Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar

B. ASTM D 570 - Test Method for Water Absorption of Plastics

C. ASTM D 635 - Test Method for Rate of Burning and/or Extent and Time of Burning of Self Supporting Plastics in a Horizontal Position

D. ASTM D 638 - Test Method for Tensile Properties of Plastics

E. ASTM D 695 - Test Method for Compression Properties of Rigid Plastics

F. ASTM D 696 - Test Method for Coefficient of Linear Thermal Expansion of Plastics

G. ASTM D 790 - Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

H. ASTM D 792 - Test Method for Specific Gravity (Relative Density) and Density of Plastics by Displacement

I. ASTM D 953 - Test Method for Bearing Strength of Plastics

J. ASTM D 2344 - Test Method for Short Beam Strength of Polymer Matrix Composite Materials and their Laminates

K. ASTM D 2583 - Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor

L. ASTM D 2584 - Test Method for Ignition Loss of cured Reinforced Resins

M. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials

N. ASTM F 593 - Stainless Steel Bolts, Hex Cap Screws, and Studs

O. ASTM F 594 - Stainless Steel Nuts

P. ASTM F 3125 - High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength

Q. New York City Building Code (NYCBC)

R. American Society of Civil Engineers (ASCE)

1. MOP 66 - Structural Plastics Design Manual

2. MOP 102 - Design Guide for FRP Composite Connections

1.05 DESCRIPTION

A. Design Requirements

1. Design criteria, and selection of structural shapes for use under compressive or flexural load shall be in accordance with the manufacturer's load tables.

1.06 QUALITY ASSURANCE

A. Quality Assurance Inspections

1. Quality Assurance inspections may be made by NYC DEP Bureau of Engineering Design and Construction, Quality Assurance Section or its representative at the manufacturer's facility.

2. Quality Assurance inspections shall be in accordance with the requirements of the Contract Documents.

3. The Contract shall give ample notice to the Engineer prior to the beginning of any fabrication, so that Quality Assurance inspection may be made.

4. Quality Assurance inspections shall include (but are not limited to) the following activities:

a. Obtain copies of Certified Materials Test Reports (both chemical and physical) and Manufacturer Certificates of Conformance.

b. Perform visual inspection of welding, as per applicable welding code.

1.07 SUBMITTALS

A. Shop Drawings and material specifications shall be submitted to the Engineer for approval in accordance with the requirements of Section 01 33 00 – Submittal Procedures.

1. Shop Drawings:

a. Shop Drawings shall be submitted for the fabrication and erection of all FRP structural systems, including FRP platform system with removable railings and accessories. Plans, elevations and details of sections and connections shall be included.

b. Shop Drawings for elevated framing platforms or walkways, shall be certified and stamped by a licensed Professional Engineer registered in New York State who has expertise in the field of fiberglass reinforced plastics as well as structural design.

c. The manufacturer's shop drawings shall clearly show material sizes, types, styles, part or catalog numbers, and complete details for the fabrication and erection of components including, but not limited to, location, lengths, types and sizes of fasteners, clip angles, member sizes and connection details.

d. The Contactor shall submit the manufacturer's published literature including structural design data, structural properties data corrosion or resistance tables, certificate of compliance, test report as applicable and design calculations for systems not sized or designed

in the Contract documents. Manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions shall be included.

e. Shop drawings shall be certified and stamped by a Professional Engineer licensed in New York State with expertise in the field of FRP as well as structural design, for components that are not sized or designed in the Contract Drawings.

f. Manufacturer’s certifications for all material shall be submitted.

2. The Contractor is to submit sample pieces of structural shapes and other finished products for acceptance by the Engineer as to type, quality, texture, color, workmanship and finish. Sample pieces shall be manufactured by the method to be used in the work. Compliance with all other requirements shall be the exclusive responsibility of the Contractor.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Manufactured materials shall be delivered in original, unbroken pallets, packages, containers or bundle bearing the label of the manufacturer. Adhesives, resins and their catalysts and hardeners shall be crated or boxed separately and noted as such to facilitate their movement to dry indoor storage.

B. All materials shall be carefully handled to prevent them from abrasion, cracking, chipping, twisting, and other types of damage. Store adhesives, resins and their catalysts and hardeners in dry indoor storage between 70 and 85 degrees Fahrenheit until used.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Pultruded FRP structural shapes shall be as follows:

1. Extren Series 625 as manufactured by Strongwell, Bristol, VA.

2. Dynaform VEFR as manufactured by Fibergrate Composite Structures, Inc., Dallas, TX.

3. Pultex as manufactured by Creative Pultrusions Inc., Alum Bank, PA.

4. Delta Shapes as manufactured by Detla Composites, Houston, TX.

5. or approved equal.

2.02 MATERIALS / EQUIPMENT

A. All structural shapes are to be manufactured by the pultrusion process. The structural shapes shall be composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions as required for this contract.

B. Premium performance vinyl ester resin system, with fire retardant additives to meet a tested flame spread of 25 or less per ASTM E84 and shall meet the self-extinguishing requirements of ASTM D635. Glass content for structural shapes shall be a minimum of 45% and a maximum of 55% by the weight as determined by ASTM D2584 for a maximum sunlight and chemical/corrosion resistance.

C. A synthetic surface veil shall be the outermost layer covering the exterior surfaces. Glass strand roving shall be used internally for longitudinal strength. Continuous strand glass mats or stitched reinforcements shall be used internally for transverse strength.

D. A UV inhibitor shall be present in the resin to resist ultraviolet degradation. Standard color shall be as per manufacturer's specifications.

E. All finished surfaces of FRP items and fabrications shall be smooth, resin-rich, and free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.

F. Pultruded structural shapes are to have the minimum mechanical properties listed below:

Mechanical Properties	ASTM Method	Value
Tensile Strength	D638	30,000 psi
Tensile Modulus	D638	2,600,000 psi
Compressive Stress	D695	30,000 psi
Flexural Stress	D790	30,000 psi
Flexural Modulus	D790	1,600,000 psi
Modulus of Elasticity (Full Section)	N/A	2,800,000 psi
Short Beam Shear (Transverse)	D2344	4,500 psi
Ultimate Bearing Stress	D953	30,000 psi
Barcol Hardness	D2583	45
Density	D792	.062 - .070 pci

G. Fasteners and Accessories:

1. Fasteners shall be in accordance with Section 05 05 23.02 – Miscellaneous Metal Fastenings unless otherwise shown or detailed on the Contract Drawings. All fasteners shall be stainless steel Type 316.

2. End fasteners shall be stainless steel Type 316 for fastening structural shapes together for continuous run and/or installation.

H. Structural systems Structural systems shall include components from Section 06 74 13 - Pultruded FRP Gratings and Plates and Section 06 81 13 - Glass-Fiber Reinforced Plastic Railings.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Fabrication and Handling

1. Structural shapes and appurtenances shall conform to the requirements specified herein and to the following standards:

a. Sealing: All cut edges and holes shall be sealed with a vinyl ester resin to provide maximum corrosion resistance. All field fabricated cuts or drilling shall be coated similarly by the Contractor in accordance with the manufacturer's instructions.

b. Hardware: Type 316 stainless steel bolts shall be provided.

2. The fabricator and Contractor shall exercise precautions necessary to protect the fiberglass pultruded structural shapes from abuse to prevent breakage, nicks, gouges, etc. during fabrication, handling and installation.

3. Structural shapes shall be fabricated and assembled as indicated on the Contract Drawings and in accordance with the manufacturer's fabrication and repair instructions.

4. All structural shapes shall be accurately fabricated, free from warps, twists or other defects, which affect the appearance and serviceability of the gratings and plates.

5. Materials shall be of the minimum size and thickness as specified herein unless otherwise indicated on the Contract Drawings. The dimensions shown on approved shop drawings shall be followed.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Inspection

1. The structural shapes shall be as free, as possible, from visual defects such as foreign inclusions, delamination, blisters, resin burns, air bubble and pits.

2. The inspector will have the authority to reject any Work that does not meet the requirements of this Section.

3. Inspection of personnel, materials and equipment shall not relieve the Contractor of responsibility of providing material and fabrication procedures in compliance with specified requirements.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Field Measurements

1. Field measurements shall be taken prior to preparation of shop drawings and fabrication where required, to ensure proper fitting of the Work.
2. All dimensions shall be checked in the field after all piping and equipment are installed to determine the exact dimensions and locations of openings and cutouts.

3.02 INSTALLATION

A. Structural members shall be installed with each section accurately set plumb, aligned and braced as required to achieve final set condition as shown on the Contract Drawings or Shop Drawings

B. The clearance at the ends or between structural sections shall be a maximum of ¼-inch.

C. Beams, plates and columns shall be set flush with surrounding construction.

D. Beams shall be set with a full uniform bearing on fiberglass columns and beam frames to preclude rocking movement; wedges or similar shimming devices shall not be used.

E. Gratings and plates shall be set with a full uniform bearing on fiberglass angle frames to preclude rocking movement; wedges or similar shimming devices shall not be used.

1. Gratings and plates shall be installed with each section readily removable and replaceable. Adjacent units shall be neatly fitted together.

F. Making cutouts or openings in the field shall be approved by the Engineer.

G. Exposed connections shall be fitted accurately together to form tight joints.

H. Perform cutting, drilling and fitting required for installation of FRP fabrications. Set FRP fabrication accurately in location, alignment and elevation, with edges and surfaces level, plumb and true.

I. Any field cut and drilled edges, holes and abrasions shall be sealed with a catalyzed resin compatible with the original resin as recommended by the manufacturer.

J. Install items specified as indicated and in accordance with manufacturer’s instructions.

K. Fastening Devices

1. Fastening to In-Place Construction: Type 316 stainless steel anchorage devices or approved fasteners shall be provided to secure structural shapes to in-place construction with means for easy removal, as recommended by the manufacturer. Hold down fasteners to supports shall be installed at a maximum spacing of 2 feet on center but not less than four fasteners per each panel. Double nuts or burr threads shall be installed to prevent loosening of the hold down fasteners due to equipment's vibration.

a. Secure structural shapes to in-place construction with means for easy removal, as recommended by the manufacturer.

b. Structural shapes shall be secured to FRP or other structural members with stainless steel Type 316 fasteners, or as specified by the manufacturer.

c. Connections shall be combination joints using mechanical fasteners with adhesive bonding, as per manufacturer's instructions.

d. Mechanical connections utilize mechanical fasteners to join parts of fiberglass assemblies. Stainless steel Type 316 fasteners are to be used to eliminate corrosion.

e. Structural adhesive holds FRP parts together by surface attachment and can sustain a continuously applied load without excessive deformations or failure. Polyesters and epoxies are the two types of adhesives recommended for use with fiber-reinforced materials.

f. Surfaces shall be prepared and joined as per manufacturer's instructions.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

END OF SECTION

SECTION 06 74 13 – PULTRUDED FIBERGLASS REINFORCED GRATINGS AND PLATES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the general requirements for the fiberglass reinforced plastic (FRP) gratings and plates, stair treads and stair stringers. FRP gratings and plates including frames, embedded angles, grating support legs, stringers, anchors, fastening devices and miscellaneous appurtenances shall conform to the requirements specified in the Contract Documents.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 05 23.02 - Miscellaneous Metal Fastening

1.04 REFERENCES

A. ASTM A666 - Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar

B. ASTM D635 - Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position

C. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials

D. ASTM F593 - Stainless Steel Bolts, Hex Cap Screws, and Studs

E. ASTM F594 - Stainless Steel Nuts

F. New York City Building Code (NYCBC)

G. American Society of Civil Engineers (ASCE) Manual of Practice MOP #102 - Design Guide for FRP Composite Connections.

1.05 DESCRIPTION

A. Design Requirements

1. Design Criteria:

a. The design live load for grating or plate covering floor openings shall be that designated for the adjacent floor area but not less than a uniform load of 150 pounds per square foot or a concentrated load of 300 pounds distributed over 12-inch square area at the center of span, whichever produces the maximum stress or maximum deflection.

b. The maximum allowable deflection of the span due to live load as indicated on the Contract Drawings or specified herein shall not exceed 1/360, but not more than 1/4 inch.

c. FRP framing supports or FRP grating leg supports shall be provided at the cutout of opening size larger than 3-inch diameter or 3 inches in any direction unless otherwise indicated in the analysis that it meets the requirements of the specified deflection and allowable stress criteria.

d. Connections shall be as per ASCE MOP #102.

B. Type of Grating and Plates

1. Type of Gratings: Unless otherwise shown on the Contract Drawings or specified, gratings shall be one of the following types and shall be the product of one manufacturer. The type specified shall be used exclusively throughout the work.

a. Type "A" Molded Fiberglass Reinforced Grating.

b. Type "C" Pultruded Fiberglass Reinforced Grating.

2. Type "A", and Type "C" gratings shall be used in, over, and adjacent to containment area. Either Type "A", or Type "C" gratings can be used in other areas unless otherwise indicated on the Contract Drawings.

3. Stair Treads: Stair treads shall be pultruded fiberglass structural shapes and shall be used in, over and adjacent to containment areas unless otherwise indicated on the Contract Drawings.

C. Grating Cut-Outs

1. Cutouts shall be provided in the grating for the passage of pipe, valve stems, columns and similar work. Where more than four (4) bearing bars are included in the cut-out, banding bars of the same dimension as the bearing bars shall be provided around the opening and welded or electric-forged to the component parts of gratings.

D. Grating Stair Treads and Landings

1. Grating stair treads shall meet the requirements of pultruded grating and shall be 1 inch wider than tread widths shown on the Contract Drawings but not less than 10-1/2 inches wide and shall be securely fastened to FRP or stainless steel angles or carrier bars which in turn shall be fastened to FRP or steel treads. The outer edge or nosing of stair treads shall be so constructed as to make it distinctly visible and contrasting with other part of the tread. Nosings shall be furnished on all the stair treads and landings.

1.06 QUALITY ASSURANCE

1. Quality Assurance Inspections:

a. Quality Assurance inspections shall include (but are not limited to) the following activities:

1) Obtain copies of Certified Materials Test Reports (both chemical and physical) and Manufacturer Certificates of Conformance.

2) Obtain copies of required test reports that show compliance with subsection 2.02.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Plans.

2. Elevations.

3. Details of sections and connections.

4. Shop drawings for elevated framing platforms or walkways, except raised platform systems, shall be certified and stamped by a Professional Engineer

licensed in New York who has expertise in the field of fiberglass reinforced plastics as well as structural design.

5. Setting drawings and templates for location and installation of anchorage devices or grating support legs shall be submitted.

6. Manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions shall be included.

7. Gratings and plates shall not be fabricated until field measurements are verified and until the manufacturer's drawings have been approved.

B. The following shall be submitted in accordance with the Contract Documents:

1. Samples: Representative samples of gratings and plates, fasteners and other finished products shall be submitted for approve by the Engineer. The Engineer will review for type, color, texture, workmanship and finish only. Compliance with all other requirements shall be the exclusive responsibility of the Contractor.

2. The grating and plate manufacturer shall be required to furnish copies of ASTM E84 and ASTM D635 test reports showing test results of grating and plate from an independent test laboratory of the grating and plate finished product. Test results on the resin system only will not be allowed.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Molded Grating and Plates

1. Duragrate as manufactured by Strongwell, Bristol, VA.

2. Fibergrate Molded Grating as manufactured by Fibergrate, Dallas, TX.

3. DeltaGrate as manufactured by Delta Composite Structures, Houston, TX.

4. Or approved equal.

B. Pultruded Gratings

1. Safe-T-Span as manufactured by Fibergrate, Dallas, TX.

2. Duradek as manufactured by Strongwell, Bristol, VA.
3. DeltaSpan as manufactured by Delta Composite Structures, Houston, TX.
4. Or approved equal.

C. Resin System
1. VEFR as manufactured by Fibergrate, Dallas, TX.
2. Duragrate as manufactured by Strongwell, Bristol, VAC.
3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Molded grating and plate shall be molded from a premium grade thermosetting resin system.
1. Resin system
a. Premium performance vinyl ester resin system shall have a tested flame spread of 25 or less as per ASTM E84.
b. Resin system shall be provided in, over, and adjacent to containment areas unless otherwise indicated on the Contract Drawings.

B. Pultruded Gratings:
1. All pultruded components shall be pultruded using an UV inhibitor in the resin to resist ultraviolet degradation and an UV resistant synthetic veil on all exposed surfaces.
2. Resin system:
a. Vinyl ester with flame spread rating of 25 or less as per ASTM E84.
b. Resin system shall be provided in locations other than containment areas unless otherwise indicated on the Contract Drawings.
3. Glass content shall be a minimum of 60% and a maximum of 70% by the weight as determined by ASTM D2584 for a maximum sunlight and chemical resistance. Grating panels shall have no exposed dry glass or voids containing dry glass.

C. Embedded Angles and Grating Support Legs: FRP embedded angles and FRP grating support legs of the size and shape indicated on the Contract Drawings shall be manufactured by the pultrusion process by combining fiberglass and premium grade resins in a polymer matrix. The angles and grating support legs shall be pultruded using quality thermosetting resins with ultraviolet inhibitors. The FRP embedded angles shall be continuous angle with integral anchors. Grating support legs shall be adjustable type.
1. The resin systems for the angles and grating support legs shall be as follows:
a. Vinyl ester resin with a tested flame spread rating of 25 or less.

b. Resin system shall be provided in, over and adjacent to the containment areas unless otherwise indicated on the Contract Drawings.

c. Resins shall be a vinyl ester with chemical formulation necessary to provide the corrosion resistance, strength and other physical properties as required

2. Glass content shall be a minimum of 45% and a maximum of 55% by the weight as determined by ASTM D2584 for a maximum sunlight and chemical resistance. Angles and grating support legs shall have no exposed dry glass or voids containing dry glass.

D. Fasteners and Accessories:

1. Fasteners shall be in accordance with Section 05 05 23.02 – Miscellaneous Metal Fastening unless otherwise stipulated in the Contract Documents and requirements of ASTM A666.

2. Hold down fasteners shall be stainless steel Type 316, including self-tapping stainless steel screws or machine bolts and nuts as required to hold the gratings and plates on the structure, as per ASTM F593 and F594. Stainless steel Type 316 wire clips shall be provided for attaching grating support leg to grating in panel.

3. Adhesive grouted anchors shall be provided for holding the gratings and plates on the concrete.

4. End fasteners shall be stainless steel Type 316 for fastening gratings or plates together for continuous run and/or installation.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Floor gratings, plates and appurtenances shall conform to the requirements specified herein and to the following standards:

1. Molded fiberglass reinforced gratings shall be a fiberglass reinforced composite molded with smooth mold surfaces. All bearing bars and cross-bars of the grating shall be molded at the same time into a one-piece construction.

2. Molded covered fiberglass reinforced gratings. Grating shall be a molded fiberglass reinforced grating. Cover shall be laminated to the grating and shall be manufactured by building up multiple layers of resin-impregnated fiberglass reinforcement. Fiberglass reinforcement shall be continuous and equally oriented in two (2) directions.

3. Pultruded fiberglass reinforced gratings shall be manufactured from thermally cured pultruded structural load and tie bar components. The load bar shall be formed using continuous strand roving and an outside surface covered with a continuous strand mat and a synthetic surfacing veil.

B. Gratings and plates shall be accurately fabricated, free from warps, twists or other defects which affect the appearance and serviceability of the gratings and plates.

C. Top surface of gratings and plates shall be gritted with annular abrasive particles for skid resistance.

D. Grating and plate cuts shall be sealed with catalyzed resin capable with resin used in the manufacture of the grating and plates and of equal or superior corrosive resistance.

E. Materials shall be of the minimum size and thickness as specified herein unless otherwise indicated on the Contract Drawings. The dimensions shown on approved Shop Drawings shall be followed.

1. The molded FRP grating shall be of a square grid pattern of not less than 1-1/2 inch deep and shall consist of full depth bi-directional bearing bars with a bar spacing of 1-1/2 inches on center in both directions.

2. The molded covered fiberglass grating shall consist of a FRP plate of a nominal thickness of 1/8-inches laminated to the molded FRP gratings.

3. The pultruded FRP grating shall consist of 1-1/2 inch deep minimum bearing bars at a 1-inch maximum clear spacing and with a tie bar spacing of 6 inches maximum on center.

4. The FRP stair treads shall consist of channels with a minimum size of 10 inches deep x 2-3/4 inches wide x 1/2 inch thick.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Field Measurements

1. Field measurements shall be taken prior to preparation of shop drawings and fabrication where required, to ensure proper fitting of the work.

2. All dimensions shall be checked in the field after all piping and equipment are set in place to determine the exact dimensions and locations of openings and cutouts.

3.02 IMPLEMENTATION

A. Installation

1. Gratings and plates shall be installed with each section readily removable and replaceable. Adjacent units shall be neatly fitted together.

2. The clearance at the ends or between sections of gratings and plates shall be a maximum of 1/4-inch.

3. Top of gratings and plates shall be set flush with surrounding construction.

4. Gratings and plates shall be set with a full uniform hearing on fiberglass angle frames to preclude rocking movement; wedges or similar shimming devices shall not be used.

5. Making cutouts or openings in the field shall be approved by the Engineer.

6. Exposed connections shall be fitted accurately together to form tight joints.

B. Fastening Devices

1. Fastening to In-Place Construction: Type 316 stainless steel anchorage devices or approved fasteners shall be provided to secure gratings and plates to supporting members with means for easy removal, as recommended by the manufacturer. Hold down fasteners to supports shall be installed at a maximum spacing of 2 feet on center but not less than four fasteners per each panel. Double nuts or burr threads shall be installed to prevent loosening of the hold down fasteners due to equipment's vibration.

a. Fastening devices shall not protrude above the walking surface of the gratings and plates in a way that will create a tripping hazard.

b. Gratings and plates shall be secured to fiberglass or other structural members with stainless steel Type 316 hold-down fasteners, or as specified by the manufacturer.

c. In the absence of grating and plate support structure, edges of gratings and plates shall be secured to each other with end panel fasteners.

C. Supports for Raised Floor Systems

1. 1-1/2 inch square mesh molded FRP grating panels provided in the containment area shall be supported on FRP adjustable legs with screw-leveling feature, FRP nut base and stainless steel Type 316 wire clip. The height of grating support legs shall be adjusted from atop grating. Raised floor systems to a maximum height of 60-inches shall be cross-braced using FRP angle 2 inches x 2 inches x 1/4 inch minimum fastened with stainless steel Type 316 bolts. The adjacent panels shall be secured with "F" type stainless steel Type 316 clips spaced at maximum 48-inches on center.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 06 74 20 – FIBERGLASS LADDERS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the requirements for the fiberglass reinforced plastic (FRP) ladders. FRP ladders, anchors, fastening devices, miscellaneous appurtenances and personal fall arrest system shall conform to the requirements specified herein, and as shown on the Contract Drawings.

B. The Contractor shall furnish all labor, materials, equipment and incidentals necessary to install the FRP ladders.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 05 23.02 - Miscellaneous Metal Fastening

1.04 REFERENCES

A. ANSI/ASSP Z359.16-2016 – Safety Requirements for Climbing Ladder Fall Arrest Systems

B. ASTM D570 – Test Method for Water Absorption of Plastics

C. ASTM D635 – Test Method for Rate of Burning and/or Extent and Time of Burning of Self Supporting Plastics in a Horizontal Position

D. ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials

E. ASTM F593 – Stainless Steel Bolts, Hex Cap Screws, and Studs

F. ASTM F594 – Stainless Steel Nuts

G. ASTM F3125 – High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi Minimum Tensile Strength, Inch and Metric Dimensions

H. OSHA 1910.23 – Ladders

I. OSHA 1910.28 – Duty to have fall protection and falling object protection

J. OSHA 1910.29 – Fall protection systems and falling object protection – criteria and practices

K. New York City Building Code (NYCBC)

1.05 DESCRIPTION

A. Design requirements

1. The FRP ladder and connections shall be in accordance with NYCBC and OSHA 1910.23and DEP EHS Guidelines.

2. The design live load for ladders shall be that designated for the adjacent floor area but not less than a concentrated load of 300 pounds distributed over the rung span, whichever produces the maximum stress or maximum deflection.

3. The maximum allowable deflection of the span due to live load as indicated on the Contract Drawings or specified herein shall not exceed 1/360, but not more than 1/4 inch.

1.06 QUALITY ASSURANCE

A. All items to be provided under this section shall be furnished only by manufacturers having a minimum of 5 years of experience in the design and manufacture of similar products and systems. Additionally, if requested, a record of at least three previous, separate, similar successful installations in the last 5 years shall be provided.

B. Substitution of any component or modification of the FRP ladder system shall be made only when approved by the Engineer.

C. In addition to the requirements of this Specification, the Contractor must comply with manufacturer's instructions and recommendations for work and installation.

D. Quality Assurance Inspections:

1. Quality Assurance inspections shall include (but are not limited to) the following activities:

a. Obtain copies of Certified Materials Test Reports (both chemical and physical) and Manufacturer Certificates of Conformance.

b. Obtain copies of required test reports that show compliance with subsection 2.02.

1.07 SUBMITTALS

A. Shop drawings and material specifications of all fabricated ladder and accessories shall be submitted to the Engineer for approval in accordance Section 01 33 00 – Submittal Procedures.

1. Shop Drawings shall be submitted for the fabrication and erection of all Work. These drawings shall clearly show material sizes, types, part or catalog numbers, complete details for the fabrication and erection of components including, but not limited to plans, elevation, location, lengths, type and sizes of fasteners, clip angles, member sizes and connection details.

2. Shop drawings for ladders shall be certified and stamped by a licensed Professional Engineer registered in New York State who has expertise in the field of fiberglass reinforced plastics as well as structural design.

3. Setting drawings and templates for location and installation of anchorage devices shall be submitted.

4. Manufacturer's specifications, load tables, structural design data, structural properties data, corrosion resistance tables, dimension diagrams, anchor details, design calculations for systems not sized and installation instructions shall be included.

5. Ladders shall not be fabricated until field measurements are verified and until the manufacturer's drawings have been approved.

6. Shop Drawings shall also show personal fall arrest system for ladders 15 feet or greater.

B. The following shall be submitted upon request of the Engineer:

1. Samples: Representative samples of ladders, fasteners and other finished products shall be submitted for approval by the Engineer. The Engineer will review for type, color, texture, workmanship and finish only. Compliance with all other requirements shall be the exclusive responsibility of the Contractor.

2. The ladder manufacturer shall be required to furnish copies of ASTM E84 and ASTM D635 test reports showing test results from an independent test laboratory of the finished product. Test results on the resin system only will not be allowed.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to the City a manufacturer's limited warranty, in an acceptable and beneficial form, warranting all FRP products against defects in materials and workmanship for a period of 5 years from the date of acceptance by the City.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Ladder and components shall be as manufactured by:

1. Delta Composites, LLC, Spring, TX;
2. Fibergrate, Dalla, TX;
3. Strongwell, Bristol, VA;
4. Structural Fiberglass, Inc., Bedford, PA;
5. Or approved equal.

B. Fall Prevention System

1. Ladder safety system shall be:
   a. PeakWorks 2000 Series Climb-Rite Fixed Rail Ladder Safety System as manufactured by SureWerx;
   b. Miller Saf-T-Climb System as manufactured by Honeywell;
   c. Or approved equal.
2. Full body harness shall be:
   a. PeakPro Harness as manufactured by SureWerx;
   b. Miller Saf-T-Climb Harness as manufactured by Honeywell;
   c. Or approved equal.
3. Shuttle/Trolley shall be:
   a. PeakWorks 2000 Climb-Rite Trolley as manufactured by SureWerx;

b. Miller Saf-T-Grip Shuttle as manufactured by Honeywell;

c. Or approval equal.

2.02 MATERIALS / EQUIPMENT

A. All ladder side rails, rungs and ladder mounting brackets are to be FRP structural shapes manufactured by the pultrusion process. All structural shapes shall be composed for fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions as specified in the Contract Documents.

B. Fiberglass reinforcement shall be a combination of continuous roving, continuous strand mat, bi-directional roving mat and surfacing veil in sufficient quantities as needed by the application and/or physical properties required.

C. Resins shall be a vinyl ester with chemical formulation necessary to provide the corrosion resistance, strength and other physical properties as required.

D. All finished surfaces shall be smooth, resin-rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.

E. All products shall have a tested flame spread rating of 25 or less per ASTM E84 Tunnel Test.

F. The ladder side rail shall be 1-3/4 inch square tube with a wall thickness of 1/4 inch or greater. The rungs shall be 1-1/4 inch diameter flutted structural shapes, continuously fluted to provide a non-slip surface. Rungs that are gritted as a secondary operation shall not be permitted. Ladder and wall and floor mount shall be fabricated from pultruded angles, 3/8 inch minimum thickness.

G. Rung to side rail connections shall be bonded and pinned with a dowel rod to prevent rung rotation and pullout. Ladder Dowel Pins shall be ¼ inch diameter solid round rod..

H. The side rails shall be fiberglass reinforced pultruded polyester with OSHA safety yellow pigment.

I. Pultruded ladder and components:

1. All pultruded components shall be pultruded using an ultraviolet resistant synthetic veil on all exposed surfaces.

a. Glass content shall be a minimum of 60% and a maximum of 70% by the weight as determined by ASTM D2584 for a maximum sunlight and chemical resistance. Grating panels shall have no exposed dry glass or voids containing dry glass.

2. Resin shall be a vinyl ester, with flame-spread rating of 25 or less per ASTM E84. A UV inhibitor in the resin shall be present to resist ultraviolet degradation. Standard color shall be dark gray unless otherwise noted.

J. Embedded angles and ladder support: FRP embedded angles and FRP ladder support of the size and shape indicated on the Contract Drawings shall be manufactured by the pultrusion process by combining fiberglass and premium grade resins in a polymer matrix. The angles and support shall be pultruded using quality thermosetting resins with ultraviolet inhibitors. The FRP embedded angles shall be continuous angle with integral anchors. The resin systems for the angles and grating support legs shall be as follows:

1. Vinyl ester resin, with a tested flame spread rating of 25 or less shall be provided in, over and adjacent to the containment areas unless otherwise indicated on the Contract Drawings.

2. Glass content shall be a minimum of 60% and a maximum of 70% by the weight as determined by ASTM D2584 for a maximum sunlight and chemical resistance. Angles and grating support legs shall have no exposed dry glass or voids containing dry glass.

K. All other components of the products shall be pultruded fiberglass structural shapes and shall be as located on the Contract Drawings.

L. Fasteners and Accessories:

1. Fasteners shall be in accordance with Section 05 05 23.02 – Miscellaneous Metal Fastening unless otherwise shown or detailed on the Contract Drawings meet the requirements of ASTM F593, ASTM F594 and ASTM F3125.

M. Vertical Ladders

1. Ladders shall comply with OSHA 1910.23

2. A personal fall arrest system or ladder safety system shall be required on all fixed ladders that extend more than twenty-four feet above a lower level as specific in OSHA 1910.28.

3. The third rail required for the fall prevention system shall be stainless steel.

N. Fall Prevention System

1. All fixed ladders that extend more than twenty-four feet above a level shall be provided with a fall prevention system.

2. Fall prevention systems shall comply with OSHA 1910.28, OSHA 1910.29 and ANSI Z359.16.

3. All necessary components of the fall prevention system shall be furnished including two trolley/shuttle and two full-body harnesses for each fall prevention installation, to provide a complete and fully operational fall prevention system. Full-body harnesses shall be size medium where not universally sized.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Fabrication

1. Pultruded fiberglass reinforced ladder shall be manufactured from thermally cured pultruded structural load and tie bar components. The load bar shall be formed using continuous strand roving and an outside surface covered with a continuous strand mat and a synthetic surfacing veil.
2. Ladders shall be accurately fabricated, free from warps, twists or other defects which affect the appearance and serviceability of the ladders.
3. Top surface of ladder rungs shall be gritted with annular abrasive particles for skid resistance.
4. Ladder cuts shall be sealed with catalyzed resin capable with resin used in the manufacture of the ladder and of equal or superior corrosive resistance.
5. Materials shall be of the minimum size and thickness as specified herein unless otherwise indicated on the Contract Drawings. The dimensions shown on approved Shop Drawings shall be followed.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. All cuts or machined edges and holes shall be performed during ladder fabrication. No cuts shall be performed in the field without prior approval by the Engineer. Abrasions shall be sealed with a resin compatible with the resin matrix used in the fabrication of the ladder.

B. Exposed connections shall be fitted accurately together to form tight joints.

C. Fastening devices

1. Fastening to In-Place Construction: Type 316 stainless steel anchorage devices or approved fasteners shall be provided to secure ladders to supporting members with means for easy removal, as recommended by the manufacturer.
2. Fastening devices shall not protrude into the hand hold area of the ladder in a way that will cause injury.

3.03 FIELD TESTING / QUALITY CONTROL

A. Field measurements

1. Field measurements shall be taken prior to preparation of Shop Drawings and fabrication where required, to ensure proper fitting of the Work.

2. All dimensions shall be checked in the field after all piping and equipment are installed to determine the exact dimensions and locations of openings and cuts.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 06 81 13 – GLASS-FIBER-REINFORCED PLASTIC RAILINGS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the general requirements for the fiberglass reinforced plastic (FRP) railing. FRP railings including all incidentals, such as fasteners toe boards and anchors, shall conform to the requirements specified herein and as shown on the Contract Drawings.

1. FRP railings shall also include, when shown on the Contract Drawings, FRP spring loaded swing gates and all hardware including reinforced mounting posts and hardware and hinges.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 05 23.02 - Miscellaneous Metal Fastenings

1.04 REFERENCES

A. ASTM A666 Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar

B. ASTM D570 Test Method for Water Absorption of Plastics

C. ASTM D635 Test Method for Rate of Burning and/or Extent and Time of Burning of Self Supporting Plastics in a Horizontal Position

D. ASTM D638 Test Method for Tensile properties of Plastics

E. ASTM D695 Test Method for Compression Properties of Rigid Plastics

F. ASTM D696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between −30°C and 30°C with a Vitreous Silica Dilatometer

G. ASTM D790 Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

H. ASTM D792 Test Method for Specific Gravity (Relative Density) and Density of Plastics by Displacement

I. ASTM E84 Test Method for Surface Burning Characteristics of Building Materials

J. ASTM E985 Standard Specification for Permanent Metal Railing Systems and Rails for Buildings

K. ASTM F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs

L. ASTM F594 Standard Specification for Stainless Steel Nuts

M. ANSI A1264.1 Safety Requirements for Workplace Walking / Working Surfaces and Their Access; Workplace, Floor, Wall and Roof Openings; Stairs and Guardrail/Handrail Systems

N. 29 CFR 1910.23 Guarding Floor and Wall Openings, and Holes

O. The New York City Building Code (NYCBC)

P. American Society of Civil Engineers (ASCE)

1. MOP 66 Structural Plastics Selection Manual

2. MOP 102 Design Guide for FRP Composite Connections

1.05 DESCRIPTION

A. FRP handrail and railing system shall be provided in accordance with the City of New York Building Code and OSHA, Part 1910.23, including the imposed 200-pound loading requirement. In addition, the system shall conform to the following requirements:

1. Completed handrail and railing shall withstand a uniform lateral force of 50 pounds per linear foot and a vertical uniform force of 50 pounds per linear foot, both applied simultaneously at the top of the handrail and railing.

2. Intermediate and bottom rails shall withstand simultaneously applied lateral uniform forces of 50 pounds per linear foot and a vertical load of 50 pounds per linear foot, however, lateral and vertical loads on intermediate and bottom railings need not be considered in the detailing and fabrication of posts and anchorages.

3. Concentrated 200-pound load and uniform force conditions shall not be applied simultaneously.

4. Other pertinent requirements ceded to ANSI A1264.1 by governing codes.

5. Applied loads shall not produce permanent deflection in the completed work when loads are removed.

B. Design of Members and Connections:

1. All details shown on the Contract Drawings are typical; similar details shall apply to similar conditions, unless otherwise shown on the Contract Drawings or specified. Dimensions shall be verified at the site without causing delay in the work.

2. Fabricator shall be responsible for structural analysis FRP railing system within the requirements established by these Specifications.

3. Complete structural analysis and Shop Drawings shall be prepared, signed and stamped with the seal of a Professional Engineer, licensed to practice in the State of New York and recognized as an expert in structural analysis.

C. Fasteners and Supports:

1. When the size, length or load carrying capacity of an anchor bolt or concrete anchor is not shown on the Contract Drawings, the size, length and capacity required to carry the design load times a minimum safety factor of four shall be used.

2. Sizes shown on the Contract Drawings shall be considered minimum. Size shall be increased to comply with design loadings and minimum safety factor specified.

D. Tolerances

1. "Pencil-line" thin butt joints shall be provided.

2. Variations of cast-in-place inserts, sleeves and field-drilled holes shall be limited to the following:

   a. Spacing: ±3/8-inch

   b. Alignment: ±1/4-inch

   c. Plumb: ±1/8-inch

3. Variation of complete railing system alignment shall be limited to 1/4-inch in 12 feet.

4. Rails horizontal or parallel to rake of steps or ramp shall be set to within 1/4-inch in 12 feet.

1.06 QUALITY ASSURANCE

A. Quality Assurance: Materials and fabrication procedures shall be subject to inspection and tests in the mill, shop, and field conducted by a qualified inspection agency. Such inspections and tests shall not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

B. Manufacturer Qualifications:

1. Engage a single fabricator with undivided responsibility for detailing and performance of the fiberglass railing systems.

2. Engage a firm which can show five years previous successful experience in detailing and fabrication of fiberglass railing systems of scope and type similar to the required Work.

C. Installer Qualifications:

1. Engage a single installer skilled, trained and with successful experience in the installation of fiberglass railing systems and with specific skill and successful experience in the erection of the types of materials required; and who agrees to employ only tradesmen with specific skill and successful experience in this type of work. Submit names and qualification to Engineer along with the following information in a minimum of three successful projects:

a. Names and telephone numbers of owner, architects or engineers responsible for projects.

b. Approximate contract cost of the fiberglass railing.

c. Amount of area installed.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and Material Specifications for the approval of the Engineer. Submittals shall include, but not limited to:

1. Drawings for the fabrication and erection of FRP railing and handrail system with sizes of members, components and anchorage devices shall be submitted based on requirements of these Sections. All plans and elevations identifying the location of all handrail and railings, and details of sections and connections, and all anchorage items shall be included.

2. Calculations for the complete structural analysis of the FRP railing and handrail system, including calculations showing compliance with design criteria specified, shall be submitted.

3. Manufacturer's catalogs showing complete selection of standard and custom components and miscellaneous accessories shall be submitted for selection of the Engineer.

B. Maintenance Manuals: Upon completion of the installation of the FRP railing system the following shall be submitted:

1. Product name and manufacturer.

2. Name, address and telephone number of manufacturer and local distributor.

3. Detailed procedures for routine maintenance and cleaning, including recommended cleaning materials, application methods and precautions as to use of materials that may be detrimental to finish when improperly applied.

C. Test reports from independent testing laboratory evidencing compliance with ASTM E985. The resin shall be fire-retardant vinyl ester with a flame spread rating of 25 or less according to ASTM E84 Tunnel Test. A synthetic surface veil as the outermost layer and UV inhibitor in the resin shall be present to resist ultraviolet degradation.

D. Samples of FRP railing and handrail shall be submitted.

1. Each type of railing finish, including bolted connections, not less than 6-inches long.

2. Samples will be reviewed for color, texture, workmanship and finish only. Compliance with all other requirements is the exclusive responsibility of the Contractor.

E. Certification: Copies of certificate of compliance, where required, attesting to the material's compliance with the requirements shall be submitted:

1. Certification shall be furnished by the manufacturer stating that loading tests have been performed on the railing and handrail system, and that they conform to all applicable New York City Building Code, OSHA and ANSI requirements for load and deflection.

F. Manufacturer's and installer's qualifications.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Materials shall be delivered to the Project Site in undamaged condition and protected against damage to finished surfaces.

2. All railings shall be properly wrapped with paper and protected against scratching, splashing of mortar, paint or other defacements during transportation and erection until adjacent work is completed by other trades.

B. Storage of Materials:

1. All materials shall be stored in clean, dry location, away from uncured concrete and masonry.

2. All materials shall be covered with waterproof paper, tarpaulins or polyethylene sheeting.

C. Handling of Materials:

1. On-site handling shall be kept to a minimum.

2. Protective covering on railings and handrails shall be maintained.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Modular Handrail System as manufactured by Fibergrate, Dallas, TX.

B. Safrail Handrail System as manufactured by Strongwell, Bristol, VA.

C. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Railings: FRP railings shall be furnished and installed with the following materials and properties:

1. All rails, posts and toe boards shall be FRP pultruded structural shapes with synthetic veil for ultraviolet resistance.

2. Glass content shall be a minimum of 25% and a maximum of 35% by weight as determined by ASTM D2584 for a maximum sunlight and chemical resistance.

3. The resin system shall be fire retardant vinyl ester with a flame spread rating of 25 or less, type square or round:

4. Laminates shall have no exposed glass, voids or dry glass.

5. The FRP railing manufacturer shall be required to furnish copies of ASTM E84 and ASTM D635 test reports showing test results of all materials from independent test laboratory of the finished railing product. Test results on only the resin system will not be accepted.

B. Mechanical Properties (minimum) of FRP structural shapes and plates:

Ultimate Tensile Strength	30,000 psi
Ultimate Compressive Strength	30,000 psi

Ultimate Bearing Strength	30,000 psi
Ultimate Shear Strength	4,500 psi
Modulus of Elasticity	2.5 x 10^6 psi
Barcol Hardness	50 psi

C. Toe boards:

1. Toe boards shall be furnished and installed of the same material and finish as railings for railings around openings, platforms, balconies and other areas shown on the Contract Drawings. The dimensions and details shall be fabricated as shown on the Contract Drawings.
2. Toe boards shall be securely fastened in place with not more than 1/4-inch clearance above floor level. Expansion in toe boards shall be provided for without warping or buckling of toe boards.
3. Toe boards shall meet requirements of OSHA Part 1910.23, Section (e).
4. Toe boards shall follow curvature of FRP railing. Where FRP railing system is shown to have curved contours at corners, or other locations, the toe board shall likewise be curved to follow line of FRP railing system.

D. Brackets, Flanges and Anchors: ASTM A666, Type 316L stainless steel brackets, flanges, and anchors shall be provided for railing posts and handrail supports. Components shall be in accordance with manufacturer's recommendations and as acceptable to the Engineer as shown on approved Shop Drawings.

E. Removable Railing Post Sleeves: FRP post sleeves shall be provided for removable railing sections. Post sleeves shall be sized for snug fit to avoid lateral movement of the removable railing.

F. Concrete and Masonry Anchors: Concrete and masonry anchors shall be stainless steel Type 316 as specified in Section 05 05 23.02 - Miscellaneous Metal Fastenings.

G. Bolting Materials: Stainless steel Type 316 bolts as specified in Section 05 05 23.02 - Miscellaneous Metal Fastenings.

H. FRP shape and plate cuts shall be sealed with catalyzed resin of equal or superior corrosive resistance to the FRP shapes and plates.

I. Spring Loaded Swing Gate shall be fully assembled and capable of swinging in either direction by inverting installation position. Gate size shall be laterally adjusted for minus 1-1/4 inch to plus 2-1/2 inch.

1. Standard system shall have top and mid rail in accordance with OSHA Standard 29 CFR 1910.23(a) (2)
2. Height
   a. Top rail 42 inches
   b. Bottom rail 21 inches

3. Widths shall be as indicated on the Structural or Architectural Drawings and field verified.

4. Posts shall be reinforced FRP.

5. FRP Railings:

   a. Round tubular pultruded FRP with 1.90 inch outer diameter, 1.51 inch inner diameter

   b. Pultruded square tube FRP handrail or as shown on the Contract Drawings.

   c. Color shall be Safety Yellow or as shown on the Contract Drawings.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Field Measurements: Field measurements where required shall be taken prior to preparation of Shop Drawings and fabrication to ensure proper fitting of the work.

B. An FRP railing system shall be provided as shown on the Contract Drawings with posts, top, bottom, intermediates and picket type rails and with flush joints. Details shall be as shown on the Contract Drawings.

C. Items shall be preassembled in the shop to the greatest extent possible, so as to minimize field splicing and assembly of units at the site. Units shall be disassembled only to the extent necessary for shipping and handling. Units shall be clearly marked for reassembly and coordinated installation.

D. Railing shall be assembled in sections as long as practicable. Posts shall be connected to flanges by stainless steel bolts.

E. Exposed work shall be formed true to line and level with accurate angles and surfaces and straight sharp edges. All corners shall be fabricated without the use of fittings. Corners shall be formed to the smallest radius as possible without causing grain separation or otherwise impairing the work. The 4-inch outside radius shall be provided.

F. Intersections of rails and posts shall be coped. Lower rails shall be coped and connected to the posts.

G. Expansion and contraction shall be provided for in the railing system. Adequate number of expansion joints shall be located so that each joint does not have to move more than 1/16-inch plus or minus from each side of joint.

H. Completely factory fabricated railing system shall be provided.

I. Unless otherwise indicated on the Contract Drawings the following minimum sizes of railing shall be provided:

1. Top and mid-rails shall not be less than 1-3/4 inches x 1-3/4 inches x 1/8 inch square tube.

2. Posts shall not be less than 2 inches x 2 inches x 3/16 inch square tube.

3. Toe boards shall not be less than 9/16 inch x 4 inches.

J. Color: Railing color shall be yellow unless otherwise indicated on the Contract Drawings.

K. Weep Holes: Provide 15/64-inch diameter weep holes at the lowest point on all railing system posts and along the bottom side of railing system rails. Provide pressure relief holes at closed ends of handrails and railings.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Fastening to In-Place Construction

1. Stainless steel anchoring devices and fasteners shall be used unless otherwise indicated on the Contract drawings.

2. Anchorage devices and fasteners shall be provided where necessary for securing handrails and railing items to in-place construction, including threaded fasteners for concrete and masonry inserts, through-bolts and other connectors as required. Devices and fasteners shall be compatible with installed material.

3. Flanged fittings shall be secured to steel, ironwork and FRP work with nuts, bolts and washers; hollow tile and other masonry shall be secured with injection adhesive anchors as specified in Section 05 05 23.02 - Miscellaneous Metal Fastenings. Flanges shall be set in neat Portland cement grout.

4. Expansion joints shall be located at the post nearest the expansion joint in the structure upon which the railing is placed. End posts and railing returns shall be provided at 16-inches on each side of the structure expansion joints. Separation between returns shall match the width of the structure expansion joint.

5. Field dowel connections shall be located at posts.

B. Cutting, Fitting and Placement

1. Cutting, drilling and fitting shall be performed as required for installation. Measured from established lines and levels, the work shall be accurately set in location, alignment and elevation, plumb, level, true and free of rack.

2. Exposed connections shall be fitted accurately together to form tight hairline joints. The surfaces of units which have been finished after

fabrication and are intended for field connections shall not be cut or abraded.

3. Wall handrails shall be supported at ends with handrail returns and with intermediate brackets spaced not more than 6 feet on center. The wall plate portion of the bracket shall be drilled to receive one bolt, unless otherwise shown on the Contract Drawings for concealed anchorage. Flush-type wall return fittings shall be provided with the same projection as shown on the Contract Drawings for wall brackets. Wall brackets and wall return fittings shall be secured to building construction as follows:

   a. For concrete and solid masonry anchorage, anchor expansion shields and adhesive anchors shall be used.

   b. For hollow masonry anchorage, adhesive anchors bolts having square heads shall be used.

4. Permanent splice connections shall be made in accordance with manufacturer's instructions.

5. Expansion Joints: Slip joints shall be provided with internal sleeve extending two inches minimum beyond the joint on each side. Expansion joints shall be provided for field splices and their internal sleeves shall be secured on one side to the rail assembly. Joints shall be located within six inches of posts. Proposed locations of expansion joints shall be submitted to the Engineer for review.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Alignment and Adjustment

1. Railings shall be adjusted in place prior to securing, to ensure proper matching at butting joints and correct alignment throughout their length. Posts shall be plumbed in each direction.

2. At walkways where railing is provided on each side, railing posts shall be located directly opposite each other.

3. Posts shall be top mounted by providing base plates or fixtures securely attached to concrete surfaces with concrete anchors.

4. Posts shall be side mounted by fastening them securely in brackets attached to steel, FRP members or concrete fascia as shown on the Contract Drawings, and shall be completed in accordance with the manufacturer's instructions.

5. Posts shall be anchored to steel or FRP stringers, support flanges, angle type or floor type as required by conditions and shall be completed in accordance with the manufacturer's instructions.

6. Hinged railing sections shall be provided where shown on the Contract Drawings. Hinges and latches shall be provided for connection to adjacent railing.

B. Cleaning and Repair

1. Cleaning:

a. Protective plastic shall be removed as recommended by the manufacturer.

b. All stains, dirt, grease or other substances shall be removed by washing railings thoroughly, using clean water and soap and then rinsing with clean water. If stain remains after washing, remove, finish and restore in accordance with manufacturer's recommendations.

c. Acid solution, steel wool or other harsh abrasive shall not be used.

2. FRP railing and handrails shall be left free from dents, burrs, scratches, holes and other blemishes. Minor scratches shall be refinished indistinguishable from adjacent un-scarred areas. If, after refinishing, damage remains visible when viewed from five feet away, or if finish of the work has been altered to the point where it appears different from adjacent work, the damaged work shall be replaced with new undamaged material at no additional expense to the City.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 07 11 13 – BITUMINOUS DAMPPROOFING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This section includes cold applied, solvent based, asphalt fibered damp-proofing for concrete exterior surfaces below grade under no hydrostatic pressure.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. New York City Building Code

B. ASTM D41 - Standard Specification for Asphalt Primer Used in Roofing, Damp-proofing, and Waterproofing

C. ASTM D4479 - Standard Specification for Asphalt Roof Coatings – Asbestos free; Type 1

1.05 DESCRIPTION

A. Job Conditions

1. Environmental Conditions:

a. Proceed with Work only when temperature and moisture conditions comply with the manufacturer's written recommendations and when no rain or other damaging environmental condition is forecast for the time when the materials will be exposed to potential damage.

b. Protect Work from precipitation, frost and direct sun. Erect temporary shelters to protect Work in progress.

c. Proceed with bituminous damp-proofing only when weather conditions will permit unrestricted use of materials and quality control of the Work being installed, complying with the Sections and with the recommendations of the bituminous damp-proofing manufacturer, and only when manufacturer and installer are willing to guarantee the Work as required without additional reservations and restrictions.

d. Record decisions, conditions and agreements to proceed with the Work when weather conditions might be unfavorable. State the reasons for proceeding, with the names of the persons involved along with the changes, if any, or revisions, requirements or terms of the Contract.

B. Protection:

1. Provide continuous protection of materials against damage, wetting and moisture absorption primarily by storing materials under cover and above ground and away from other construction traffic.

2. Protect installed materials and completed systems against damage by construction activities. Exclude all persons not involved with the Work from the work area until such time as the Work has been isolated from all potential damage.

C. Substitutions:

1. Do not change products, system components, installation techniques or manufacturers after Working Drawing approval by Engineer.

D. Clearly identify, in a manner which is highlighted to Engineer, all proposed substitutions, modifications, variations, unspecified features and "or equal" products. Provide complete comparative data with specified products at time of Working Drawing submission.

1.06 QUALITY ASSURANCE

A. Source Quality Control:

1. Engage a single manufacturer who shall provide the services of a Technical Representative who shall assist Contractor and Engineer by providing technical opinions on the adequacy of materials, methods of installation and field testing methodology and significance of test results based on Shop Drawings approved by Engineer.

2. Provide such services during the time of delivery, storage, handling, job mock-up construction, installation and testing of all components.

B. Installer Qualifications:

1. Engage a single installer skilled, trained and with successful experience in the application of each product who is a licensee of the manufacturer, or who can submit evidence in writing of being acceptable to the manufacturer and who agrees to employ only tradesmen with specific skill and successful experience in this type of Work. Submit name and qualifications to Engineer along with the following information on a minimum of three successful projects:

a. Names and telephone numbers of owners, architects or engineers responsible for projects

b. Approximate contract cost of the work

c. Size of area installed

2. Submit proof of acceptability of installer by manufacturer to Engineer.

C. Allowable Installation Tolerances:

1. Do not install Work until substrate preparation and tolerances have been approved by Engineer, bituminous damp-proofing manufacturer's Technical Representative and the bituminous damp-proofing installer, and Contractor has verified to Engineer that substrates are within tolerances specified and acceptable to produce approved Work. Work advanced for any reason without such verification shall be stopped, removed and replaced with new material after substrate is approved at no additional expense to DEP.

2. Substrate Tolerances:

a. Out-of-Plane: 1/8 inch maximum in 10 foot - 0 inches and 1/16 inch maximum in any 12 inches measured along the plane.

b. Maximum Offset in Plane Alignment: 1/16 inch.

c. Variation From Slope: 1/8 inch maximum in 10 foot - 0 inches.

D. Requirements of Regulatory Agencies:

1. Material and Equipment Acceptance Division of the Board of Standards and Appeals of New York City Department of Buildings: Where, in order to be

incorporated into the Work, a particular item or product system specified by Engineer requires acceptance by the New York City Commissioner of Buildings, the Contractor shall assist the product manufacturer in obtaining such approval, without additional expense to DEP, and in providing DEP with an approved certified copy of the boards resolution giving the MEA number for the item or product system which shall be submitted to Engineer as part of the Working Drawing approval process. Contractor may submit, in place of products specified by Engineer, products which are "equal" in all ways to the product specified but which have already achieved an MEA number. Such "or approved equal" product submissions shall not change the requirements of these Sections as to performance, required features or properties, as determined by Engineer, and shall not require additional compensation to Contractor or additional expense to DEP. Final acceptance of "equal" is at the sole determination of Engineer.

2. Comply with all applicable requirements of governing authorities and codes for all Work.

3. In those instances where the Commissioner of Buildings requires a certificate of compliance of the manufacturer or producer certifying that the item or product system was tested and is equivalent to material of the same kind and quality regularly being manufactured by such manufacturer or producer Contractor shall provide all such certificates to the Commissioner of Buildings without additional expense to DEP.

E. Job Mock-Ups:

1. Prior to the installation of bituminous damp-proofing, but after Engineer's approval of Working Drawing submittals, erect stepped-back job mock-ups using substrate preparation, materials and application techniques specified and approved for final Work. Provide all components of the bituminous damp-proofing showing the correct installation, substrate preparation and the workmanship quality which shall be achieved in the Work. Build mock-ups at the Site, in a location approved by Engineer, of full thickness and approximately 4 feet long and 4 feet square. Indicate the proposed workmanship to be expected in the finished Work. Obtain Engineer's acceptance of mock-ups before start of Work. Retain and protect mock-ups before start of Work. Retain and protect mock-ups during construction as a standard of judging completed Work. Do not alter or destroy mock-ups until given written permission by the Engineer.

2. Build as many job mock-ups as necessary in order to achieve Engineer's acceptance of the Work.

F. Work which proceeds without approved job mock-ups shall be stopped, removed and re-installed, after job mock-up approval, at no additional expense to DEP.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and Design materials for approval of the Engineer. Submittals shall include, but not be limited to:

1. Samples: Submit for approval the following:
   a. Bituminous damp-proofing system applied to a 12-inch by 12-inch by 2-inch thick concrete sample demonstrating specified surface preparation to be used on job mock-up and specified thickness of fluid-applied waterproofing. Apply waterproofing to only one-half of the sample board, leaving the other half visible and showing specified substrate preparation.
   b. Samples will be reviewed by Engineer for general appearance and as examples of the types of components to be installed on the job mock-ups. Compliance with other requirements is the responsibility of Contractor.
2. Shop Drawings: Submit for approval the following:
   a. Copies of specifications, installation instructions and general recommendations from the manufacturer, for each type of bituminous damp-proofing product.
3. Test Reports: Submit for approval the following:
   a. Copies of test reports verifying compliance with physical properties specified herein.
   b. Copies of testing agencies background and experience in preforming similar tests to those specified.
4. Certificates: Submit for approval the following:
   a. Copies of certificates stating that the installer has been approved, or is a licensee of the manufacturer.
   b. Evidence of installer's experience.
   c. Evidence prior to delivery that materials and components furnished conform to the requirements of the Sections.
5. Statement of Application:

B. Upon completion of the work, submit a notarized statement to Engineer signed by Contractor stating that the work complies with the requirements of these Specifications and the installation methods were proper and adequate for the conditions of installation and use.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:
1. Deliver materials in manufacturer's original, unopened and undamaged containers, with information accurately representing container contents as approved by Engineer at time of Working Drawing submission.
2. Include the following information on the label:
   a. Name of material and supplier.

b. Installation, handling and protection requirements.

3. Deliver materials in sufficient quantities to allow uninterrupted continuity of the Work.

B. Storage of Materials:

1. Store materials in original, undamaged containers with manufacturer's labels and seals intact.

2. Store all materials in a dry, enclosed area, off the ground and away from all possible contact with water and in a location where temperature can be constantly maintained between 60 F and 75 F and out of direct sunlight.

3. Prevent damage to materials during storage primarily by minimizing the amount of time they are stored at the site before being incorporated into construction systems.

C. Handling of Materials:

1. Do not open containers, or expose materials to detrimental conditions or physical damage. Materials which are so exposed shall be removed from the site and shall not be incorporated into the Work.

2. Handle materials in a manner which prevents contamination and inclusion of foreign materials.

3. Do not open packages or containers until all necessary preparatory Work is complete, approved and installation will begin immediately. Do not allow materials to become wet or soiled or covered with ice or snow.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fibered damp-proofing

1. Type “83AF” as manufactured by Karnak Corp., Clark, NJ

2. Or approved equal complying with the following:

1) Solids by Weight: 72%

2) Solids by Volume: 65%

3) Permeability: 0.003

4) ASTM D4479 - Type 1

5) Cure Time: 24 to 48 hours @ 70ºF, 50% RH

B. Asphalt Primer

1. Type “108" as manufactured by Karnak Corp., Clark, NJ
2. Or approved equal conforming to ASTM D41.

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. The Contractor shall examine the surfaces to receive the damp-proofing, and the conditions under which the Work is to be performed, and notify Engineer in writing of all conditions detrimental to the proper and timely completion of the Work and the performance of the damp-proofing systems. Do not proceed with the damp-proofing Work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

3.02 SUBSTRATE PREPARATION

A. Provide cast-in-place concrete free from voids and sharp projections before placing any fluid-applied waterproofing system. Comply with the manufacturer's instructions for the preparation of the substrates to receive the damp-proofing system unless more stringent conditions are specified.

B. Remove surface irregularities on cast-in-place concrete and fill all holes, honeycombs, spalls and cracks using manufacturer's recommended joint seal parging. Repair areas of unacceptable consolidation. Where necessary to remove sharp projections, grind concrete surfaces.

C. Clean the substrate of dust, debris and other substances detrimental to the Work. Remove grease, oil and other contaminants from surfaces of cast-in-place concrete.

D. Parge all construction joints to a minimum depth of 1/8 inch and 3 inch minimum width using manufacturer's recommended joint seal parging.

E. Seal all through-wall projections using elastic sheet flashing and manufacturer’s recommended sealants.

F. Prime the substrate with a seal coat as recommended by the manufacturer.

3.03 INSTALLATION

A. Comply with manufacturer's instructions for the installation of bituminous damp-proofing.

1. Concrete substrate walls shall be cured for a minimum of 30 days prior to installation of damp-proofing system.

2. All cracks and non-working joints over 1/8 inch shall be filled using trowel grade material of the specified system.

3. Asphalt primer shall be installed with a wide fiber brush at the rate of 1 gallon per 100 square feet.

4. Fibered damp-proofing shall be installed with a wide fiber brush at the rate of 4 gallons per 100 square feet.

5. Damp-proofing shall be cured for a minimum of 48 hours before backfilling.

B. Install 1/8-inch thick protection board, approved by the manufacturer, before backfilling.

3.04 FIELD TESTING / QUALITY CONTROL

A. Certify that the completed bituminous damp-proofing Work is in accordance with the Sections and is waterproof, of uniform thickness and without gaps, holidays or pinholes at the time of Final Acceptance.

3.05 STARTUP / DEMONSTRATION

A. Not Used

3.06 ADJUSTING / PROTECTION / CLEANUP

A. Protect the area from access by other installers and Contractors until the Work of this Section has been incorporated into finished construction systems.

B. Protect other Work from spillage of damp-proofing materials, and prevent materials from entering and clogging drains and conductors. Replace or restore other Work which is soiled or otherwise damaged by the performance of the damp-proofing and associated work.

C. System components which are dislodged, damaged, or penetrated by subsequent installation operations or damaged by detrimental conditions shall be immediately replaced with undamaged material in compliance with the Sections and properly protected as specified.

END OF SECTION

SECTION 07 14 00 – FLUID-APPLIED WATERPROOFING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes a system of 100 percent solids, solvent-free, environmentally friendly, notched or mason's trowel-applied, thixotropic liquid urethane rubber waterproofing with NSF 61 approval recommended by the manufacturer for vertical below-grade cast-in-place concrete walls and horizontal cast-in-place concrete roof slabs all provided with surface preparation in compliance with ASTM D 4258 and ASTM D 4259 - Abrasive Blast Cleaning Procedure, elastic flashings and other components and system accessories necessary to provide water- and vapor tight performance for conditions and details encountered in the Work. Provide complete technical services as available from the specified manufacturer and on-site technical representation by manufacturer's technical representative. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install, test and place into satisfactory service all fluid-applied waterproofing Work.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used.

1.04 REFERENCES

A. NYBC - New York City Building Code.

B. ASTM D412 - Vulcanized Rubber and Thermoplastic Rubber and Thermoplastic Elastomers - Tension, Standard Test Methods for.

C. ASTM D573 - Rubber - Deterioration in an Air Oven, Standard Test Method for.

D. ASTM D624 - Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers, Standard Test Method for.

E. ASTM D746 - Brittleness Temperature of Plastics and Elastomers by Impact, Standard Test Method for.

F. ASTM D1149 - Rubber Deterioration - Surface Ozone Cracking in a Chamber, Standard Test Method for.

G. ASTM D2240 - Rubber Property - Durometer Hardness, Standard Test Method for.

H. ASTM D4258 - Surface Cleaning Concrete for Coating, Standard Practice for.

I. ASTM D4259 - Abrading Concrete, Standard Practice for.

J. ASTM D4263 - Indicating Moisture in Concrete by the Plastic Sheet Method, Standard Test Method for.

K. ASTM E96 - Water Vapor Transmission of Materials, Standard Test Methods for.

L. ASTM E329- Agencies Engaged in the Testing and/or Inspection of Materials Used In Construction, Standard Specification for.

1.05 DESCRIPTION

A. Environmental Conditions:

1. Proceed with fluid-applied waterproofing Work only when temperature and moisture conditions comply with the fluid-applied waterproofing manufacturer's written recommendations and when no rain or other damaging environmental condition is forecast for the time when the materials will be exposed to potential damage.

2. Apply fluid-applied waterproofing only when material temperature is above 60° F, surface temperature is minimum of 40° F and air temperature is minimum of 40° F and rising.

3. Protect Work from precipitation, frost and direct sun. Erect temporary shelters to protect Work in progress.

4. Proceed with fluid-applied waterproofing only when weather conditions will permit unrestricted use of materials and quality control of the Work being installed, complying with the Section requirements and with the recommendations of the fluid-applied waterproofing manufacturer and only when manufacturer and installer are willing to guarantee the Work as required without additional reservations and restrictions.

5. Record decisions, conditions and agreements to proceed with the Work when weather conditions might be unfavorable. State the reasons for proceeding, with the names of the persons involved along with the changes, if any, or revisions, requirements or terms of the Contract.

B. Pre-installation Conference:

1. Before erecting job mock-up, Contractor, his installers for the fluid-applied waterproofing and bentonite waterproofing, mason responsible for installation of glazed face brick and technical representative of the fluid-applied waterproofing system manufacturer shall meet on-site with Engineer to discuss approved products and workmanship to ensure proper application of fluid-applied waterproofing system components and substrate preparation requirements for the Work. Two series of meetings shall be provided; one series for below-grade vertical walls, the other for above-grade cast-in-place concrete roof deck Work.

2. Record the discussions of the conferences and the decisions and agreements or disagreements reached, and furnish a copy of the records to each party attending. Review foreseeable methods and procedures related to the fluid-applied waterproofing Work, including, but not necessarily limited to, the following:

a. Review project requirements (Drawings, Specifications and other Contract Documents).

b. Review required submittals, both completed and yet to be completed.

c. Review status of substrate Work, including approval of abrasive blast surface finish, preparation, drying, structural loading limitations and similar considerations.

d. Review availability of materials, tradesmen, equipment and facilities needed to make progress and avoid delays.

e. Review required inspection, testing and certifying.

f. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions, including the possibility of temporary waterproofing.

g. Review regulations concerning code compliance, environmental protection, health, safety, fire and similar considerations.

h. Review procedures needed for protection of waterproofing during the remainder of the construction period.

3. Reconvene the meetings at the earliest opportunity if additional information must be developed in order to conclude the subjects under consideration.

4. Record any revisions or changes agreed upon, reasons therefor, and parties agreeing or disagreeing with them.

C. Protection:

1. Provide continuous protection of materials against damage, wetting and moisture absorption primarily by storing materials under cover and above ground and away from other construction traffic.

2. Protect installed materials and completed systems against damage by construction activities. Exclude all persons not involved with the fluid-applied waterproofing Work from the work area until such time as the Work has been isolated from all potential damage.

D. Scheduling:

1. Proceed with the fluid-applied waterproofing and associated Work after projections and penetrations through the substrates have been installed, and when the substrate construction and framing of openings is complete.

E. Substitutions:

1. Do not change products, system components, installation techniques or manufacturers after Shop Drawing approval by Engineer.

2. Clearly identify, in a manner which is highlighted to Engineer, all proposed substitutions, modifications, variations, unspecified features and "or equal" products. Provide complete comparative data with specified products at time of Shop Drawing submission.

1.06 QUALITY ASSURANCE

A. Source Quality Control:

1. Engage a single manufacturer who shall provide the services of a Technical Representative who shall assist Contractor and Engineer by providing technical opinions on the adequacy of materials, methods of installation and field testing methodology and significance of test results based on Shop Drawings approved by Engineer.

2. Provide such services during the time of delivery, storage, handling, job mock-up construction, installation and testing of all fluid-applied waterproofing components.

3. Provide a manufacturer who will provide complete technical services including preparation and review of Shop Drawings, installation methods

and proposed detailing for the Work. Where the manufacturer requires additions, or changes to the Contract Drawings and Contract Specifications these shall be made at no additional expense to DEP and only as acceptable to Engineer.

4. Fluid-applied waterproofing system shall incorporate only the highest quality materials, environmental features, and methods of construction and installation as recommended by the manufacturer and as acceptable to Engineer.

B. Installer Qualifications:

1. Engage a single installer skilled, trained and with successful experience in the application of each product who is a licensee of the manufacturer, or who can submit evidence in writing of being acceptable to the manufacturer and who agrees to employ only tradesmen with specific skill and successful experience in this type of Work. Submit name and qualifications to Engineer along with the following information on a minimum of three successful projects:

   a. Names and telephone numbers of owners, architects or engineers responsible for projects.

   b. Approximate contract cost of the fluid-applied waterproofing.

   c. Amount of area installed.

2. Submit proof of acceptability of installer by manufacturer to Engineer.

C. Performance Criteria:

1. Contractor's Review: Accompanying approval request, submit to Engineer a written statement signed by Contractor, stating that the Contract Drawings and Specifications have been reviewed with an agent of the fluid-applied waterproofing material manufacturer and that he is in agreement that the selected systems are proper and compatible and that the details used for the Work are not in conflict with the manufacturer's details.

2. Statement of Application: Upon completion of the Work, submit a notarized statement to Engineer signed by Contractor stating that the Work complies with the requirements of the manufacturer's printed instructions and were proper and adequate for the condition of installation and use.

3. Do not thin fluid-applied waterproofing. Do not request the use of spray application. Requests by Contractor for spray application will not be approved by Engineer. Resulting consequences of additional time spent by Contractor in attempting to have such requests approved shall be at no additional expense to DEP regardless of final determination on product use. All expenses caused by such attempts shall be at the expense of Contractor. Apply all fluid-applied waterproofing with a notched or mason’s trowel.

D. Testing Agency: Engage a testing laboratory regularly engaged in the testing of construction materials, and who complies with ASTM E 329.

E. Allowable Installation Tolerances:

1. Do not install Work until substrate preparation and tolerances have been approved by Engineer, fluid-applied waterproofing manufacturer's Technical Representative and the fluid-applied waterproofing installer and Contractor has verified to Engineer that substrates are within tolerances specified and acceptable to produce approved Work. Work advanced for any reason without such verification shall be stopped, removed and replaced with new material after substrate is approved at no additional expense to DEP.

2. Substrate Tolerances:

a. Out-of-Plane: 1/8 inch maximum in 10 foot - 0 inches and 1/16 inch maximum in any 12 inches measured along the plane.

b. Maximum Offset in Plane Alignment: 1/16 inch.

c. Variation From Slope: 1/8 inch maximum in 10 foot - 0 inches.

F. Requirements of Regulatory Agencies:

1. Material and Equipment Acceptance Division of the Board of Standards and Appeals of New York City Department of Buildings: Where, in order to be incorporated into the Work, a particular item or product system specified by Engineer requires acceptance by the New York City Commissioner of Buildings, the Contractor shall assist the product manufacturer in obtaining such approval, without additional expense to DEP, and in providing DEP with an approved certified copy of the boards resolution giving the MEA number for the item or product system which shall be submitted to Engineer as part of the Shop Drawing approval process. Contractor may submit, in place of products specified by Engineer, products which are "equal" in all ways to the product specified but which have already achieved an MEA number. Such "or approved equal" product submissions shall not change the requirements of these Specifications as to performance, required features or properties, as determined by Engineer, and shall not require additional compensation to Contractor or additional expense to DEP. Final acceptance of "equal" is at the sole determination of Engineer.

2. In those instances where the Commissioner of Buildings requires a certificate of compliance of the manufacturer or producer certifying that the item or product system was tested and is equivalent to material of the same kind and quality regularly being manufactured by such manufacturer or producer Contractor shall provide all such certificates to the Commissioner of Buildings without additional expense to DEP.

G. Job Mock-Ups:

1. Prior to the installation of fluid-applied waterproofing systems, but after Engineer's approval of Shop Drawing submittals, erect stepped-back job mock-ups using substrate preparation, materials and application techniques specified and approved for final Work. Provide all components of the fluid-

applied waterproofing systems showing the correct installation, substrate preparation and the workmanship quality which shall be achieved in the Work. Build mock-ups at the site, in location approved by Engineer, of full thickness and approximately 12 foot - 0 inches long and 12 foot - 0 inches square for horizontal surfaces. Indicate the proposed workmanship to be expected in the finished Work. Include methods of installation typical to the Work including wall and roof penetration details, system termination details and installation of the glazed face brick to follow the Work of this Section. Also include an area of honeycombing and fin removal and the Work of this Section for Engineer's approval. Obtain Engineer's acceptance of mock-ups before start of Work. Retain and protect mock-ups before start of Work. Retain and protect mock-ups during construction as a standard of judging completed Work. Do not alter or destroy mock-ups until given written permission by Engineer.

2. Build as many job mock-ups as necessary in order to achieve Engineer's acceptance of the Work.

3. Fluid-applied waterproofing Work which proceeds without approved job mock-ups shall be stopped, removed and re-installed, after job mock-up approval, at no additional expense to DEP.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings for approval of the Engineer. Submittals shall include, but not be limited to:

1. Samples: Submit for approval the following:

a. Fluid-applied waterproofing system applied to a 12-inch by 12-inch by 2-inch thick concrete sample demonstrating specified surface preparation to be used on job mock-up and specified thickness of fluid-applied waterproofing. Apply waterproofing to only one-half of the sample board, leaving the other half visible and showing specified substrate preparation.

b. Samples will be reviewed by Engineer for general appearance and as examples of the types of components to be installed on the job mock-ups. Compliance with other requirements is the responsibility of Contractor.

2. Shop Drawings: Submit for approval the following:

a. Copies of specifications, installation instructions and general recommendations from the fluid-applied waterproofing manufacturer, for each type of fluid-applied waterproofing product.

b. Drawings showing extent of each component of each system used in the Work and all details for the Work referencing system components provided as samples to Engineer. Provide Shop Drawings coordinated with cast-in-place concrete, bentonite waterproofing system and glazed face brick masonry showing all

construction, system terminations and other conditions encountered in the Work and manufacturer's approved and recommended details appropriate to waterproof these joints and transitions as required for full fluid-applied waterproofing system waterproof performance whether or not specific indication is made on the Contract Drawings to the details of the specified manufacturer.

3. Test Reports: Submit for approval the following:

   a. Copies of test reports verifying compliance with physical properties specified herein.

   b. Copies of testing agencies background and experience in preforming similar tests to those specified.

B. Certificates: Submit for approval the following:

1. Copies of certificates stating that the fluid-applied waterproofing systems installer has been approved, or is a licensee of the fluid-applied waterproofing manufacturer.

2. Evidence of installer's experience.

3. Evidence prior to delivery that materials and components furnished conform to the requirements of the Sections.

4. Evidence of acceptance of the substrate by the fluid-applied waterproofing manufacturer.

5. Evidence that the material used in the Work has been manufactured within one year of installation and has, for that entire time, been constantly stored between 50°F and 80°F, and in accordance with the manufacturer’s written recommendations.

C. Contractor's Review: Contractor shall submit to Engineer a written statement as specified. Show by copy of transmittal form that a copy of the statement has been transmitted to the manufacturer.

D. Statement of Application: Contractor shall submit to Engineer a written statement as specified.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Deliver materials in fluid-applied waterproofing manufacturer's original, unopened and undamaged containers, with information accurately representing container contents as approved by Engineer at time of Shop Drawing submission.

2. Include the following information on the label:

   a. Name of material and supplier.

   b. Installation, handling and protection requirements.

3. Deliver materials in sufficient quantities to allow uninterrupted continuity of the Work.

B. Storage of Materials:

1. Store materials in original, undamaged containers with manufacturer's labels and seals intact.

2. Store all materials in a dry, enclosed area, off the ground and away from all possible contact with water and in a location where temperature can be constantly maintained between 60 F and 75 F and out of direct sunlight.

3. Prevent damage to materials during storage primarily by minimizing the amount of time they are stored at the job-site before being incorporated into construction systems.

C. Handling of Materials:

1. Do not handle, open or mix component materials unless fluid-applied waterproofing can be properly handled as recommended by the manufacturer of the fluid-applied waterproofing.

2. Do not open containers, or expose materials to detrimental conditions or physical damage. Materials which are so exposed shall be removed from the site and shall not be incorporated into the Work.

3. Handle materials carefully and in a manner which prevents contamination and inclusion of foreign materials.

4. Do not open packages or containers until all necessary preparatory Work is complete, approved and installation will begin immediately. Do not allow materials to become wet or soiled or covered with ice or snow.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Product and Manufacturer: Provide one of the following:

1. LM-60V and LM-60H Fluid-Applied Waterproofing System as manufactured by:

a. Gaco Western, Incorporated, Waukesha, WI.

b. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Fluid-Applied Waterproofing:

1. Liquid Urethane Rubber: Provide materials that comply with the following physical properties and have received NSF 61 approval:

a. Tensile Strength, ASTM D412: 175 psi.

b. Elongation at Break, ASTM D412: 300% at 75°F

c. Hardness, Shore Type A, Durometer 30 ASTM D2240.

d. Low Temperature Brittleness, ASTM D746: Passed @ minus 50°F.

e. Water Vapor Transmission, ASTM E96: 0.012 per inch.

f. Tear Resistance, ASTM D624: 30 pounds per lineal inch.

B. Elastic Membrane Flashing:

1. Synthetic rubber sheet, not less than 60 mils thick, textured as required for bonding to the substrate, in widths of not less than 10 feet, complying with the following:

a. Tensile Strength, ASTM D412.: 1400 psi.

b. Elongation at Break, ASTM D412: 300% at 75°F.

c. Hardness, Shore Type A, ASTM D2240: Durometer 50 to 70.

d. Low Temperature Brittleness, ASTM D746: Minus 75°F.

e. Tear Resistance, Die C, ASTM D624: 125 pounds per lineal inch.

f. Water Absorption, ASTM D1149: 0.5% maximum by weight, 72 hours at 104 F.

g. Resistance to Heat Aging, ASTM D573: 15 points maximum increase in hardness, 30% maximum loss of elongation and 15% maximum loss of tensile strength for 168 hours at 240 F.

C. Miscellaneous Waterproofing Materials:

1. Bonding Adhesive: Types recommended by manufacturer.

2. Expansion Joints and Flashing Accessories: Types recommended by the manufacturer for the specific installation, provided at locations shown or specified and at locations recommended by manufacturer, and including adhesive tapes, flashing cements and sealants.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Certify that the completed fluid-applied waterproofing Work is in accordance with the Sections and is waterproof, of uniform thickness and without gaps, holidays or pinholes at the time of Final Acceptance.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examination

1. The Contractor shall examine the surfaces to receive the trowel-applied waterproofing, and the conditions under which the trowel-applied waterproofing Work is to be performed, and notify Engineer in writing of all conditions detrimental to the proper and timely completion of the Work and the performance of the fluid-applied waterproofing systems. Do not proceed with the fluid-applied waterproofing Work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

B. Preparation

1. Provide cast-in-place concrete free from voids and sharp projections before placing any fluid-applied waterproofing system. Comply with the manufacturer's instructions for the preparation of the substrates to receive the waterproofing system unless more stringent conditions are specified.

2. Test substrate for moisture in accordance with ASTM D4263. Where substrate indicates moisture content above manufacturer’s recommended limit, use appropriate drying methods, and retest. If, after retesting, substrate continues to contain moisture above manufacturer’s recommended maximum, provide continuous barrier coat material, at no additional expense to DEP.

3. Remove surface irregularities on cast-in-place concrete and fill all holes, honeycombs, spalls and cracks using manufacturer's recommended joint seal parging. Repair areas of unacceptable consolidation. Where necessary to remove sharp projections, grind concrete surfaces.

4. Clean the substrate of dust, debris and other substances detrimental to the Work. Remove grease, oil and other contaminants from surfaces of cast-in-place concrete and provide abrasive blast in compliance with ASTM D4258 and ASTM D4259 - Abrasive Blast Cleaning Procedure for all surfaces to receive the Work of this Section to provide a surface profile acceptable to the fluid-applied waterproofing manufacturer for maximum adhesion. Follow abrasive blast by broom cleaning all surfaces followed by vacuum cleaning using vacuum cleaners equipped with high-efficiency particulate air filters. Remove all dust, loose stones and debris.

5. Parge all construction joints to a minimum depth of 1/8 inch and 3 inch minimum width using manufacturer's recommended joint seal parging.

6. Seal all through wall projections using elastic sheet flashing and manufacturer’s recommended sealants.

7. Install cant strips, expansion joints flashing accessories and other items as shown and as recommended by the manufacturer.

8. Prime the substrate with a seal coat if recommended by the manufacturer.

3.02 INSTALLATION

A. Comply with manufacturer's instructions for the application of fluid-applied waterproofing, including priming, membrane flashing, and curing. Provide trowel application, do not spray.

1. Start the application only in the presence of the manufacturer's technical representative.

2. Mark walls and slabs in 100 square foot areas to indicate extent of one application kit coverage. Do not exceed recommended coverage rate of 100 square feet per four gallon kit. Provide Engineer with calculations indicating compliance with maximum coverage rate. Coverage rate is based on uniformly prepared substrate as acceptable to installer. Provide additional material at no additional expense to DEP as may be required by substrate accepted by installer.

B. Apply fluid-applied waterproofing using notched or mason’s trowel and in accordance with manufacturer's written instructions. Apply in one coat to obtain total uniform, continuous thickness of 1/16-inch. Engineer should be aware this is about four gallons (one application kit) per one hundred square feet of surface area. Calculations indicating spreading rates exceeding this coverage rate are not achieving the specified application thickness of 1/16-inch. Consult manufacturer’s Technical Representative for recommendations on applying a second coat of material as may be required to achieve minimum thickness of 1/16-inch on all areas requiring fluid-applied waterproofing.

1. Apply waterproofing from first floor elevation down to base of footing, grade beams or sides of mat slabs.

C. Elastic Membrane Flashing: Install with membrane flashing as shown on approved Shop Drawings.

3.03 FIELD TESTING / QUALITY CONTROL

A. All components of the fluid-applied waterproofing system shall be fully tested and accepted before placing any other materials.

B. Area to be tested shall be sandbagged and made watertight around entire area of test and flooded to a minimum depth of two (2) inches at high end and maximum depth at end of slope. Water in flooded area shall be left in-place for 48 hours. Monitor and record air temperature and humidity and water temperatures during the time of the test. Provide calculations of surface area water evaporation expected to be encountered over the temperature and humidity ranges experienced during the test. Monitor water level.

C. Water levels which, for any reason, fall below expected levels based on evaporation calculations, shall be interpreted as indication that the system is not performing in a watertight manner.

D. Inspect and determine location of leaks. Where location of leak cannot be determined Contractor may, at its option, retest the area in question or remove and replace the waterproofing system with new material. Waterproofing system which fails a second test shall be removed and replaced with new at no additional expense to City. Replace only after substrate is dry, clean and acceptable to perform the Work.

E. Include all test information and calculations in Field Report to be submitted to Engineer.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Do not allow construction traffic which is not associated with the installation of the fluid-applied waterproofing and related materials in the area of Work. Protect the area from access by other installers and Contractors until the Work of this Section has been incorporated into finished construction systems.

B. Protect other Work from spillage of waterproofing materials, and prevent materials from entering and clogging drains and conductors. Replace or restore other Work which is soiled or otherwise damaged by the performance of the waterproofing and associated Work.

C. System components which are dislodged, damaged, or penetrated by subsequent installation operations or damaged by detrimental conditions shall be immediately replaced with undamaged material in compliance with the Sections and properly protected as specified.

D. Upon completion of the Work the installer shall advise Contractor of recommended procedures for his surveillance and protection of the waterproofing Work during the remainder of the construction period. At the end of the construction period, or at a time when the remaining construction work will in no way affect or endanger the waterproofing Work, the installer and Technical Representative shall make a final inspection of fluid-applied waterproofing and prepare a written report to Contractor with copy to DEP and Engineer of deterioration or damage found in the Work.

E. Only the installer shall repair or replace deteriorated or defective Work found at the time of final inspection. Only the installer shall be engaged by Contractor to repair damage to the waterproofing Work which occurred subsequent to fluid-applied waterproofing installation and prior to final inspection. Repair or replace the Work so that there will be no question as to the waterproof condition of fluid-applied waterproofing and associated Work at the time of Final Acceptance.

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the requirements for perimeter foundation insulation, cavity wall insulation, formaldehyde-free recycled glass fiber thermal batt insulation, preformed concrete masonry unit core insulation, fire safing insulation with gas and smoke tight fire resistant sealants and other fire stop system components for each kind and condition of penetration through fire-rated construction and miscellaneous materials and accessories as specified herein and as required to complete the Work.

B. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install all building insulation Work.

C. The Contractor shall implement practices and procedures to meet the project's sustainability goals as identified in the Contract Documents. The Contractor shall ensure that the sustainability requirements of this Section are implemented to the fullest extent.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used.

1.04 REFERENCES

A.	NYCBC	-	New York City Building Code
B.	ASTM C177	-	Steady-State Heat Flux Measurement and Thermal Transmission Properties by Means of the Guarded Hot-Plate Apparatus, Standard Test Method for
C.	ASTM C203	-	Breaking Load and Flexural Properties of Block-Type Thermal Insulation, Standard Test Methods for
D.	ASTM C236	-	Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box, Test Method for
E.	ASTM C272	-	Water Absorption of Core Materials for Structural Sandwich Constructions, Test Method for
F.	ASTM C303	-	Dimensions and Density of Preformed Block-Type Thermal Insulation, Test Method for
G.	ASTM C518	-	Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of Heat Flow Meter Apparatus, Test Method for
H.	ASTM C520	-	Density of Granular Loose Fill Insulation, Test Method for
I.	ASTM C531	-	Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Monolithic Surfacing's, and Polymer Concrete, Test Method for
J.	ASTM C549	-	Perlite Loose Fill Insulation, Specification for
K.	ASTM C578	-	Rigid, Cellular Polystyrene Thermal Insulation, Specification for
L.	ASTM C665	-	Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing, Specification for

M.	ASTM D449	-	Asphalt Used in Damp-proofing and Waterproofing, Specifications for
N.	ASTM D696	-	Coefficient of Linear Thermal Expansion of Plastics between -30 Degrees C and 30 Degrees C, Test Method for
O.	ASTM D1621	-	Compressive Properties of Rigid Cellular Plastics, Test Method for
P.	ASTM E84	-	Surface Burning Characteristics of Building Materials, Test Method for
Q.	ASTM E96	-	Water Vapor Transmission of Materials, Test Method for
R.	ASTM E119	-	Fire Tests of Building Construction and Materials, Test Methods for
S.	UL 1479	-	Fire Tests of Through-Penetration Firestops

1.05 DESCRIPTION

A. Substitutions:

1. Do not change products, system components, manufacturers after Shop Drawing approval by Engineer.

2. Clearly identify, in a manner which is highlighted to Engineer, all proposed substitutions, modifications, variations, unspecified features and "or equal" products. Provide complete comparative data with specified products at time of Shop Drawing submission.

B. Scheduling:

1. Proceed with the building insulation and associated Work only after curbs, blocking, OSB substrate board, nailer strips, vents, drains and other projections through the substrates have been installed, and when the substrate construction and framing of openings is complete.

2. Proceed with and complete the Work only when materials, equipment and tradesmen required for the installation of the building insulation and backfilling operations are at the site and are ready to follow with the Work in a manner which will not leave the Work vulnerable to damage or deterioration.

3. Do not advance the installation of building insulation materials beyond that which is necessary for proper sequencing of the Work and for which there is proper and secure protection from damaging weather and construction activities.

4. Do not begin stainless steel sheet metal cladding until testing confirms that all cavity spaces between the structure and OSB sheet metal substrate sheathing have been completely and uniformly filled with foamed-in-place cementitious insulation. Do not delay job progress or permit OSB substrate to degrade with exposure to detrimental weather conditions. Schedule installation of sheet metal cladding immediately after testing indicates that all cavities have been filled or after remedial foamed-in-place cementitious insulation Work has been completed. No final payment shall be made until testing confirms acceptability of the foamed-in-place cementitious insulation installation and acceptability of the OSB substrate by the sheet metal cladding manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer/Installer Qualifications:

1. Obtain all foamed-in-place cementitious insulation from a manufacturer who is a licensed manufacturer of the product developer and who will also be responsible for the installation of foamed-in-place cementitious insulation.

2. Engage single installers for each type of building insulation who are skilled, trained and have a record of successful experience in the application of each product and who have a record of performing Work in accordance with the recommendations and requirements of the manufacturer or who can submit evidence in writing of being acceptable to the manufacturer for production of guaranteed construction and who agrees to employ only tradesmen with specific skill and successful experience in each type of Work. Submit names and qualifications to Engineer along with the following information on a minimum of three successful projects:

a. Names and telephone numbers of owners, architects or engineers responsible for projects.

b. Approximate contract cost of the building insulation system installed.

c. Amount of area installed.

B. Product/Manufacturer Selection:

1. Obtain building insulations, requiring a hydro-chlorofluorocarbon blowing agent, from manufacturers who manufacture specified insulation using a blowing agent acceptable for use until the year 2020 complying with the requirements of the Copenhagen Amendments to the Montreal Protocol in all ways.

2. Provide a manufacturer who will provide complete technical services including preparation and review of Shop Drawings, installation methods and proposed detailing for the Work.

C. Performance Criteria:

1. Thermal Conductivity: The thicknesses shown are for the thermal conductivity, k-value at 75 degrees F, specified for each material.

2. Provide adjusted thicknesses as directed by Engineer for the use of material having a different thermal conductivity.

D. Materials and Equipment Compliance:

1. Materials and equipment submitted for DEP's approval by the Contractor shall have met, at the time of their submittal, the certification and material acceptance requirements of the NYC Department of Buildings.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings for approval of the Engineer. Submittals shall include, but not be limited, to:

1. Samples: Submit for approval the following:

a. 12-inch by 12-inch sample of each insulation product and each accessory and miscellaneous material to be used in the Work.

b. Samples will be reviewed by Engineer for general appearance and as examples of the types of components to be installed on the job mock-ups specified in other Sections. Compliance with other requirements is the responsibility of Contractor.

2. Shop Drawings: Submit for approval the following:

a. Copies of specifications, installation instructions and general recommendations from the building insulation manufacturers, for each type of building insulation product. Include manufacturer's data substantiating that the materials comply with the requirements.

b. Complete selection of fire stop manufacturer's recommended systems for each condition and kind of penetration encountered in the Work. Coordinate with equipment manufacturers for required number and kind of penetrations through fire rated construction. Provide a schedule of penetrations and the fire stop system to be included in the Work for each condition and kind of penetration encountered.

c. Drawings showing extent of the Work and all details required for the Work referencing system components provided as samples to Engineer.

3. Test Reports: Submit for approval the following:

a. Copies of test reports verifying compliance with physical properties and environmental features specified herein.

b. Copies of testing agencies background and experience in preforming similar tests to those specified.

4. Certificates: Submit for approval copies of certificates stating that the manufacturer of the foam-type rigid board insulation has used an environmentally safe blowing agent complying with the requirements of the Sections.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Deliver building insulation products in manufacturer's original, unopened, factory-sealed containers, bearing manufacturer's name and labels, accurately representing container contents as approved by Engineer at time of Shop Drawing submission.

2. Damaged materials unsuitable for use shall be rejected by Engineer and permanently removed from site by Contractor.

3. Do not deliver insulation materials to the project site before the time of installation.

4. Deliver materials in sufficient quantities to allow uninterrupted continuity of the Work.

B. Storage of Materials:

1. Store materials in original, undamaged containers with manufacturer's labels and seals intact.

2. Store all materials in a dry, enclosed area, off the ground and away from all possible contact with water, ice or snow.

3. Prevent damage to materials during storage primarily by minimizing the amount of time they are stored at the job-site before being incorporated into construction systems.

C. Handling of Materials:

1. Handle materials carefully in order to avoid damage and breakage or compressing of boards to less than their specified thickness or other damage.

2. Do not open containers, or expose materials to detrimental conditions or physical damage. Materials which are so exposed shall be removed from the Site and shall not be incorporated into the Work.

3. Handle materials in a manner which prevents inclusion of foreign materials.

4. Do not open packages or containers until all necessary preparatory Work is complete and installation will begin immediately. Do not allow materials to become wet or soiled or covered with ice or snow.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide one of the following for each of the following product types:

1. Perimeter Foundation, Parapet and Coping Insulations:
   a. STYROFOAM 100 HIGH LOAD as manufactured by The Dow Chemical Company, Midland, MI.
   b. Or approved equal.
2. Cavity Wall Rigid Insulation Board:
   a. CAVITYMATE ULTRA and Square Edge STYROFOAM, as manufactured by The Dow Chemical Company, Midland, MI.
   b. Or approved equal.
3. Semi-rigid Insulation:
   a. Rainbarrier Black as manufactured by Thermafiber, Inc., Toledo, OH.
   b. Or approved equal.
4. Recycled Glass Fiber Insulation Batts:
   a. Grid-SHIELD Thermal Batt Insulation as manufactured by Schuller International, Incorporated (Johns-Manville), Littleton, CO.
   b. Or approved equal.
5. Preformed Concrete Masonry Unit Core Insulation:
   a. Korfil Standard U-Shaped Block Insulation as manufactured by Concrete Block Insulating Systems Incorporated, a Division of W.R. Grace Construction Products, Incorporated, West Brookfield, MA.
   b. Or approved equal.
6. Fire Safing Insulation:

a. Thermafiber Safing Insulation as manufactured by USG Interiors, Incorporated, Stockton, CA.

b. Or approved equal.

7. Fire-Stop Sealants and Other Fire-Stop System Components:

a. 3M Fire Stop Systems as manufactured by 3M Incorporated, St. Paul, MN.

b. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Perimeter Foundation, Parapet and Coping Insulations: Provide the following:

1. Rigid, closed-cell, thermally stabilized, very high-load-resisting, extruded, hydrogenated chlorofluorocarbon blown, foam board insulation consisting of 100 percent virgin extruded polystyrene modified resin complying with ASTM C578, Type V.

2. Provide a blowing agent with lowest available ozone depletion potential, such as HCFC-142b, or better. HCFC-141b shall not be approved by Engineer.

3. Physical Properties: Provide the following:

a. Thermal Conductivity (k), ASTM C177 and ASTM C518: 0.20 Btu/in./hr./sf/^{0}F.

b. Compressive Strength (psi at 5% deformation) ASTM D1621: 100 psi minimum.

c. Flexural Strength, ASTM C203: 100 psi minimum.

d. Coefficient of Thermal Expansion, ASTM D696: 3.5 x 10^{-5} inches/in./F.

e. Water Vapor Absorption, ASTM C272: Less than 0.1% by volume maximum.

f. Water Vapor Permeance, ASTM E96: 0.3-0.8 perms/inch maximum.

g. Flame Spread, ASTM E84: 5.

h. Smoke Developed, ASTM E84: 165 maximum.

4. Thickness: Two layers each 2-inches thick, unless otherwise noted on drawings.

5. Width: 24-inches

6. Length: 96-inches

B. Cavity Wall Rigid Insulation Board: Provide the following:

1. Rigid, rectangular boards of extruded polystyrene complying with ASTM C578, Type X and IV.
2. Provide a blowing agent with lowest available ozone depletion potential, such as HCFC-142b, or better. HCFC-141b shall not be approved by Engineer.
3. Physical Properties: Provide the following:
   a. Minimum Compressive Strength, (at 10 percent deformation), ASTM D1621: 25 psi.
   b. Flame Spread, ASTM E84: 10 maximum
   c. Smoke Development, ASTM E84: 165 maximum
   d. Vapor Transmission, ASTM E96: 0.4 - 1.1 perms/inch
   e. Thermal Resistance, ASTM C177: 5/inch and 5.6/inch
   f. Maximum Water Absorption, ASTM C272: 0.10% by volume
4. Sizes: 24-inches by 48 inches by 3-inches thick and 16-inches by 48-inches by 3-inches thick (Minimum).

C. Recycled Glass Fiber Insulation Batts: Provide the following:

1. General: Provide un-faced, polyethylene encapsulated insulation formed from glass fibers certified by SCS as containing a minimum of 25 percent total recycle glass content with a minimum of 18 percent obtained from post-consumer recycled bottle glass and thermosetting acrylic resin binders fabricated into flexible blankets, complying with ASTM C665, Type 1.
   a. Physical Properties: Provide the following:
      1) Thermal Conductivity (k), ASTM C518: 0.32.
      2) Btu/in./hr./sf/EF.
      3) Density, ASTM C303: 1.5 pcf.
      4) Water Vapor Transmission, ASTM E96: 0.10 perm/inch.
      5) Flame Spread, ASTM E84: 25.
      6) Smoke Developed, ASTM E84: 50.
      7) Thickness: 6-3/4-inches
      8) Nominal Width: 24-inches by 48-inches

D. Preformed Concrete Masonry Unit Core Insulation: Provide the following:

1. Individually molded expanded polystyrene core insulation complying with ASTM C236, and ASTM C578 Standard Type I.
2. Physical Properties: Provide the following:
3. Density, ASTM C303: 0.90-1.14 pounds per cubic foot minimum.

4. Water Vapor Transmission, ASTM E96: 1.4 per inch
5. Thermal Conductivity (k), ASTM C177: 0.26 BTU/in/hr/sf/^{0}F.
6. Compressive Strength, ASTM D1621: 1013 pounds per square inch.
7. Flame Spread, ASTM E84: 5 maximum.
8. Smoke Developed, ASTM E84: 130 maximum.

E. Fire Safing Insulation: Provide the following:

1. Mineral Fiber Insulation: Un-faced, semirigid, nonasbestos, non-combustible blankets composed of compounds of spun mineral fiber felt, complying with ASTM C665, Type I, and FS HHI558B, Type 1 and 2.
2. Physical Properties: Provide the following:
3. Thermal Conductivity (k), ASTM C518: 0.25 Btu/in./hr./sf/°F.
4. Density, Manufacturer's Certified Test: 4 pcf.
5. Flame Spread, ASTM E84: 15 maximum.
6. Smoke Developed, ASTM E84: 0.
7. Fire Resistance Rating, ASTM E119: 3 hours.
8. Thickness: 4-inches
9. Width: 24-inches

F. Fire-Stop Sealants and Other Fire-Stop System Components: Provide the following:

1. Complete selection of fire stop manufacturer's recommended silicone rubber fire stop systems. Provide complete systems complying with UL 1479 with a two or three hour fire rating. Provide equal fire protection as provided by fire-rating of construction penetrated.
2. Provide multiple component systems coordinated to meet actual conditions encountered in the Work and as recommended by the fire stop manufacturer. In addition to providing fire-resistance the fire stop systems shall also be gas and watertight.

G. Miscellaneous Materials and Accessories: Provide the following:

1. Adhesive for Bonding Insulation: Provide the type recommended by the insulation manufacturer, and complying with fire resistance requirements.
2. Mechanical Anchors: Provide type and size shown or, if not shown, as recommended by the insulation manufacturer for the type of application shown and condition of substrate.
3. Protection Board: Provide fiberboard sheathing or heavy duty asphaltic panels as recommended by the insulation manufacturer.

4. Adhesive Tapes: Provide complete selection of insulation manufacturer's recommended taping materials.

5. Bitumen: Asphalt, ASTM D449

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Contractor shall verify that foamed-in-place cementitious insulation shall be mixed using the quantities, proportions and the pressures required in the manufacturer's written specifications and comply with the intended use.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examination

1. The Contractor shall examine the substrate and the conditions under which the Work is to be performed, and notify Engineer in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.

B. Preparation

1. Verify that surfaces to receive building insulation are clean of all debris, dirt and other contamination before installation begins in any area.

2. Correct unacceptable Work to meet the requirements of the Section

3.02 INSTALLATION

A. General:

1. Comply with manufacturer's instructions for the particular conditions of installation in each case. If printed instructions are not available or do not apply to the project conditions, submit to Engineer specific recommendations from manufacturer for approval before proceeding with the Work.

2. Extend all insulations full thickness over entire surface to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation.

3. Apply the number of layers of insulation specified herein, each of the required thickness to provide the thermal value indicated, unless otherwise shown or required, to make up the total thickness.

B. Pre-installation Conference:

1. Prior to the installation of the foamed-in-place cementitious insulation and associated Work, Contractor shall schedule and meet at the site with the installer of the foamed-in-place cementitious insulation, sheet metal cladding installer, the installer of each component of associated work, Engineer and other representatives directly concerned with performance of the Work. Review foreseeable methods and procedures related to the foamed-in-place cementitious insulation Work, including but not necessarily limited to, the following:
    a. Review project requirements, including Drawings, Sections and other Contract Documents.
    b. Review required submittals, both completed and yet to be completed.
    c. Review status of substrates including curing of foamed-in-place insulation, structural loading limitations and similar considerations.
    d. Review availability of materials, tradesmen, equipment and facilities needed to make progress and avoid delays.
    e. Review required inspection, testing, certifying and accounting procedures.
    f. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.
    g. Review regulations concerning environmental protection, health, safety, fire and similar considerations.
    h. Review procedures needed for protection of substrates during the remainder of the stainless steel cladding construction period.
2. Reconvene the meeting at the earliest opportunity if additional information must be developed in order to conclude the subjects under consideration.
3. Record any revisions or changes agreed upon, reasons therefor, and parties agreeing or disagreeing with them.

C. Environmental Conditions:

1. Do not install building insulation when weather conditions are such that conditions do not comply with the building insulations manufacturer's written recommendations. Install building insulations only when damaging environmental condition are not forecasted for the time when the system material components will be exposed to potential damage.
2. Install foamed-in-place cementitious insulation only when the combination of interior and exterior temperatures are such that the temperature at the point of application is 40°F and rising during the application process and 48 hour initial curing period.

3. If Contractor wishes to advance the foamed-in-place cementitious insulation Work when weather conditions are not within manufacturer's recommended temperature ranges provide enclosures with heat to maintain manufacturer's recommended temperatures during the initial curing period. Erecting and maintaining all such enclosures and the provision of heat and heating equipment shall be at no additional expense to the City.

4. Record decisions, conditions and agreements to proceed with the Work when weather conditions might be unfavorable. State the reasons for proceeding, with the names of the persons involved along with the changes, if any, or revisions, requirements or terms of the Contract.

5. Proceed with the Work only when temperature and moisture conditions comply with the manufacturer's written recommendations.

D. Preformed Concrete Masonry Unit Core Insulation:

1. Provide factory-installed preformed concrete masonry unit core insulation installed in all cores of all exterior perimeter wall concrete unit masonry construction.

2. Install inserts in accordance with manufacturer's written specification.

3. Concrete unit masonry Work containing damaged or mutilated preformed insulation shall not be used in the Work.

E. Board Type Perimeter Insulation:

1. Install perimeter insulation after concrete foundation Work has been poured and after sodium bentonite panels and prefabricated drainage mats are in-place and acceptable to Engineer.

2. Apply double 2 foot-0-inch-wide continuous layers of insulation of the required thickness. Stagger joints in insulation and butt insulation tightly together.

3. Protect top surface of horizontal insulation (from damage during backfilling Work) by application of one of the types of protection course materials recommended by the insulation manufacturer.

4. On vertical surfaces, set units in adhesive applied in accordance with manufacturer's instructions. Use type of adhesive recommended by manufacturer of board-type perimeter insulation.

5. Tape bottom edge of insulation before temporarily attaching insulation to wall with mastic.

6. Tape all joints in vertical wall insulation.

7. Protect insulation on vertical surfaces (from damage during backfilling) by application of one of the types of protection course materials recommended by the insulation manufacturer. Set in adhesive in accordance with the

recommendations of the manufacturers of the insulation and the protection course material.

F. Cavity Wall Rigid Insulation Board:

1. Install exterior wall rigid insulation board after all concrete unit masonry Work is complete.

2. Apply a single layer of insulation cut to fit snugly and uniformly and in continuous contact with edges of continuous masonry horizontal joint reinforcement over the entire plane of the wall.

3. Apply exterior wall rigid insulation to exterior concrete unit masonry walls in all area shown to receive masonry outer cavity wall wythes.

4. Set units in adhesive applied in accordance with manufacturer's instructions. Use type of adhesive recommended by manufacturer of board-type cavity wall insulation.

G. Batt-Type Insulation:

1. Install batt insulation above ceilings and between studs and rafters as shown. Extend insulation full width, length and height in all areas shown.

2. Fit tightly around obstructions to form a uniform insulated barrier.

H. Safing Insulations and Fire Stop Systems:

1. Install safing insulation and fire stop systems to present a continuous fire-rated fire barrier in areas shown and at the perimeter of all fire-rated partitions and poke through floor and wall penetrations to maintain the continuity of fire-rated construction whether or not shown.

2. Install fire stop sealants and other fire stop system components in thicknesses recommended by the manufacturer at all locations where poke through penetrations occur, all locations where other penetrations such as ducts, pipe cables, cable trays and conduit occur and at the perimeter of all fire rated walls.

3. Include all components of manufacturer's fire/smoke stop systems for complete system responsibility installed in accordance with manufacturer's written recommendations and specifications.

3.03 FIELD TESTING / QUALITY CONTROL

A. Foamed-In-Place Cementitious Insulation: Contractor shall conduct a timed, field density check at the beginning, middle and end of each day’s application. Check shall be done in accordance with manufacturer’s instructions and a log of results maintained and submitted to Engineer on a daily basis.

B. In order to assure that foamed-in-place insulation has been installed in a continuous layer completely insulating all areas of the structure, infrared thermographic testing shall be performed at the completion of the insulation Work for each structure

before beginning the insulation Work on the next structure, at no additional expense to the City.

C. Submit results of all testing to Engineer along with recommendations for remedial Work. Do not delay job progress. Coordinate the submission of tests and remedial Work in a manner which does not impact the acceptability of OSB substrate and which permits expeditious completion of the sheet metal cladding Work.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. All components of the Work shall be protected from detrimental weather and until construction operations including, but not limited to, backfilling, framing and sheathing, aluminum siding and concrete unit masonry Work, is completed and acceptable to Engineer. Protect Work from precipitation, frost and direct sun.

B. Protection:

1. Do not overload the building structure or damage in-place construction system with the weight of stored materials or use of equipment.

2. Provide continuous protection of materials against damage, wetting and moisture absorption primarily by storing materials under cover and above ground and away from all other construction traffic.

3. Protect materials against damage by construction activities.

C. Work which cannot for reasons acceptable to Engineer be covered with complete construction system before onset of weather detrimental to the Work shall be completely covered and protected in such a manner as to deflect water and weather from the installation without damaging adjacent Work.

D. To not allow construction traffic which is not associated with the installation in the area of Work. Protect the area from access by other installers and Contractors until the Work of this Section has been incorporated into finished construction systems.

E. System components which are dislodged, damaged, broken, penetrated or crushed by subsequent installation operations or damaged by detrimental weather shall be immediately replaced with undamaged material in compliance with the Sections and properly protected as specified.

F. Only the original installer shall repair or replace deteriorated or defective Work.

G. Building insulations which have become wet, damaged, or deteriorated shall be promptly removed from the Site, even if discovered in the completed Work.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the requirements for roofing insulation systems including extruded polystyrene rigid foam board-type insulation beneath all sheet metal flashing, very high load bearing extruded polystyrene rigid foam board-type insulation beneath all cast-in-place concrete rooftop wearing decks and a composite system of lightweight insulating concrete and pre-generated foam with integral expanded polystyrene rigid foam insulation board for use over non-vented substrates beneath all single-ply roofing.

B. The Work also includes all miscellaneous materials and accessories and a Job Conditions Report from the installer of the composite roofing insulation containing information specified. Contractor shall also include the presence of full time on-site composite roofing manufacturer's Technical Representative and provide a ten-year composite roofing insulation performance warranty. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install and field test roofing insulation Work.

C. The Contractor shall implement practices and procedures to meet the project's sustainability goals as identified in the Contract Documents. The Contractor shall ensure that the sustainability requirements of this Section are implemented to the fullest extent.

D. The roofing insulation system described herein must come from the same manufacturer as the Elastomeric Membrane Roofing specified in Section 07 53 00 – Elastomeric Membrane Roofing.

E. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 07 53 00 - Elastomeric Membrane Roofing

B. Section 07 62 00 - Sheet Metal Flashing and Trim

1.04 REFERENCES

A. NYCBC - New York City Building Code

B. NYCECCC - New York City Energy Conservation Code

C. ASTM C150 - Standard Specification for Portland cement

D. ASTM C177 - Steady-State Heat Flux Measurement and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus, Test Method for

E. ASTM C203 - Breaking Load and Flexural Properties of Block-Type Thermal Insulation, Test Method for

F. ASTM C272 - Water Absorption of Core Materials for Structural Sandwich Construction, Test Method for

G. ASTM C303 - Dimensions and Density of Preformed Block-Type Thermal Insulation, Test Method for

H. ASTM C495 - Compressive Strength of Lightweight Insulating Concrete, Test Method for

I. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

J. ASTM C550 - Measuring Trueness and Squareness of Rigid Block Thermal Insulation, Test Method for

K. ASTM C578 - Rigid Cellular Polystyrene Thermal Insulation, Specification for

L.	ASTM C796	-	Foaming Agents for Use in Producing Cellular Concrete Using Preformed Foam, Test Method for
M.	ASTM C869	-	Foaming Agents Used in Making Preformed Foam for Cellular Concrete, Specification for
N.	ASTM D696	-	Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between −30°C and 30°C with a Vitreous Silica Dilatometer
O.	ASTM D1621	-	Compressive Properties of Rigid Cellular Plastics, Test Method for
P.	ASTM D1623	-	Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics, Test Method for
Q.	ASTM D5116	-	Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products
R.	ASTM E84	-	Surface Burning Characteristics of Building Materials, Test Method for
S.	ASTM E96	-	Water Vapor Transmission of Materials, Test Method for
T.	FM	-	Factory Mutual Incorporated, Approval Guide
U.	UL	-	Building Materials Directory Fire Resistance Directory

1.05 DESCRIPTION

A. System Design Requirements

1. Roofing insulation Work shall withstand the uplift forces of wind, as defined by the roofing guarantee. Refer to Section 07 53 00 - Elastomeric Membrane Roofing, and Section 07 62 00 - Sheet Metal Flashing and Trim.

2. Failures of the roofing insulation Work in bond or anchorage to the substrate, or within the insulation, will be considered failures of materials or workmanship under the insulation performance warranty.

B. Sustainable Design Requirements

1. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

2. Insulation shall be produced using a blowing agent with zero ozone-depleting potential. HCFC-142b or HCFC-141b shall not be used.

3. Recycled Content of Roof Insulation Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 15 percent.

C. Substitutions

1. Manufacturer of the primary roofing systems shall be manufacturers who find the generic types of insulation specified herein as acceptable and bondable if installed according to the roofing manufacturer's standards for complete product and performance responsibility.

2. The thickness of the composite insulation system, the maximum step between layers of expanded polystyrene rigid board insulation, and the minimum slope-to-drain shall not vary from what is shown, specified and approved.

1.06 QUALITY ASSURANCE

A. Composite Roofing Insulation Installer Qualifications:

1. Subcontract roofing insulation Work to an installer approved in writing, who has qualified for appointment and has been trained by the manufacturer of the composite roofing insulation system.

2. Engage a single installer skilled, trained and with successful experience in the installation of the type of composite roofing insulation specified, and equipped to perform workmanship in accordance with both the requirements of the manufacturer of the composite roofing insulation and of the single-ply roofing manufacturer so that there will be unequivocal responsibility for the performance of the roofing insulation Work.

3. Submit proof of acceptability of installer by manufacturer to Engineer.

B. Performance Criteria:

1. The thicknesses shown are for the thermal conductivity, k-value at 75 F specified for each material.

2. Comply with Factory Mutual Technical Advisory Bulletin 1-29 for recommendations concerning requirements for 1-90 securement.

3. Provide composite roofing insulation system recommended by the manufacturer for use on non-vented substrates.

C. Erection Tolerances: Provide the following for composite roofing insulation:

1. Provide minimum of 1/8-inch leveling slurry coat of insulating concrete over the top of cast-in-place concrete roofing decks.

2. Finished system shall not pond water and shall provide a uniformly sloped surface to low point of roof drains. If at any time up to the time of Final Acceptance the roofing shows signs of ponding water, the composite roofing insulation system shall be repaired to provide uniform slope to drain.

D. Requirements of Regulatory Agencies: Comply with fire-resistance ratings as shown, and as required by governing authorities and the New York City Building Code and comply with the following roofing insulation requirements:

1. Materials and equipment submitted for DEP's approval by the Contractor shall have met, at the time of their submittal, the certification and material acceptance requirements of the NYC Department of Buildings, unless otherwise required by the Authority Having Jurisdiction over the Work.
2. All material provided under this Section shall comply with the Detailed Specifications.
3. Comply with all applicable requirements of governing authorities and codes for all Work.
4. U.L. requirements for Roofing Deck Constructions which are rated "UL Construction No. 1".
5. Factory Mutual requirements for "Class 1" construction, for fire hazard and 1-90 wind resistance.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings for approval of the Engineer. Submittals shall include, but not be limited to:

1. Samples: Submit for approval the following:
   a. Each fastener to be used in the Work.
   b. 12-inch by 12-inch sample of specified rigid board-type insulation and composite insulation system.
2. Shop Drawings: Submit for approval the following:
   a. Manufacturer's specifications and installation instructions for type of insulation required. Include data substantiating that the materials comply with specified requirements.
   b. Weights of all equipment to be used on roofing.
   c. Field verified locations of all roof penetrations, drain locations, and deck deflections.
   d. Complete layout of all roofing insulation showing sizes, placement and number of courses and methods of fastening.
   e. All required roofing insulation details approved by the roofing insulation manufacturer and the manufacturer of the respective roofing systems.
   f. Laboratory test results for Thermal Resistance Values based on ASTM C177 or ASTM C518 for actual composite roofing insulation system shown and specified.
3. Certifications: Submit Job Conditions Report as specified and, in addition, include a notarized statement from the full-time on-site Technical Representative and installer that the composite roofing insulation system was installed according to manufacturer's written recommendations.

4. Sustainable Design Submittals:

   a. Environmental Materials Reporting Form (EMRF) Recycled Content. Provide the following information:

      1) Name of Product and Manufacturer.

      2) Cost of product: Material cost only (excluding labor and equipment).

      3) The percentage (by weight) of post-consumer and pre-consumer recycled content for the submitted product.

   b. VOC Reporting Form:

      1) For adhesives used onsite and within the building's weatherproofing system provide the VOC content in grams/Liter (g/L) less water and exempt compounds.

5. Sustainable Design:

   a. Recycled Content: Submit percentage of recycled content for each material or product. No product shall contain CFC, HCFC (hydro-chlorofluorocarbon) or any Resin base chemical.

   b. Regional Materials: Submit location of product manufacturer and distance from manufacturing location to the project site.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Do not deliver roofing insulation materials to the project site before time of installation.

2. Deliver materials in manufacturer's original, undamaged packages or acceptable bulk containers.

3. Materials shall be manufactured and delivered from manufacturing locations that are closest to the project site to reduce transportation costs and emissions.

B. Storage of Materials:

1. Do not allow roofing insulation materials to become wet or soiled, or covered with ice or snow.

2. Store packaged materials to protect them from the element and physical damage.

C. Handling of Materials:

1. Comply with manufacturer's recommendations for handling, storage and protection.

2. Do not use cement which shows indication of moisture damage, caking or other signs of deterioration.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Roofing insulation systems shall be as manufactured by:

1. Firestone; Polyiso Insulation
2. Sika sarnafil; Styrofoam Deckmate Plus insulation
3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Extruded Polystyrene Rigid Board Roofing Insulation: Provide the following between sheet metal structural roof decks and board sheet metal flashing substrate:

1. Rigid, rectangular boards of extruded polystyrene complying with ASTM C578, Type VI.
2. Physical Properties: Provide the following:
   a. Minimum Compressive Strength, (at 5 percent deformation), ASTM D 1621: 40 psi.
   b. Flame Spread, ASTM E84: 5 maximum.
   c. Smoke Development, ASTM E84: 165 maximum.
   d. Vapor Transmission, ASTM E96: 1.0 perms/inch.
   e. Thermal Resistance per inch, ASTM C177: 5.0 deg F x h x sq. ft. /Btu x in. at 75 deg F
   f. Maximum Water Absorption, ASTM C272: 0.10% by volume.
   g. Flexural Strength, ASTM C203: 60 lbs. /in^2.
3. Size: 24-inches by 96 inches by 2-inch thick; cut as required to fit within profile of sheet metal flashing adjustable radiused hat section.
4. Number of Layers: As indicated by thickness of roofing insulation shown.
   a. Minimum insulation assembly R-value of 34 continuous insulation.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examination

1. The Contractor shall examine the substrate and the conditions under which the roofing insulation Work is to be performed, and notify Engineer in writing of any unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

2. Environmental Requirements:

a. Do not install insulation when weather conditions are such that the deck is not completely dry, or where there is no assurance that the insulation can be completely protected from the weather by the end of the day.

b. For applications of composite roofing insulation system when the temperature is expected to fall below 40ºF submit written installation recommendations of the composite insulation system manufacturer confirming acceptability of the conditions encountered. Contractor shall verify that composite roofing insulation system installed under such adverse weather conditions meet all material and performance requirements specified. Record actual conditions of installation, including intervals between system component placement, weather and temperature conditions, temporary uses of roofing (if any) and other pertinent installation factors and submit notarized information signed by manufacturer's full-time on-site technical representative to Engineer.

c. Hot water is not available at the project site and shall be supplied by composite roofing insulation installer as required by installation conditions.

d. Potable water is not available at the project site and shall be provided by composite roofing insulation installer.

B. Preparation

1. Pre-Roofing Conference: Provide both a representative of the composite roofing insulation system manufacturer and the foreman of the installer who will actually work on this job at the pre-roofing conference specified in Section 07 53 00 – Elastomeric Membrane Roofing.

2. Verify that fire-resistant cement board insulation underlayment is in place on sloping metal decks and that channel-shaped attachment angles and

adjustable radiused hat sections are properly installed over all areas to receive sheet metal flashing Work.

3. Do not overload the building structure with the weight of stored materials or use of equipment.

4. Sequencing:

a. Proceed with and complete the Work only when materials, equipment and tradesmen required for the installation of the roofing membrane and sheet metal flashing over the insulation are at the site and are ready to follow with this Work immediately (same day) behind the insulation Work.

b. Do not install any more board-type insulation each day than can be covered with the complete sheet metal flashing system by the end of that working day.

c. Follow composite roofing insulation manufacturer written requirements for installation timing sequence for Work. Do not place more leveling slurry coat than can be completely covered with insulation within 30 minutes nor more expanded polystyrene insulation than can be covered with insulating concrete within 4 hours of placing insulation.

3.02 INSTALLATION

A. General:

1. Comply with manufacturer's instructions for the particular conditions of installation in each case. If printed instructions are not available or do not apply to the project conditions, consult the manufacturer's full-time on-site Technical Representative for specific recommendations before proceeding with the Work. All such discussions shall be recorded in writing in Job Conditions Report and shall be incorporated into the Work only when acceptable to Engineer.

2. Coordinate heights of wood blocking to provide flush transition between roofing insulation Work and perimeter wood blocking.

3. Extend insulations full thickness as shown over entire surface of the roofs.

4. Cut and fit board-type insulation tightly around obstructions, and fill voids with insulation. Keep back 1/4 inch for all vertical flashings.

B. Laying Board-Type Insulation Units for Sheet metal flashing System:

1. Apply four courses of rigid board insulation over entire surface of roofs receiving sheet metal flashing between continuous adjustable radiused hat sections.

2. Mechanically fasten in accordance with the requirements of the applicable fire and insurance ratings and primary roofing manufacturer's recommendations, and apply in accordance with the recommendations of

the manufacturer of the insulation, mechanical fastener and completed roofing system manufacturer.

3. Install insulation board with the long joints between boards perpendicular with incline of deck. Cut roofing insulation and taper edges of boards where curvature of deck requires, to fit snugly beneath oriented strand board sheet metal flashing substrate Work. Remove ridges between insulation boards and provide a smooth transition between boards following curvature of adjustable radiused hat sections.

C. Laying Composite Roofing Insulation System for Single-Ply Roofing System:

1. Place insulating concrete using approved equipment after sufficient mixing time to provide a consistent, thoroughly uniform consistency that will screed to a smooth surface and achieve the compressive strength specified.

2. Provide insulating concrete leveling slurry to a depth of 1/8-inch above the top of deck.

3. Place expanded polystyrene rigid board insulation into the slurry within 30 minutes of insulating concrete placement with joints staggered in a running bond pattern.

4. Tightly butt all rigid boards together and install in a manner that provides full contact of slurry to board, and with adequate pressure to cause insulating concrete to enter the locking/keying openings of the rigid board.

5. Install rigid boards in a stair-stepped configuration with maximum step down of 1 inch between boards, over entire plane of roof surface beneath all single-ply roofing. Cut boards as required in order to maintain 2 inches of insulating concrete cover at insulation step in compliance with slope-to-drain and high point and low point elevations shown.

6. Within four hours of rigid board placement place 2 inches of insulating concrete over rigid boards and screed to a smooth, consistently dense, uniformly sloped plane leading to roof drains at low points. Insure that all locking/keying openings in rigid board are completely filled with insulating concrete. Provide finish and other system features acceptable to single-ply roofing installer.

7. Include reinforcing mesh as part of the composite roofing insulation system to help control crack formation and distribute forces within the roofing insulation system.

8. Provide high and low point elevations shown.

D. Laying Board-Type Insulation Units for Liquid-Applied Membrane Waterproofing Inverted Roofing:

1. Apply two courses of very high load bearing rigid board insulation over entire surface of roofs.

2. Adhesively adhere boards, staggering joints between courses.

3. Be prepared to follow immediately with cast-in-place concrete sloped-to-drain wearing slab.

3.03 FIELD TESTING / QUALITY CONTROL

A. Retain a minimum of four 3-inch by 6-inch cylinder material specimens for each day's pour. Protect specimens from damage and temperature extremes and test in accordance with ASTM C495. Submit results of test as part of notarized Job Conditions Report and submit to Engineer.

B. Check cast density hourly at the point of placement. Include reports as part of notarized Job Conditions Report information and submit to Engineer.

1. Final Acceptance will be contingent upon the receipt by the Engineer of a Job Conditions Report certifying conformance of the Work with the requirements of the Section and which includes all information required.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting

1. Insulation which has become wet, damaged, or deteriorated shall be promptly removed from the job, even if already installed.

2. Correct all improperly sloped, chipped, cracked, improperly set, ridged or rough areas in the insulation to provide substrate acceptable to roofing manufacturer and Engineer.

B. Protection

1. Do not permit construction period traffic over completed roofing insulation Work, except as required for roofing.

2. Protect insulation Work from exposure to moisture, damage and deterioration, primarily by prompt installation of roofing Work to be placed over the insulation.

3. Do not expose completed Work to prolonged exposure to elements in excess of seven days.

4. Do not use completed roofing insulation as a temporary working surface without protection approved by insulation installer.

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. Vapor and air barriers as specified herein shall include, but not be limited to reinforced polyethylene fabric, seam tape, fabric repair tape, and appurtenances.

B. Vapor barriers or air barriers shall be provided where shown on the Contract Drawings, specified in the Contract, or as required for a complete installation.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. ASTM D882 - Standard Test Method for Tensile Properties of Thin

			Plastic Sheeting
B.	ASTM D1709	-	Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method
C.	ASTM D2582	-	Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting
D.	ASTM D3776	-	Standard Test Methods for Mass Per Unit Area (Weight) of Fabric
E.	ASTM D4833	-	Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
F.	ASTM E84	-	Standard Test Method for Surface Burning Characteristics of Building Materials
G.	ASTM E96	-	Standard Test Methods for Water Vapor Transmission
H.	NYBC	-	New York City Building Code
I.	NFPA 701	-	Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

1.05 DESCRIPTION

A. Regular vapor barrier, such as that used under slabs on grade, shall be a three-ply laminate combining two layers of rubber modified high density polyethylene and a high strength cord grid reinforcing mesh, manufactured in one piece in sizes up to 120 feet by 200 feet, with as few seams as possible, in accordance with the requirements of the Contract Documents.

B. Fire retardant vapor barrier or air barrier, such as that used on roof slabs, or as part of a wall system, shall be a three-ply polyethylene vapor barrier, reinforced with a heavy duty cord grid, manufactured in one piece in sizes up to 100 feet by 200 feet, with as few seams as possible, in accordance with the requirements of the Contract Documents. Fire retardant material shall have a Class I, Class A flame spread rating when tested in accordance with ASTM E84.

1.06 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: All fire retardant vapor barriers and/or air barriers work shall comply with fire-resistance ratings as shown, and as required by governing authorities and the New York City Building Code and shall be in accordance with the following requirements:

1. The Office of Technical Certification and Research (OTCR) of the New York City Department of Buildings: Where, in order to be incorporated into the Work, a particular item or product system specified by the Engineer requires acceptance by the New York City Commissioner of Buildings, Contractor shall ensure that the product manufacturer has obtained such approval, without additional expense to DEP, and in providing DEP with an approved certified copy from the Approved Independent Agency, for the

item or product system which shall be submitted to the Engineer as part of the Working Drawing approval process. Contractor may submit, in place of products specified by the Engineer, products which are "equal" in all ways to the product specified that is NYC code prescribed or alternate the code. Such "or approved equal" product submissions shall not change the requirements of these Specifications as to performance, required features or properties, as determined by the Engineer, and shall not require additional compensation to Contractor or additional expense to DEP. Approval of the proposed "equal" is at the sole determination of the Engineer.

2. In those instances where the Commissioner of Buildings requires a certificate of compliance of the manufacturer or producer certifying that the item or product system was tested and is equivalent to material of the same kind and quality regularly being manufactured by such manufacturer or producer Contractor shall provide all such certificates to the Commissioner of Buildings without additional expense to DEP.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings for approval of the Engineer. Submittals shall include, but not be limited to:

1. Product Data: The Contractor shall submit copies of specifications, installation instructions and general recommendations from the vapor barrier and/or air barrier manufacturer. Manufacturer's data substantiating that the materials comply with the requirements shall be included.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Materials shall not be delivered to the project site before the time of installation.

2. Materials shall be delivered in sufficient quantities to allow continuity of the Work.

B. Storage of Materials:

1. Materials shall be stored in original, undamaged containers with manufacturer's labels and seals intact.

2. All materials shall be stored in a dry, enclosed area, out of direct sunlight, off the ground and away from all possible contact with water, ice, or snow.

3. Damage to materials during storage shall be prevented primarily by minimizing the amount of time they are stored at the project site before being incorporated into construction systems.

C. Handling of Materials:

1. Materials shall be handled carefully in order to avoid damage or breakage.

2. Materials shall not be exposed to detrimental conditions or physical damage. Materials which are so exposed shall be permanently removed from the project site and shall not be incorporated into the Work.

3. Materials shall be handled in such a manner so as to prevent inclusion of foreign materials.

4. Packages or containers shall not be opened until all necessary, preparatory Work is complete and installation is to begin immediately. Materials shall not be allowed to become wet or soiled or covered with ice or snow.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Membrane-Type Vapor and Air Barriers

1. Blueskin SA System by Henry, A Carlisle Company, El Segundo, CA

2. Air shield System by W.R. Meadows, Hampshire, IL.

3. Or approved equal.

B. Fluid type Vapor and air barriers:

1. Air-Bloc 16MR System by Henry, A Carlisle Company, El Segundo, CA

2. Air shield LM System by W.R. Meadows, Hampshire, IL.

3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Vapor barrier systems and air barrier systems shall be provided by the same manufacturer.

B. Regular Vapor Barrier Membrane: Regular vapor barrier membrane shall be a three-ply reinforced polyethylene fabric, and shall meet or exceed the following performance standards when tested in accordance with the following methods:

Property	ASTM Test	Result
Weight	ASTM D3776	28 lbs./MSF
Puncture Propagation Tear	ASTM D2582	17 lbs.
Permeance	ASTM E96	0.037 grains/hr/sf

Property	ASTM Test	Result
Drop Dart	ASTM D1709	490 g
3" Tensile Strength	ASTM D882	96 lbs./5800 psi
Puncture Strength	ASTM D4833	26.6 lbs.

C. Fire Retardant Vapor or Air Barrier Membrane: Fire retardant membrane shall be a three-ply laminate fabric combining two layers of fire retardant, linear, low density polyethylene reinforced with a high strength cord grid, and shall meet or exceed the following performance standards when tested in accordance with the following methods:

Property	ASTM Test	Result
Weight	ASTM D3776	43 lbs./MSF
Puncture Propagation Tear	ASTM D2582	26 lbs.
Permeance	ASTM E96	0.035 grains/hr/sf
Cold Crack	ASTM D1709	-15 degrees F
Drop Dart	ASTM D1709	700 g
3" Tensile Strength	ASTM D882	100 lbs./3268 psi
Puncture Strength	ASTM D4833	36.0 lbs.
Flame Spread	ASTM E84	0
Smoke Developed	ASTM E84	50
NFPA 701 Large Scale Fire Resistance Test		Pass

D. Seam Tape: Seam tape shall be the manufacturer's standard double-sided asphaltic pressure sensitive mastic type seaming tape.

E. Fabric Repair Tape: Fabric repair tape shall be the manufacturer's standard self-adhesive tape used to repair any holes in vapor barrier which may be caused by excessive abuse.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examination

1. The Contractor shall verify that areas to receive vapor barriers and/or air barriers are properly prepared and completed to final elevations.

B. Preparation

1. Surfaces to receive vapor barriers shall be clean and free of all foreign matter. Slab subgrade shall be properly compacted in accordance with Division 2 requirements, and shall be smooth with no rutted or lumpy areas.

2. Surfaces to receive air barriers shall be clean and free of all foreign matter.

3.02 INSTALLATION

A. General: Vapor barriers and air barriers shall be installed in strict accordance with the manufacturer's instructions. Barriers shall be smooth and wrinkle free.

B. Seams: Seams in barrier fabric shall be accomplished using the manufacturer's standard seam tape. Fabric overlap and seam tape placement shall be in accordance with the manufacturer's instructions. In ambient temperatures of 60 degrees F and less, additional heat sources shall be applied to the seams to achieve an effective bond.

C. Door, Window and Louver Penetrations: Penetrations edges through the barriers shall be taped using manufacturer's membrane adhere to substrate and return into penetration opening 3-inches. Install in accordance with the manufacturer's directions. Membrane shall not be exposed on interior and exterior finishes and shall cover membrane.

D. Pipe Penetrations: Pipes and other penetrations through the barriers shall be sealed using manufacturer's standard pipe boots, which shall be installed in accordance with the manufacturer's directions.

E. Repairs: Holes in vapor barriers and/or air barriers shall be brought to the attention of the Engineer, and if, in the opinion of the Engineer, the holes are reparable, the holes shall be repaired using the manufacturer's standard fabric repair tape, applied in strict accordance with the manufacturer's instructions.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting

1. System components which are dislodged, damaged, expanded, or penetrated by subsequent installation operations or damaged by detrimental

weather shall be immediately replaced with undamaged material in compliance with the Sections and properly protected as specified.

B. Protection

1. All components of the Work shall be protected from detrimental weather and damage until construction operations are completed and acceptable to Engineer.

2. Work which cannot, for reasons acceptable to Engineer, be covered with complete construction system before the onset of weather detrimental to the Work shall be completely covered and protected in such a manner as to deflect water and weather from the installation without damaging adjacent Work.

3. Vapor and air barrier systems shall be protected from all damage and abuse from all other Contractors and installers involved in the Work until Final Acceptance by DEP.

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. The Work of this section includes, but not limited to, fiber cement panels, components of fiber cement panel attachments consisting of the following:

1. Fiber cements panels (fabricated to sizes indicated).
2. Concealed embedded anchoring fasteners.
3. Aluminum horizontal adjustable tracks and clips.
4. Anchors, fasteners, flashing, insect screens and joint trim and other accessories required for a complete installation.

B. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install and place into satisfactory service all fiber cement panel Work.

C. The Contractor shall implement practices and procedures to meet the project's sustainability goals as identified in the Contract Documents. The Contractor shall ensure that the sustainability requirements of this Section are implemented to the fullest extent.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A.	Section 07 21 00	-	Thermal Insulation
B.	Section 07 27 00	-	Air Barriers

1.04 REFERENCES

A.	NYCBC	-	New York City Building Code
B.	ASTM C 1185	-	Standard Test Methods for Sampling and Testing Non-Asbestos Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards.
C.	ASTM C 1186	-	Standard Specification for Flat Fiber-Cement Sheets.
D.	ASTM E 84	-	Surface Burning Characteristics of Building Materials.
E.	ASTM E 119	-	Standard Test Methods for Fire Tests of Building Construction and Materials.
F.	ASTM E2226	-	Standard Practice for application of Hose Stream.
G.	ASTM G 155	-	Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.
H.	ASTM D 2244	-	Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
I.	AISI S905	-	Test Methods for Mechanically Fastened Cold-Formed Steel Connections.
J.	ICC-ES AC90	-	Acceptance Criteria for Fiber Cement Siding used as Exterior Wall Siding.
K.	NFPA 285	-	Standard fire test method for evaluation of fire propagation characteristics of exterior non-load-bearing wall assemblies containing combustible components.
L.	ISO 9001	-	Quality Management System.
M.	ISO 14001	-	Environmental Management System.
N.	OHSAS 18001	-	Safety Management System Not Used.

1.05 DESCRIPTION

A. System Design Requirements

1. Through color high density fiber cement panels.
2. The system shall consist of panels supported by extruded aluminum clips attached to aluminum horizontal tracks. Vertical adjustable aluminum track clips.
3. Fixed concealed, embedded panel anchors.
4. Silicone gaskets inserted into vertical track and silicone isolators wrapped around clips provide color consistent or shadow line at vertical joint (custom color or standard black) and compression bubbles in each maintain panel position across the façade and prevent wind induced rattle.
5. Perimeter Framing Deflection: L/300.
6. Thermal Movement: Design system to accommodate vertical and horizontal thermal movement of components without causing distortion, excessive stress on fasteners, or 'oil canning' when subjected to recurring temperature variations.
7. Drainage: Design for positive drainage of water leakage and condensation to exterior of wall panel system.
8. Seismic Design: Conform to New York Building Code for the Seismic Category appropriate for location of system installation.

B. Structural Performance: Cementitious wall panel assemblies must be designed to withstand project-specific design loads and their effects within constraints specified in this Section and ASCE/SEI 7, as modified by lol codes, without defects, damage, or failure, including but not limited to the following:

1. Dead Loads: As indicated on Drawings.
2. Wind Loads: As indicated on Drawings.
3. Seismic Loads: As indicated on Drawings.
4. Snow Loads: As indicated on Drawings.
5. Live Loads: As indicated on Drawings including those arising from use and occupancy.
6. Loads from Temperature and Moisture Loads: Including expansion, contraction, deflection, deformation, creep, shrinkage, settlement, and differential movement.
7. Cladding Deflection Limits: L/300
8. Restrictions: cementitious wall panels must not have a limitation on installation height.

C. Moisture/Air Control and Weathertightness:

1. Building Enclosure Design Principle: Exterior enclosure construction for this Project is based on. “Rainscreen Principle” as defined by RAiNA. Face sealed assemblies are not permitted.
2. Continuity: Maintain integrity and continuity of building enclosure’s thermal, air, and vapor control layers always by using appropriate insulation, water-resistive barriers to tie work of this section with adjacent construction in sections.
3. System must be a drained, back ventilated system. Incorporate means of draining moisture to exterior. Drainage system must provide clear, paths of drainage of trapped moisture within cementitious panel assemblies to exterior of wall assemblies.

D. Ventilation and Drying:

1. Air Space Inlets and Outlets: Provide air inlets and outlets at the top and bottom of building and at wall terminations. Size air outlets above based on vertical distance between lower inlets. For air outlets at top of building or at wall terminations, do not exceed twice the size of air inlets. Air outlets are permitted to be up to 1/8 in (3mm) less than inlets. Maintain unobstructed vertical airflow near windows, doors, eaves, and building bases.
    a. Minimum sizes for air inlets and outlets (based on building height):
        1) 0 to 16 ft: Minimum air inlets and outlets 3/8 inch.
        2) >16 ft to 33 ft: Minimum air inlets and outlets 1/2 inch.
        3) >33 ft to 66 ft: Minimum air inlets 3/4 inch.
2. Minimum Air Space: Maintain vertical continuity of airflow behind the cementitious panels from the air inlets to the outlets. Provide a minimum vertical air gap based on the building height to ensure the performance of the rainscreen system.
    a. Minimum size for air space for an open jointed system (based on building height):
        1) 0 to 44 ft: Minimum 3/4 inch vertical air space.
        2) >44 ft to 99 ft: Minimum 1 inch vertical air space.

E. Thermal Movements: Fabricate and install cementitious wall panel assemblies to prevent buckling, opening of joints and overstressing of fasteners under the following temperature conditions:

1. Temperature Change: Ambient temperature cycling of -4 deg F to 176 deg F.

F. Color Evaluation: No visible change, 2000 hours of accelerated weathering with color evaluation when calculated to ASTM D 2244.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Minimum of 10 years' experience in fabricating and supplying fiber cement panel systems.

2. Responsible for technical design support as required for system conforming to panel manufacturer's warranty provisions.

3. Provide review and approval of shop drawings showing conditions differing from panel manufacturer's standard details prior to installation.

4. Conduct interim inspections during construction.

B. Installer Qualifications:

1. Engage a single installer skilled, trained and with successful experience in the installation of preformed metal siding and with specific skill and successful experience in the erection of the types of materials required; and who agrees to employ only tradesmen with specific skill and successful experience in this type of Work. Submit names and qualification to Engineer along with the following information on a minimum of three successful projects:

a. Names and telephone numbers of owner, architects or engineers responsible for projects.

b. Approximate contract cost of the preformed metal siding.

c. Amount of area installed

C. Single Source Responsibility:

1. Provide system and components for this Section under responsibility of single metal wall panel manufacturer.

2. Perform metal panel and related flashing and sheet metal work by or under supervision of single installer.

D. Mock-Up: Provide a full size mock-up minimum 12 feet by 10 feet, with 6 feet corner return, for evaluation of surface preparation techniques and application workmanship. Mock-up shall include a corner, window sill, jamb and head condition, wall base and wall-roof intersection.

1. Finish areas designated by Architect.

2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.

1.07 SUBMITTALS

A. Product Test Reports:

1. Indicate compliance of products with requirements of this Section.

2. Provide report documentation certified by a qualified, independent testing agency.

B. Shop Drawings: Submit for approval the following:

1. Profiles of metal wall panel, and the details of forming, jointing, internal supports, anchorages, trim, flashing, and accessories. Show details of rain screen and condensate drainage at edges, terminations and penetrations of the metal wall panel Work drawn at 1-1/2 inch scale. Accurately represent the conditions where the Work of this Section interfaces with other materials and construction systems such as door, louver and roof construction. Show completely dimensioned small-scale layouts and elevations of entire Work drawn at 1/4 inch scale with details referenced from these elevations.

2. Show location, extent and accurate configuration and profile of all items required to be built into the Work, which penetrate the Work or which are mounted on the Work.

3. Completely dimensioned isometric drawings of details of all custom transition flashings, required for the Work drawn at 1-1/2 inch scale.

4. Completely dimensioned plans, elevations and details showing all support system components and required adjustable anchorage for the entire metal wall panel Work and other inter-related component systems such as windows, louvers and doors specified in other Sections. Support system structural performance calculations and anchorage drawings shall be prepared, signed and stamped with the seal of a Licensed Professional Engineer licensed to practice in the State of New York and recognized as an expert in the specialty involved.

5. Provide drawings coordinating the Work of this Section with adjacent Work.

6. Provide mock-up drawings coordinating the Work of this Section with adjacent Work.

C. Product Data:

1. Provide manufacturer's technical data, installation instructions, standard detail drawings specific to this project, and accessory data showing conformance with specified requirements.

2. Indicate installation requirements, rough-in dimensions, special procedures, and conditions requiring special attention.

3. Provide data for fasteners including: Clips, fastener types, and locations.

4. Provide data related to treatment at edges, terminations, and flashings.

5. Indicate provisions for thermal expansion and contraction.

D. Operation and Maintenance Data: Submit operation, maintenance, and cleaning information for products covered under this section..

E. Samples: Submit for approval the following:

1. Samples two complete sets of 5 1/4" x 2 1/2" color chips. Final selection of finish shall be made by Engineer from complete range of standard finishes from the manufacturer.

2. One of each type fastener employed, with statement of intended use.

3. Samples will be reviewed by Engineer for color, finish and workmanship only. Compliance with all other requirements is the responsibility of Contractor

F. Sustainable Design Submittals:

1. Environmental Materials Reporting Form (EMRF) Recycled Content and Regional Materials. Provide the following information:

a. Name of Product and Manufacturer.

b. Material cost breakdowns. Cost breakdowns must include total material-only cost (excluding installation, labor and equipment).

c. The percentage (by weight) of post-consumer and pre-consumer recycled content for the submitted product.

d. Indicate the location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, wall panels, and other manufactured items to prevent damage or deformity.

B. Package wall panels for protection during transportation and handling.

C. Unload, store, and erect wall panels in a manner to prevent bending, warping, twisting, and surface damage.

D. Store wall panels flat and cover with suitable weather tight and ventilated covering. Store wall panels to ensure dryness, with positive slope for drainage of water. Do not store wall panels in contact with other materials that may cause staining, denting, or other surface damage. Do not allow storage space to exceed 120 degrees Fahrenheit.

E. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

1. High-density, through-color cementitious panels: Standard limited 20-year material and 10-year finish warranty in accordance with manufacturer's terms and conditions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiber Cement Wall Panel:

1. Etex N.V. EQUITONE, 1731 Fred Lawson Drive, Maryville, TN.
2. American Fiber Cement, 6901 S. Pierce St., Littleton, CO.
3. SwissPearl Group AG, 8867 Niederurnen, Switzerland.
4. Or Equal.

2.02 MATERIALS / EQUIPMENT

A. Air-cured High Density Cementitious panels (Grade III) – Premium Semi-Transparent / Graffiti Resistant Finish:

1. Basis-of-Design Product: natura PRO by EQUITONE.
2. Material Location: This item is installed from grade to first floor.
3. Nominal Thickness: 1/2 in.
4. Panel Sizes (fabricated): As noted on Drawings.
5. Panel Fastening Method: concealed using Fischer Tergo+ or approved alternatives per manufacturer.
6. Exposed Finish: Manufacturer's standard semi-transparent, double-layer acrylic finish with a matte UV-hardened polyurethane (PU) topcoat that allows for panel fibers to remain visible.
7. Panel Color: To be selected by Architect from manufacturer's standard offering.
8. Concealed Finish: back side to be sealed with transparent coating.

B. Air-cured High Density Cementitious panels (Grade III) – Opaque / Graffiti Resistant Finish:

1. Basis-of-Design Product: pictura PRO by EQUITONE.
2. Material Location: This item is installed from first floor to roof.
3. Nominal Thickness: 1/2 in.
4. Panel Sizes (fabricated): As noted on Drawings.
5. Panel Fastening Method: concealed using Fischer Tergo+ or approved alternatives per manufacturer.
6. Exposed Finish: Manufacturer's standard opaque, double-layer acrylic finish, with a matte UV hardened polyurethane (PU) topcoat

7. Panel Color: To be selected by Architect from manufacturer's standard offering.

8. Concealed Finish: back side to be sealed with transparent coating.

C. Rainscreen Cladding Support System:

1. Primary rail system (in contact with backup wall)

   a. Basis-of-Design Product: Therma Z by Knightwall or equal.

   b. Rail Finish: Coating per manufacturer.

   c. Rail Color: Black.

   d. Direction: vertical.

2. Secondary rail system (in contact with cementitious wall panel)

   a. Minimum 1.8mm 6063-T5 aluminum.

   b. Rail Finish: Anodized.

   c. Rail Color: Black.

   d. Direction: horizontal.

3. Thermally Broken Systems:

   a. Manufacturer's standard thermally broken support system for rainscreen cladding consisting of horizontal or vertical framing elements, designed to minimize thermal bridging and securely support cladding assembly.

   b. Components: proprietary profiles and brackets suitable for exterior cladding applications. Components must allow for thermal isolation between cladding and building structure.

   c. Thermal Isolation: Incorporate thermal break elements into system to reduce heat transfer. Thermal isolators must be compatible with structural components and sized appropriately to meet system performance requirements.

4. Adjustability: Ensure system allows for adjustable cavity depth to accommodate insulation, align cladding, and maintain required ventilation cavity.

5. Fasteners: Provide mechanical fasteners suitable for substrate encountered. Ensure fasteners are corrosion-resistant and capable of long-term performance in exterior conditions.

6. Bracing and Reinforcement: Include necessary bracing, furring, and support elements to ensure system stability and accommodate special conditions, such as complex geometries or variations in cladding plane.

D. Auxiliary Materials

1. Perforated Insect/Vermin Screen: Provide aluminum or stainless steel perforated screen with perforation pattern that permits airflow equivalent to the continuous inlet/outlet gap as specified in this Section.
    a. Minimum open area: minimum 4.75 in² / ft (1025 mm² open area per linear meter) of open area.
    b. Screen thickness: not to exceed 1/32 in. (0.79 mm/ 21ga) when installed between the cementitious panel and sub-framing elements.
2. Aluminum joint closures: Provide products as detailed on Drawings. Maximum thickness of nonstructural finishing profile to be 1/32 in. (0.79 mm/ 21ga) gage between cementitious panel and sub-framing elements.
3. Galvanic Protection: Provide tapes and other methods as necessary to separate and prevent contact between dissimilar metals.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Fabrication

1. Tolerances: Panel bow not to exceed L/300 panel dimension in width and length.
2. Allow for field adjustments as recommended by the manufacturer where final dimensions cannot be established by field measurement prior to panel fabrication.
3. Do not ship or provide to field any panels with scratches and marks caused by the fabrication of panels.
4. Strippable Protective Film: Factory applied for protection of weather face finish and removed upon completion of the panel installation. Failure to remove the film may lead to over-exposure and damage to the panel.

B. Fasteners

1. Supply Fasteners and clips tested to meet provisions of this section, as approved by fastener manufacturer and engineer of record.
2. Concealed Sheet Metal Fasteners: Non-corrosive fasteners, as instructed by panel manufacturer.
3. Fastener Lengths: Penetrate metal framing and sub girts, and other metal framing systems in accordance with the manufacturer’s recommendations.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examination

1. Verify installation conditions are satisfactory to receive work of this Section before beginning.
2. Verify substrate installation is complete, flat, and true to plane.

B. Preparation

1. Field Measurements: Verify dimensions prior to fabrication of wall panels and flashings.
   a. Field measure location penetrations and other elements and fabricate panels with cut outs to the greatest extend possible.
2. Install sub framing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and cementitious panel manufacturer's written recommendations.
3. Ensure step flashings and kick-out flashings are installed before beginning installation of air and water-resistive barrier membrane.
4. Protect surrounding areas and surfaces to preclude damage during work of this Section.
5. Lay out work before beginning installation as necessary for true, plumb, and aligned panel installations.
6. Verify locations of joints and panel lengths.

3.02 INSTALLATION

A. General

1. Conform to manufacturer’s instructions and provisions of Contract Documents.

B. Girts and Fasteners

1. Space, locate, align, and fasten sub girt framing over CMU after application of air barrier as specified by Section 07 27 00 – Vapor and Air Barrier.
2. Install fasteners in lengths and locations in accordance with fastener manufacturers’ instructions.
3. Torque screws as necessary to provide a snug fit. Do not over-torque; prevent damage to panels.

C. Wall Panels

1. Align panels and secure in place without warp or deflection.
2. Saw-cut wall panels where penetrations and wall mounted elements are required is , de-burr edges, and clean as instructed by manufacturer round penetrations and wall mounted elements.
3. Maintain consist of 3/8” gap at penetration and elements abutments.

D. Flashings

1. Install flashings as part of complete, watertight system as necessary to seal and close ends and to restrict water penetration behind wall panels.
2. Thermal Movement: Install flashing systems to allow unrestricted thermal movement of metal panels over attachment clips.
3. Penetrations: Detail and install flashings per weather resistive barrier and metal panel manufacturers' written instructions.

E. Metal Flashing:

1. Detail and install per weather-resistive barrier and metal panel manufacturers' written instructions.
2. Overlap adjacent flashings a minimum of 4 inches in conformance with Section – 07 62 00 Sheet Metal Flashing and Trim.
3. Cutting and Fitting: Make neat, square, and true.

3.03 FIELD TESTING / QUALITY CONTROL

A. Manufacturer's Service:

1. Manufacturer shall review work involved in handling, installation, protection, and cleaning of cementitious wall panel assemblies and components, and submit written reports in acceptable format to verify compliance of Work with Contract conditions.
2. Manufacturer's Field Services: Provide manufacturer's field services consisting of product use recommendations and periodic site visits for product installation review in accordance with manufacturer's instructions.
    a. Report any inconsistencies from manufacturer's recommendations immediately to ENGINEER.
    b. Schedule site visits to review work at stages listed:
        1) Start of installation of secondary vertical framing.
        2) Start of installation of horizontal track system.
        3) Start of installation of fiber cement wall panels.
        4) Midway point of installation of fiber cement wall panels.
        5) Completion of fiber cement wall panels.
3. Clean and inspect fiber cement wall panels prior to substantial completion. Provide photographic and video documents of all elevation of the building.
    a. Replace damaged panels.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting

1. Correct identified defects and irregularities.
2. Replace damaged, soiled, or discolored panels.

B. Protection

1. Take measures to protect wall panel installations from construction activities for duration of Project.
    a. Protect cementitious wall panel assemblies from damage, soiling and contaminating substances resulting from construction activities or caused by work of other trades. Protect panels from damage during the removal of spacers and shims. Do not apply adhesives or tapes to finished surfaces of panels.
2. Do not permit activities that may result in gouging, scratching, or denting metal panels and flashing.
3. Promptly replace cementitious wall panel assemblies work damaged during construction that cannot be satisfactorily repaired to the satisfaction of the City, at no cost to the City.

C. Cleaning

1. Where soiling or spills have occurred, remove spills and soiling from adjacent surfaces using cleaning procedures recommended in writing by affected material's manufacturer. Do not use materials or process that can damage finishes, surfaces, or construction.
2. Leave installation clean and free from residue and debris from Work of this Section.

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the general requirements for a fully adhered, single-ply elastomeric roofing system and for a complete water- and weather-tight installation of the system complying with all governing codes and standards.

B. The Contractor shall provide all labor, materials, equipment and incidentals necessary to perform the work of this Section as shown on the Contract Drawings, specified herein or in the Contract, or required otherwise for a complete installation.

C. The Contractor shall implement practices and procedures to meet the project's sustainability goals as identified in the Contract Documents. The Contractor shall ensure that the sustainability requirements of this Section are implemented to the fullest extent.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the

applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A.	Sections 03 32 00	-	Joints in Concrete
B.	Section 07 22 16	-	Roof Board Insulation
C.	Section 07 62 00	-	Sheet Metal Flashing and Trim
D.	Section 07 27 00	-	Air Barriers

1.04 REFERENCES

A.	NYCBC	-	New York City Building Code
B.	ASTM D312	-	Asphalt Used in Roofing, Specification for
C.	ASTM D395	-	Rubber Property - Compression Set, Standard Test Methods for
D.	ASTM D412	-	Vulcanized Rubber and Thermoplastic Elastomers – Tension, Standard Test Methods for
E.	ASTM D471	-	Rubber Property - Effect of Liquids, Standard Test Method for
F.	ASTM D542	-	Index of Refraction of Transparent Organic Plastics, Standard Test Method for
G.	ASTM D573	-	Rubber - Deterioration in an Air Oven, Standard Test Method for
H.	ASTM D624	-	Tearing Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers, Standard Test Method for
I.	ASTM D1149	-	Rubber Deterioration - Cracking in an Ozone Controlled Environment, Standard Test Methods for
J.	ASTM D2137	-	Rubber Property - Brittleness Point of Flexible Polymers and Coated Fabrics, Standard Test Methods for
K.	ASTM D2240	-	Rubber Property - Durometer Hardness, Standard Test Method for
L.	FM 1-28	-	FM Global Property Loss Prevention Data Sheet, Wind Design
M.	FM 1-29	-	F Global Property Loss Prevention Data Sheet, Roof Deck Securement and Above-Deck Roofing Components
N.	FM 1-28R	-	FM Global Property Loss Prevention Data Sheets, Roof

Systems

O. FM 1-49 - FM Global Property Loss Prevention Data Sheet, Perimeter Flashing

P. South Coast Air Quality Management District (SCAQMD)

1. Rule 1113 - Architectural Coatings

2. Rule 1168 - Adhesives and Sealants

1.05 DESCRIPTION

A. The single ply roofing system to be provided under this Section shall include a complete system of loose-laid elastomeric roofing laminated to a non-woven polyester fleece backing which is capable of direct installation on composite roof insulation without the use of an intermediate protection board and is provided with elastomeric base flashing. The system shall also include all materials and system components required for puncture protection, heavy duty roof walkway, one-way breather vents, and other features necessary to complete the Work.

B. Installation of the System shall meet the requirements of FM Approval Rating Class 1-90 construction for composite cementitious wet fill insulation substrates. The work of this Section shall also be coordinated with the results of Sections 07 22 16-Roof Board Insulation and 07 62 00 – Sheet Metal Flashing and Trim, and the FM publications referenced above.

C. Sustainable Design Requirements: Products applied on site and within the building's weatherproofing system shall comply with VOC limits of authorities having jurisdiction and the following VOC limits of when calculated according to SCAQMD Rule 1113 and Rule 1168:

1. Multipurpose Construction Adhesive: VOC not more than 70 g/L.

2. Plastic Foam Adhesives: VOC not more than 50 g/L.

3. Single-Ply Roof Membrane Sealants: VOC not more than 450 g/L.

4. Nonmembrane Roof Sealants: VOC not more than 300 g/L.

5. Sealant Primers for Nonporous Substrates: VOC not more than 250 g/L.

6. Sealant Primers for Porous Substrates: VOC not more than 775 g/L.

7. Other Adhesives and Sealants: VOC not more than 250 g/L.

D. Project-specific system/design requirements will be provided in the Contract (if necessary) to update the requirements given herein or to supplement other requirements given in the Contract Drawings.

E. Scheduling:

1. Proceed with the roofing and associated work only after curbs, blocking, continuous wood sleepers, vents, drains and projections through the substrate have been installed, and when the substrate construction and framing of openings is completed.

2. Proceed with and complete the Work only when materials, equipment and skilled tradesmen required for the installation of other roofing membrane system components are at the Site and are ready to follow with the Work immediately after composite roof insulation is acceptable for installation of the complete single-ply roofing system.

1.06 QUALITY ASSURANCE

A. Installer Qualifications:

1. Engage a single installer skilled, trained and with successful experience in the installation of single-ply roofing systems, who is a recognized roofing contractor, with specific skill and successful experience in the type of roofing specified, and equipped to perform workmanship in accordance with the Drawings and Specifications, manufacturer's written instructions for guaranteed construction and the approved Shop Drawings and who agrees to employ only tradesmen with specific skill and successful - experience in this type of Work. Submit names and qualifications to Engineer along with the following information on a minimum of three successful projects:

a. Names and telephone numbers of owners, architects or engineers responsible for projects.

b. Approximate contract cost of the single-ply roofing system.

c. Amount of area installed.

2. The roofing installer shall be an approved roofing applicator who has qualified for appointment and has been trained by the manufacturer.

3. Proof of acceptability of installer by manufacturer to Engineer.

B. Performance Criteria: Provide the following:

1. Except as otherwise shown, comply with the written specifications and recommendations of the roofing manufacturer. In addition, comply with FM Publication 1-28 Technical Advisory Bulletin for Class 1-90 wind up-lift resistance. Select appropriate entries in Table 3 of 1-28 for submission to Engineer for approval.

2. Single-ply roofing system, base and other flashings shall be permanently weather- and watertight, and not deteriorated in excess of manufacturer's published limitations.

3. Provide stone ballast weight distributions over entire roof surfaces in all areas not shown to receive heavy-duty roof walkway pavers and pedestal system. Comply with FM wind uplift criteria, ballast and paver locations, weights of materials required in fields, perimeters and corners of roof areas, and approval recommendations contained in 1-29 paragraph 2.7 'Single-Ply Membrane Covers: General.'

4. Provide heavy-duty walkway protection pavers at all traffic concentration points regardless of traffic frequency and whether or not shown.

5. Specified manufacturer's installation and product specifications and details unless more stringent criteria shown or specified is acceptable to the single-ply roofing system manufacturer specified.

C. Requirements of Regulatory Agencies:

1. Comply with applicable insurance rating bureau requirements as required by the New York City Building Code, unless more restrictive requirements are specified.

2. Provide materials and roofing systems which have been tested, listed and labeled by Underwriters Laboratories' Incorporated for Class "A" rating, and bear the UL label on each package or are shipped to the Site with a UL Certificate of Compliance.

3. Provide roofing materials which have been tested, listed and FM labeled for Class "A" maximum flame spread rating.

4. The Office of Technical Certification and Research (OTCR) of the New York City Department of Buildings: Where, in order to be incorporated into the work, a particular item or product system specified by Engineer requires acceptance by the New York City Commissioner of Buildings, Contractor shall ensure that the product manufacturer has obtained such approval, without additional expense to DEP, and in providing DEP with an approved certified copy from the Approved Independent Agency, for the item or product system which shall be submitted to Engineer as part of the Shop Drawing approval process. Contractor may submit, in place of products specified by Engineer, products which are "equal" in all ways to the product specified that is NYC code prescribed or an alternate to the code. Such "or approved equal" product submissions shall not change the requirements of these Sections as to performance, required features or properties, as determined by Engineer, and shall not require additional compensation to Contractor or additional expense to DEP. Final acceptance of "equal" is at the sole determination of Engineer

5. Comply with all applicable requirements of governing authorities and codes for all Work.

6. In those instances where the Commissioner of Buildings requires a certificate of compliance of the manufacturer or producer certifying that the item or product system was tested and is equivalent to material of the same kind and quality regularly being manufactured by such manufacturer or producer Contractor shall provide all such certificates to the Commissioner of Buildings without additional expense to DEP.

D. Source Quality Control:

1. Obtain elastic sheets from only one manufacturer, who publishes complete information on the specified roofing system, and offers to guarantee the completed roofing installation as required.

2. Take field dimensions prior to preparation of Shop Drawings.

E. Allowable Installation Tolerances:

1. Do not install Work until substrate preparation and tolerances have been approved by Engineer, single-ply roofing system manufacturer's Technical Representative and the single-ply roofing system installer and Contractor have verified to Engineer that substrates are within tolerances specified and acceptable to produce approved Work. Work advanced for any reason without such verification shall be stopped, removed and replaced with new material after substrate is approved at no additional expense to DEP.

2. Substrate Tolerances:

a. Out-of-Plane: 1/8 inch maximum in 10 foot - 0 inches and 1/16 inch maximum in any 12 inches measured along the plane.

b. Maximum Offset in Plane Alignment: 1/16 inch.

c. Variation From Slope: 1/8 inch maximum in 10 foot - 0 inches.

1.07 SUBMITTALS

A. The Contractor shall submit the following for review and approval by the Engineer:

1. Samples: Submit for approval the following:

a. 12-inch by 12-inch sheet of each item specified and 6-inch long pieces of each required system component to be used in the Work.

b. Each fastener type required marked as to type of material and with their intended purpose in the Work.

c. All components of the single-ply roofing system, flashing and ballast systems labeled with their intended use in the Work.

2. Shop Drawings: Submit for approval the following:

a. Shop Drawings completely dimensioned using field-verified dimensions on plans of each roof area. Also accurate location of all roof penetrations, roof mounted equipment, curbs, skylights and other features on the roof as specified by Engineer. Contractor shall submit all details requiring consideration and the performance of the details shall be approved by the single-ply roofing system manufacturer for guaranteed construction as specified.

b. Manufacturer's specifications and product manuals indicating product information correlated to specified requirements, manufacturer's installation instructions, maintenance instructions and other data as may be required by Engineer.

c. Copies of the FM Global Property Loss Prevention Data publications and appropriate Technical Advisory Bulletins published by Factory Mutual indicating compliance with wind uplift pressure-resistant performance criteria, ballast and paver requirements and the requirements for FM Approved 1-90 system construction and perimeter securement conditions.

3. Contractor's Review: Accompanying approval request, submit to Engineer a written statement signed by Contractor, stating that the Drawings and Sections for roofing and flashing have been reviewed with an agent of the roofing material manufacturer and that he is in agreement that the selected systems are proper, compatible and that the details shown are not in conflict with the roofing manufacturer's roofing and flashing details. Show by copy of transmittal form that a copy of the statement has been transmitted to the manufacturer.

4. Statement of Application: Upon completion of the Work, submit a statement to Engineer signed by Contractor stating that the Work complies with the requirements of these Sections and the installation methods comply with the manufacturer's printed instructions and were proper and adequate for the condition of installation and use.

B. Sustainable Design Submittals:

1. VOC Reporting Form. Provide the following information:

a. For all adhesives and sealants, applied on site and within the building's weatherproofing system, provide the VOC content in grams/Liter (g/L) less water and other exempt compounds.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Deliver materials to the site in sufficient quantities to ensure uninterrupted progress of the Work.

2. Deliver materials in manufacturer's original, unopened containers and rolls with labels intact and legible.

3. Materials requiring fire resistance classification shall be delivered to the job with labels attached and packaged as required by labeling service.

B. Storage of Materials:

1. Store materials in a dry, well ventilated, weather tight place, and in a manner which will ensure that there is no possibility of significant moisture pick-up.

2. Store in a manner which complies with fire and safety regulations.

3. Store emulsions at temperatures above 40°F.

C. Store materials on clean raised platforms with weather protective covering when stored outdoors. Handling of Materials:

1. Handle rolled goods so as to prevent damage to edge or ends.
2. Select and operate material handling equipment so as not to damage existing construction or applied roofing.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

1. Firestone: RubberGard EcoWhite EPDM Roofing System;
2. Carlisle:
3. Sitka Sarnafil: EcoSmart Roofing System;
4. Or an approved equal.

2.02 MATERIALS / EQUIPMENT

A. Adhered Roofing Systems: Provide the following:

1. Ethylene Propylene Diene Monomer Synthetic Rubber Sheeting: Provide white synthetic rubber sheeting laminated to a 0.075-inch thick non-woven polyester fleece backing. Comply with the following:
   a. Rubber Membrane Thickness (not including polyester backing):
      1) 0.060-inches.
   b. Hardness Durometer A, ASTM D2240: 60 ±10 points
   c. Tensile Strength, ASTM D412: 1305 pounds per square inch minimum
   d. Elongation at Break, ASTM D412: 500% minimum at 75 F
   e. Brittleness Temperature, ASTM D2137: -75 F
   f. Tear Resistance, ASTM D624: 175 pounds per linear inch minimum
   g. Flame Resistance, ASTM D542: No flame
   h. Resistance to Heat Aging, Change in Original Properties after 70 hours at 212 F, ASTM D573: Hardness +10 points maximum, Elongation -40 percent maximum, Tensile Strength -15 percent maximum

i. Resistance to Oil Aging, Change in Volume after 70 hours Immersion in ASTM No. 33 oil at 212 F, ASTM D471: +80 percent

j. Resistance to Ozone, Condition after Exposure to 100 pphm Ozone in Air for 168 hours at 104 F, ASTM D1149: No cracks

k. Resistance to Permanent Set, Compression Set after 22 hours at 158 F, ASTM D395: +10 percent maximum

l. Resistance to Water, Change in Weight after 7 days Immersion at 158 F, ASTM D471: 2.0% maximum change in mass

B. Cover Board:

1. ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 5/8 inch thick, factory primed

2. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric, water permeable and resistant to UV degradation, type and weight as recommended by roofing system manufacturer for application

3. Attachment: Polyurethane adhesive.

C. Insulation:

1. Total Insulation Assembly R-Value: R-33.

2. Insulation board Maximum Thickness: 3”.

3. Insulation Assembly Minimum Thickness (low point): 5”

4. Attachment: Adhered.

5. Refer to Specification Section 07 22 16 Roof Board Insulation for roof insulation product.:

D. Substrate Board:

1. ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 5/8 inch thick, factory primed

2. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric, water permeable and resistant to UV degradation, type and weight as recommended by roofing system manufacturer for application.

3. Attachment: Mechanically attached.

E. Vaper Barrier:

1. Polyethylene Film: ASTM D4397, 6 mils, minimum, with maximum permeance rating of 0.13 perm.:

Walkway Pads: White EPDM, 0.30” thick by 30” x 30” with EPDM tape adhesive strips laminated to the bottom.

F. Miscellaneous Materials: Provide the following:

1. Flashing Membrane: Non-reinforced, bi-laminate, white-on-black, cured single ply roofing membrane composed of ethylene propylene diene monomer, same thickness as roofing membrane.
2. Splice Cleaner: Cleaning solution for EPDM containing toluene, heptane, carbon black and isopropanol.
3. Bonding Adhesive: Two-part spray-applied polyurethane foam catalyzed as required by installation temperature range encountered.
4. In-Seam Sealant: Silicone.
5. Splicing Cement: Butyl adhesive.
6. Lap Sealant: EPDM elastomeric sealant.
7. Deck Primer: As recommended by sheet manufacturer.
8. Asphalt: ASTM D312, Type III. Softening Point: 185F-205F
9. Rubber Fastening Strips: As required by roofing manufacturer for fully guaranteed construction.
10. Termination Bars: Continuous 2-inch by 1/4-inch Type 316 stainless steel.
11. Rubber Fastening Strips: As required by roofing manufacturer for fully guaranteed construction.
12. Yellow Safety Strip: A 5.5″ strip and nominal 30 mil (0.76 mm) thick yellow TPO or EPDM membrane laminated to a white, cured, seam tape, compatible with EPDM.
13. Other miscellaneous and accessory materials required for guaranteed construction.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Shop fabricate all special flashings shown using sheeting specified.

B. Use manufacturer's standard sheet seaming system for "plastic welding" or lapped joints to create seams of strength equal to sheet strength.

C. Include edge sealer to cover exposed sheet edges.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. The Contractor shall examine the substrate and the conditions under which the single-ply roofing system and base flashing Work is to be performed, and notify Engineer in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

B. Verify adequacy of slope-to-drain, compressive strength, moisture content and other composite roof insulation features important to the successful installation of the single-ply roofing system, flashing and ballast systems before start of work.

3.02 INSTALLATION

A. General:

1. Follow all applicable installation instructions and recommendations contained in the single-ply roofing system manufacturer's written installation and product manuals and the information contained on approved Shop Drawing submittals. Where Contractor wishes to deviate from written installation and product manuals and approved Shop Drawing submittals all such deviations shall be submitted to Engineer for approval along with single-ply roofing system manufacturer's written agreement and a statement of acceptability for compliance with guaranteed construction.

2. Begin installation only in the presence of the single-ply roofing system manufacturer's technical representative.

3. Cut sheets to the maximum size possible, in order to minimize seams and to accommodate contours of the deck. Do not seam within four feet of roof drains.

4. Clean all splices and lap areas using manufacturer's recommended splice cleaner.

5. Lap sheets and bond joints using the seaming system recommended by the manufacturer.

6. Cover top edges of each sheet at seams with uniform fillet of special sealant.

7. Install one-way breather vents as recommended by the single-ply roofing system manufacturer as shown but not less than one per 1000 square feet.

8. Install all roofing and associated work in a manner that will insure a complete roofing system at the end of each day’s work. Do not advance the installation of any one material beyond that which is necessary for proper sequencing of the single-ply roofing system Work.

B. Pre-installation Conference:

1. Prior to the installation of the single-ply roofing system and associated Work, Contractor shall schedule and meet at the site with the roofing installer, the installer of each component of associated work, the installers of deck and composite insulating substrate construction to receive roofing Work, the installers of other work in and around roofing which must follow the roofing Work, including mechanical work, Engineer and other representatives directly concerned with performance of the Work. Review foreseeable methods and procedures related to the single-ply roofing system Work, including but not necessarily limited to, the following:

a. Review project requirements, including Drawings, Sections and other Contract Documents.

b. Review required submittals, both completed and yet to be completed.

c. Review status of substrate including drying, structural loading limitations and similar considerations.

d. Review availability of materials, tradesmen, equipment and facilities needed to make progress and avoid delays.

e. Review required inspection, testing, certifying and accounting procedures.

f. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.

g. Review regulations concerning code compliance, FM compliance, environmental protection, health, safety, fire and similar considerations.

h. Review procedures needed for protection of roofing during the remainder of the construction period.

2. Reconvene the meeting at the earliest opportunity if additional information must be developed in order to conclude the subjects under consideration.

3. Record any revisions or changes agreed upon, reasons therefor, and parties agreeing or disagreeing with them.

C. Environmental Conditions:

1. Proceed with roofing and associated work only when weather conditions will permit unrestricted use of materials and quality control, complying with the Section requirements and with the recommendations of the roofing materials manufacturers.

2. Proceed only when Contractor and his installer are willing to guarantee the Work as required and without additional reservations and restrictions.

3. Record decisions, conditions and agreements to proceed with the Work when weather conditions might be unfavorable. State the reasons for proceeding, with the names of the persons involved along with the changes, if any, or revisions, requirements or terms of the Contract.

D. Substrate Board

1. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions.

E. Vapor Retarder Installation

1. Polyethylene Film: Adhere polyethylene-film vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches and 6 inches, respectively.

2. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

F. Insulation and Cover Board Installation

1. Refer to Section 07 22 16, Roof Board Insulation.

2. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

3. Comply with membrane roofing system, cover board and insulation manufacturer's written instructions for installing roof insulation.

4. Comply with membrane roofing system manufacturer's written instructions for installing roof cover board.

G. Adhered Membrane Roofing Installation

1. Adhere membrane roofing over area to receive roofing according to membrane roofing system manufacturer’s written instructions. Unroll membrane roofing and allow to relax before installing.

2. Start installation of membrane roofing in presence of membrane roofing system manufacturer’s technical personnel.

3. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

4. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

5. Fabric-Backed Membrane Adhesive: Apply to substrate at rate required by manufacturer and install fabric-backed membrane roofing.

6. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeters.

7. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

8. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping membrane roofing according to manufacturer’s written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of membrane roofing terminations.

9. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

10. Spread sealant or mastic bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

11. Install membrane roofing and auxiliary materials to tie in to existing membrane roofing to maintain weather-tightness of transition and to not void warranty for existing membrane roofing system.

H. Base Flashing Installation

1. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

2. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

3. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

4. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

5. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

I. Roof Walkway:

1. Flexible Walkway Pads: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Testing

1. Before placing any ballast or pads on single-ply roofing system membrane, and after all elastic sheet and flashing seams have been sealed, conduct in-place water retention tests.

2. Plug drains and flood roof with 2 inches of water above roof high points. Let water remain in-place for 24 hours. Do not add additional water during the time of the test and schedule testing during a period when precipitation is not predicted. If precipitation occurs during the time of the test, redo test when precipitation is not predicted during the time of the test. Calculate expected evaporation at temperatures, humidity and wind conditions occurring during the time of the tests.

3. Measure water remaining in place at the high point of roofs. Roof areas which demonstrate loss of water, that cannot be explained by loss due to evaporation, shall be inspected by a Technical Representative of the single-ply roofing system manufacturer and the source of leaks determined and presented to DEP and the Engineer as part of a field report which shall also

make recommendations for remedial Work. Where the source of leaks cannot be determined, the single-ply roofing system shall be removed and replaced with new single-ply roofing system at no additional expense to DEP. All material and construction systems damaged by the results of this test shall be replaced with new at no additional expense to DEP.

4. After remedial repairs have been made and inspected by a representative of the single-ply roofing system manufacturer and judged to be watertight, repeat the water retention test. If, this test shows that the single-ply roofing system is still not retaining water according to expected results, remove the entire single-ply roofing system and replace with new at no additional expense to DEP.

B. Inspection and Acceptance

A. At the end of the construction period, or at a time when the remaining construction Work will in no way affect or endanger the single-ply roofing system and associated Work, a technical representative of the single-ply roofing system manufacturer shall make a final inspection of the Work and prepare a written report to DEP and Engineer of deterioration, damage or deficiencies found in the Work.

B. Only the installer shall repair or replace deteriorated or defective Work.

C. Certify that the completed Work is in accordance with the Sections, and without damage or deterioration (except for normal weathering) at time of Final Acceptance.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Protect single-ply roofing system from damage during the construction period so that it will be undamaged in any way at the time of Final Acceptance by DEP.

1. Provide continuous protection of materials against wetting and moisture absorption.

2. Protect materials against damage by construction traffic.

B. Protect other Work, and surfaces of membrane, from spillage of single-ply roofing system sealing and bonding materials, and prevent materials from entering and clogging drains and conductors.

C. Replace Work which is soiled or otherwise damaged by the performance of the single-ply roofing system and associated Work and from improper installation techniques.

D. Remove broken, cracked and chipped pedestrian plaza pavers and replace with undamaged material.

END OF SECTION

SECTION 07 62 00 – SHEET METAL FLASHING AND TRIM
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the general requirements for sheet metal flashing and trim for a complete water- and weather-tight installation complying with all governing codes and standards.

B. The Contractor shall provide all labor, materials, equipment and incidentals necessary to perform the work of this Section as shown on the Contract Drawings, specified herein or required otherwise for a complete installation.

C. The Contractor shall implement practices and procedures to meet the project's sustainability goals as identified in the Contract Documents. The Contractor shall ensure that the sustainability requirements of this Section are implemented to the fullest extent.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the

applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A.	Section 04 22 00	–	Concrete Unit Masonry
B.	Section 07 53 00	–	Elastomeric Membrane Roofing
C.	Section 07 90 00	–	Joint Protection

1.04 REFERENCES

A.	NYCBC	–	New York City Building Code
B.	ASTM A666	–	Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
C.	ASTM B32	–	Standard Specification for Solder Metal
D.	FM 1-49	–	FM Global Property Loss Prevention Data Sheet, Perimeter Flashing
E.	SMACNA	–	Sheet Metal and Air Conditioning Contractors National Association, Incorporated, Architectural Sheet Metal Manual

1.05 DESCRIPTION

A. Sheet metal flashing and trim to be provided under this Section shall include complete systems of flashing and counterflashing at penetrations in roofing; interlocking, mechanically-keyed, 3-way ribbed stainless steel metal masonry cavity wall flashing and miscellaneous system components such as cast-in-place and built-in-place reglets and other accessory components; miscellaneous flashings not supplied under the work of other Sections; miscellaneous accessories, fasteners and incidental system components.

B. Installation of the systems shall meet the requirements of FM Approval Rating Class 1-90 construction, without relying upon sealants or other non-metallic detailing and fabricating techniques to achieve weather- and water tightness.

C. Performance Criteria:

1. Sheet metal flashing and trim shall be permanently watertight, and not deteriorate in excess of manufacturers' published limitations.

2. Comply with fabrication details recommended by SMACNA and the sheet metal flashing and trim manufacturers, as approved by Engineer at time of Shop Drawing submission.

3. Provide completely weather- and watertight wall and single-ply roofing metal flashing systems. Contractor shall provide only the highest quality materials and methods of construction and installation as recommended by sheet metal flashing and trim manufacturers in compliance with governing

authorities and as approved by Engineer at time of Shop Drawing submission.

D. Sustainable Design Requirements

1. Recycled Content of Steel-Sheet Flashing and Trim: Postconsumer recycled content plus one-half of preconsumer recycled content shall not be less than 25 percent.

2. Low Emitting Materials: All adhesives and sealants used onsite and within the building's weatherproofing system shall meet the VOC content limits for the work as specified in the Contract Documents.

E. Project-specific system/design requirements will be provided (if necessary) in the Contract in order to update the requirements given herein or to supplement other requirements given in the Contract Drawings.

F. Scheduling:

1. Coordinate ribbed metal cavity wall flashings with other Work to ensure secure anchorage and watertight seals, and to minimize exposure to puncture or other damage from the work of other trades. Refer to Sections 04 22 00 - Concrete Unit Masonry and 07 53 00 - Elastomeric Membrane Roofing.

2. Deliver materials to the site in sufficient quantities to ensure uninterrupted progress of the Work.

3. Do not proceed with the sheet metal flashing and trim Work until curb and substrate construction, blocking, and other construction to receive the Work is completed.

4. Schedule the installation of sheet metal flashing and trim Work to coincide with the installation of roofing, waterproofing, drains, piping, blocking, nailers, framing at openings, curbs, Concrete Unit Masonry and other adjoining and substrate work.

5. Proceed with and complete the work only when materials, equipment and knowledgeable tradesmen required for the installation of sheet metal flashing and trim systems are at the site and are ready to follow and integrate the work of this Section with work requiring the installation of sheet metal flashing and trim.

1.06 QUALITY ASSURANCE

A. Engage installers skilled, trained and with successful experience in the detailing, fabrication and installation of each type of sheet metal flashing and trim work required who are recognized sheet metal contractors, equipped to perform workmanship in accordance with the Contract Documents and approved Shop Drawings so that there will be undivided responsibility for the performance of each flashing and trim component of the work.

1.07 SUBMITTALS

A. The Contractor shall submit the following to the Engineer for review and approval:

1. Installer Qualifications: Submit names and qualifications to Engineer along with the following information on a minimum of three successful projects:

a. Names and telephone numbers of owners, architects or engineers, responsible for the projects.

b. Approximate contract prices for sheet metal flashing and trim.

c. Size of area installed

2. Samples:

a. Typical examples of sheet metal flashing and trim profiles, 12-inches long with all fasteners, clips, and supports required for the Work. 12-inch by 12-inch sheet of each item specified and 6-inch long pieces of each required system component to be used in the work.

b. Each fastener type required marked as to type of material and with their intended purpose in the work.

3. Shop Drawings:

a. Copies of manufacturers' specifications, installation instructions and recommendations for sheet metal flashing and trim requirements.

b. Manufacturer's data substantiating that the materials comply with the requirements.

c. Shop Drawings showing the coordination of the Work with Sections 04 22 00 – Concrete Unit Masonry and 07 53 00 – Elastomeric Membrane Roofing.

d. Detailed Shop Drawings showing all profiles of sheet metal flashing and trim systems to be used in the work, fully dimensioned, located, quantified and presented such that sequence of installation is acceptable to each interfacing material supplier.

e. Large scale isometric drawings of all sheet metal and trim intersections and transitions, include all fastener locations and materials, cleats and other miscellaneous accessories necessary to complete the Work as specified.

B. Sustainable Design Submittals:

1. Environmental Materials Reporting Form (EMRF) Recycled Content. Provide the following information:

a. Name of Product and Manufacturer.

b. Material cost breakdowns. Cost breakdowns must include total material-only cost (excluding installation, labor and equipment).

C. Percentage (by weight) of post-consumer and pre-consumer recycled content in the submitted product(s), if applicable.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Deliver materials in manufacturers' original, unopened and undamaged containers and rolls, with labels intact and legible and with information accurately representing container contents as approved by Engineer at time of Shop Drawing submission.

2. Items delivered in broken, damaged, rusted, or unlabeled condition shall immediately be removed from project site and not offered again for approval by Engineer.

B. Storage of Materials:

1. Store materials in an area protected from all construction traffic not associated with the work of this Section.

2. Store materials off the ground and in same package in which they were shipped, and on platforms protected from dirt and other contamination.

3. Store under cover and in a manner which does not permit water to remain on units.

C. Handling of Materials:

1. Protect all sheet metal flashing and trim work from dents, scratches, warps and bends.

2. Immediately after installation of each system component, remove all strippable protective films.

3. Comply with manufacturer's instructions for handling and installation of the ribbed metal cavity wall flashing materials, except where more stringent requirements are shown or specified.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Through-Wall Ribbed Sheet Metal Flashing (Stainless Steel):

1. Cheney Flashing Company, Inc.; Cheney Flashing – Trenton, NJ.
2. Or approved equal.

B. Reglets:

1. Cheney Flashing Company, Inc., Trenton, NJ.
2. Or approved equal

2.02 MATERIALS / EQUIPMENT

A. Stainless Steel Flashings Associated with Single-Ply Roofing:

1. Provide through-wall sheet metal flashing for embedment in masonry with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
2. Provide sheet stainless steel, Type 316 complying with ASTM A666, with No. 2D dead soft, fully annealed finish, unless required to be harder temper for proper forming and performance for application indicated.
3. Provide thickness of 0.0156 inch.
4. Provide stainless steel flashing and counterflashing at penetrations in single- ply roofing.

B. Interlocking Mechanically-Keyed, Ribbed Stainless Steel Flashing & Counterflashing System Associated with Concrete Unit Masonry:

1. Provide deformed sheet, stainless steel, Type 316 complying with ASTM A666 for all Work with No. 2D finish.
2. For flashing within concrete unit masonry wall system, through-wall flashing at spandrels and horizontal steel and concrete members in walls provide flashing with a mechanically-keyed, 3-way saw tooth design, which bonds in all directions and which has weep holes drainage at 3-inch intervals.
3. Provide a complete system of interlocking, mechanically-keyed components all by the same manufacturer including, but not limited to, cast-in-place mechanically-keyed and built-in-place mechanically-keyed masonry-reglets, through-wall metal masonry counterflashing and metal through-wall base flashing, and in other locations shown.
4. Thickness: Provide thickness of 26 gauge (0.018-inches).

C. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory- mitered and -welded corners and junctions.

1. Material: Stainless steel, 0.0187 inch thick.

2. Select reglet types required from subparagraphs below.

3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

4. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.

5. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.

6. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.

7. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.

8. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

D. Miscellaneous Materials:

1. Solder for Stainless Steel: ASTM B32, Lead-free; 96.5% Sn, 3.45% Cu, 1% Sb, 0.05% Ag used with an acid flux of the type recommended by the stainless steel manufacturer. Use a non-corrosive rosin flux over tinned surfaces.

2. Stainless Welding Rods: Type recommended by stainless steel sheet manufacturer for the type of metal sheets furnished.

3. Nails, Screws and Rivets: Same material as flashing sheet, or as recommended by manufacturer of flashing sheet.

4. Cleats: Same metal and gage as sheet being anchored, 2-inches wide, punched for two anchors.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Fabricated Metal Flashing and Trim: Shop fabricate sheet metal flashing and trim to comply with profiles and sizes shown, and to comply with manufacturer's recommended details. Except as otherwise shown or specified, provide soldered flat-lock seams, and fold back metal to form a hem on the concealed side of exposed

edges. Comply with metal producers' recommendations for tinning, soldering and cleaning flux from metal.

B. On all metal base and counterflashing, and trim provide completely shop-fabricated corners and special flashings; arc welded to insure watertight joints. Grind welds smooth so as to be indistinguishable from adjacent surfaces

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examination

1. The Contractor shall examine the substrate and the conditions under which the sheet metal flashing and trim Work is to be performed, and notify the Engineer in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

B. Preparation

1. Clean the substrate of dust, debris, substances and interferences detrimental to the Work and prepare substrates as recommended by the sheet metal manufacturer.

3.02 INSTALLATION

A. General:

1. Separate dissimilar metals from substrates and from each other by painting each metal surface in the area of contact with a 15-mil thick application of bituminous coating, as recommended by the manufacturers of the dissimilar metals. Comply with manufacturer's recommendations for other forms of protection of the stainless steel and aluminum against corrosion.

2. Provide thermal expansion for running trim, flashing and other items exposed for more than 15 feet - 0 inch continuous length. Maintain a watertight installation at expansion seams. Locate expansion seams at 15 feet - 0 inch intervals, and 2 feet - 0 inch each side of corners and intersections.

3. Fabricate and install the work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves and avoidable tool marks, considering the temper and reflectivity of the metal. Provide uniform, neat double-locked seams with cleats rolled into the seam and with minimum exposure of solder, welds and sealant. Except as otherwise shown, fold back the sheet metal to form a hem on the

concealed side of exposed edges. All exposed edges of all sheet metal flashing shall be hemmed not less than 1/2-inch wide.

4. Conceal fasteners and expansion provisions wherever possible in exposed work, and locate so as to minimize the possibility of leakage. Cover and seal work as required for a watertight installation.

5. Provide cleat-type anchorages for metal flashings and trim wherever practical, arranged to relieve stresses from building movement, and thermal expansion and contraction.

6. On vertical surfaces lap 2-piece flashings a minimum of 4 inches.

7. On sloping surfaces, for slopes of not less than 6 inches in 12 inches, lap unsealed flashings a minimum of 6 inches. For slopes less than 6 inches in 12 inches, use soldered flat-locked seams.

8. For embedment of metal flashing flanges in single ply roofing or flashing or stripping, extend flanges for a minimum of 6 inches embedment.

9. Flashing to be inserted into reglets shall be installed to the full depth of the reglet with the top flange of the flashing edge turned forward to form a hook. Caulk flashing into reglets using stainless steel wedges. Fill reglet with sealant specified in Section 07 90 00 - Joint Protection.

B. Installation of Stainless Steel Flashing and Trim:

1. Tin the edges of plain stainless steel to be soldered, for a width of 1-1/2 inches, using solder for stainless steel and acid flux. Remove every trace of acid flux residue from the metal promptly after tinning or soldering.

2. Provide welded joints. Provide upturned, 1/2-inch wide hooked flanges, and weld between adjoining sheets; lay seam flat.

C. Installation of Ribbed Metal Cavity Wall Flashing:

1. Build ribbed metal through-wall masonry flashing work into Concrete Unit Masonry construction as construction work progresses. Work performed without built-in flashings shall be stopped, removed and rebuilt at no additional expense to DEP, even if discovered only after walls and other materials are in-place and completed.

2. Install all flashings in a split bed of mortar, increasing the thickness of the bed if required to achieve full mortar coverage on top and bottom of flashings.

3. Coordinate the installation of flashing materials and associated work so as to provide a complete system complying with the combined recommendations of manufacturers and installers involved in the work.

4. Use only installation techniques approved by the ribbed metal cavity wall flashing manufacturer

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Quality Control for Cavity Wall Flashing

1. Field test ribbed metal cavity wall flashing after installation. After building three courses of concrete unit masonry above area of ribbed cavity wall flashing, tape weep vents closed and fill cavity with water.

2. Water leaking from the wall below the area of the ribbed metal cavity wall flashing shall be evidence that the ribbed metal cavity wall flashing was improperly installed.

3. Remove concrete unit masonry and improperly installed ribbed cavity wall flashing and install new ribbed cavity wall flashing. Repeat this process until the wall does not shown evidence of leakage beneath ribbed cavity wall flashing. All such remedial work shall be at no additional expense to DEP.

4. Remove tape from weep vents and all mortar and other debris from cavity and demonstrate free flow of water from the cavity at conclusion of test

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Provide continuous protection of metal flashing and trim materials against wetting, contamination and other damage primarily by storing materials under cover and above ground and away from all construction traffic.

B. Do not permit workmen, or others, to step directly on flashing sheets in place, or to place or move equipment over flashing and trim surfaces. Protect surfaces during installation of permanent covering work and adjoining work.

C. Neutralize excess flux as work progresses with five percent to ten percent washing soda solution and rinse thoroughly.

D. Clean exposed surfaces of every substance which is visible or might cause corrosion or prevent uniform oxidation of the metal surfaces. Exercise extreme care to remove fluxes and ferrous metal particles, including welding splatter and grinding dust.

E. Do not leave metal debris and discarded materials at the Site of the Work. Clean each site of the work as the work progresses on a daily basis.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Principal items of work under this Section include:

1. Preformed copings
2. Closures, trim, fasteners, sealants and accessories for fabricating and installing work under this Section.
3. Roof curbs.
4. Metal Fascia.
5. Conductors and Downspouts.
6. Thru-wall Scuppers, Conductors, and flashing.

B. Furnish all labor, materials, equipment and incidentals necessary to perform the work of this Section as specified, shown on the Contract Drawings or required for a complete job.

C. The Contractor shall implement practices and procedures to meet the project's sustainability goals as identified in the Contract Documents. The Contractor shall ensure that the sustainability requirements of this Section are implemented to the fullest extent.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry

B. Section 07 53 00 - Elastomeric Membrane Roofing

1.04 REFERENCES

A. ASTM Standards:

1. ASTM A480 - General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip, Standard Specification for

2. ASTM A240 - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications, Standard Specification for

3. ASTM A666 - Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar, Standard Specification for

4. ASTM D1187 - Test Method for Asphalt-Base Emulsions for use as Protective Coatings for Metal, Standard Specification for

5. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free, Standard Specification for

B. Trade Standards:

1. Sheet Metal and Air Conditioning Contractors National Association "Architectural Sheet Metal Manual" (SMACNA)

2. The American National Standard Institute / Single Ply Roofing Industry “ES-1” (ANSI/SPRI)

1.05 DESCRIPTION

A. System Design Requirements: Roof Specialties system shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Thermal Expansion and Contraction:

a. Completed Roof Specialties and flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, or reducing performance ability.

b. The design temperature differential shall be not less than 220 degrees Fahrenheit.

2. Uniform Wind Load Capacity:

a. Installed Roof Specialties system shall withstand negative wind pressures complying with the following criteria.

1) Design Code: ANSI/SPRI "ES-1"

2) Safety Factor: 2.0

3) The wind load criteria found on the Contract Drawings.

b. The nominal capacity of the system shall be determined based on physical testing in accordance with ANSI/SPRI ES-1. The allowable load carrying capacity shall be calculated by reducing the calculated nominal capacity by the safety factor listed herein.

3. Metal thicknesses of exposed sheet metal components shall meet the requirements of ANSI/SPRI ES-1 Table 5.

B. Accessories and items essential for the completeness of the installation shall be the same kind of material as the item to which applied.

C. Sustainable Design Requirements:

1. Recycled Content of Steel-Sheet Roof Specialties: Postconsumer recycled content plus one-half of pre-consumer recycled content shall not be less than 25 percent.

1.06 QUALITY ASSURANCE

A. The workmanship of sheet metal work, method for forming joints, anchoring, cleating, and provisions for expansion shall conform to the standard details and recommendations of the Copper Development Association and the Architectural Sheet Metal Manual published by SMACNA. Workmanship shall be in accordance with the best trade practice and recommendations and specifications of the Sheet Metal and Air Conditioning Contractors National Association, Incorporated.

1. Uplift requirements shall match the requirements for adjacent membrane roofing as specified in Section 07 53 00 - Elastomeric Membrane Roofing.

2. Wind resistance calculation shall be designed specifically for this project. The Contractor shall calculate and certify that the perimeter roof specialties systems furnished meet the anticipated design pressure as specified in the Detailed Specifications when tested in accordance with SPRI Test Methods RE-2 and RE-3.

B. The forming and assembling of sheet metal components shall be performed using methods that will not void any manufacturer's warranty.

C. Contractor must obtain all components of the roof specialties system from a single manufacturer. Any secondary products that are required which cannot be

supplied by the specified manufacturer must be recommended by the manufacturer and approved by the Engineer.

D. Installer Qualifications:

1. Engage an experienced metal edge system contractor to install edge system who has a minimum of three (3) years of experience specializing in the installation of metal edge systems.

2. Contractor must be certified by manufacturer specified as a supplier of the metal edge system and obtain written certification from manufacturer that installer is approved for installation of the specified system.

E. Coordination:

1. The Contractor will be obligated to coordinate the Work under other Sections to ensure perfect match of colors. The Contractor shall submit samples of each approved manufacturer's finishes for approval.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings for approval of the Engineer. Submittals shall include, but not be limited to:

1. Samples of each material listed

2. Manufacturers Literature

B. Each submittal shall be identified by the Specification Section Number.

C. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed materials compliance with the Contract Documents.

D. Partial, incomplete or illegible submissions will be returned to the Contractor without review for resubmission.

E. Samples shall include finish and color samples for all items.

F. Shop Drawings shall include, but not be limited to:

1. Complete layout and installation drawings with clearly marked dimensions and schedules including sizes, weights, gages of metal and spacing.

2. Details of all attachments.

G. Design Test Reports:

1. Submit copies of design test reports for each of the performance testing standards listed in Article 1.05 herein.

2. Test reports shall be performed by independent, International Accreditation Service, Inc. (IAS) accredited testing laboratory, and shall bear the seal of a registered Professional Engineer licensed in the State of New York.

H. Engineering Calculations:

1. Submit engineering wind pressure calculations specific to this Project.
2. Calculations shall be prepared and sealed by a registered Professional Engineer licensed in the State of New York, who is a full-time employee of the system manufacturer.
3. Calculations shall clearly demonstrate that the system is capable of resisting the calculated design wind pressure(s) after the application of the safety factor specified herein in accordance with the requirements of ANSI/SPRI ES-1 and the building code.

I. Installer Qualifications:

1. Engage a single installer skilled, trained and with successful experience in the installation of roof specialties systems and with successful experience in the erection of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of work. Submit names and qualifications to the Engineer for approval along with the following information on a minimum of three successful projects:
   a. Names and telephone numbers of owners, architects or engineers responsible for projects.
   b. Approximate contract cost of the system.
   c. Amount of area installed.

J. Sustainable Design Submittals:

1. Environmental Materials Reporting Form (EMRF) Recycled Content. Provide the following information:
   a. Name of Product and Manufacturer.
   b. Material cost breakdowns. Cost breakdowns must include total material-only cost (excluding installation, labor and equipment).

K. The percentage (by weight) of post-consumer and pre-consumer recycled content in the submitted product(s), if applicable.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver all materials in factory packed unopened cartons and crating bearing the manufacturer's labels.

B. Store materials in clean, dry and protected areas in such manner to preclude damage of any nature.

C. Handle all materials with proper care to avoid denting, marring, warping or other distortions during delivery, storage and handling.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

1. Copings:
   a. Perma-Tite Gold Coping as manufactured by Metal Era, An MTL Company, Waukesha, WI.
   b. Or approved equal
2. Roof curbs:
   a. Custom Solutions Roofs and Metal Products, Cedar Rapids, IA:
      1) Roof curb with Pipe Portal System: Model #P100-B-UU-N-05-L
      2) Roof Stack Flashing with Insulation: Model #P300-B-UU-N-05-CL
      3) Equipment Rail: Model #P500-B-UU-N-05-G.
   b. Or approved equal
3. Fascia :
   a. Anchor-Tite HG Fascia as manufactured by Metal Era, An MTL Company, Waukesha, WI.
   b. Or approved equal.
4. Downspouts:
   a. Industrial Closed Faced Downspouts as manufactured by Metal-Era, An MTL Company, Waukesha, WI
   b. Or approved equal.
5. Scuppers and Conductors:
   a. Thru-Wall Scupper, Welded, Raised Conductor Box as manufactured by Metal- Era, An MTL Company, Waukesha, WI
   b. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Copings:
1. Coping units over parapet walls to be 22 ga., or as noted on the Contract Drawings.
2. Units to be of size and profiles shown on the Contract Drawings.

3. Provide coping units with mitered welded corners, splice plates and joint trim, retainer clips, compression pads, fasteners and other accessories required to make a complete installation, in accordance with the manufacturer's recommendations.
4. Finish on all exposed surfaces of stainless steel copings and accessories to be 304-2B.
5. Sealants for installation of copings shall be of an approved type acceptable to the manufacturers of materials herein specified.
6. Fastenings shall be concealed type, stainless steel or cadmium plated. Self-tapping screws to be stainless steel of sizes recommended by the manufacturers.
7. Seed clips to be stainless steel.

B. Roof curbs shall be fabricated of Stainless Steel: 0.028 inch thick with continuous mitered and welded corner seams, integral base plates, factory installed pressure treated wood nailed, and insulated with 1½ inch thick rigid fiberglass insulation. Profile shall be as shown on the Contract Drawings.

C. Downspouts shall be manufactured of 22 ga. type 304-2B stainless steel. Provide telescoping joint design for expansion. Elbows shall be welded construction, and shall match the finish and color of the downspout.

1. Size: 3-inches by 4-inches.
2. Formed Lengths: 12 foot.
3. Seams: Double Seam Lock.
4. Attachment Straps: Concealed “U” straps.
    a. Width: 2-inches.
    b. Straps per 12-foot length: 3.
5. Elbows: Manufacturers custom elbows.
6. Downspout Transition: Standard Manufacturer’s shape adaptor.

D. Thru-Wall Scuppers, Conductors and Flashing: Thru wall scupper flashing in walls and parapets shall be constructed of 1/8-inch thick stainless steel. All joints shall be welded.

1. Picture Frames: Front, 2-inches wide; Back, 3-inches wide.
2. Scupper opening: 4-inches high; 8-inches wide.
3. Conductor projection: 8-inches.
4. Conductor screen: Custom removable stainless steel mesh.
    a. Size: 1/2-inch by 1/2-inch.
5. Provide overflow scupper same as welded scupper without conductor.

a. Provide 1/2-inch projected drip edge.

E. Fascia shall consist of complete assemblies, composed of hold down clips, joint covers, preformed mitered welded covers and other accessories required for a complete installation in accordance with the manufacturer's recommendation. Fascia shall be fabricated of 22 ga. type 304-2B stainless steel 5005-H34 alloy.

F. Manufacturer's Standards: In addition to the standards listed above, the flashing products and their installation shall be in accordance with the manufacturer's published recommendations and specifications.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examination:

1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, system supports, and other conditions affecting performance of the Work.
2. For the record, prepare written report, approved by Installer, listing conditions detrimental to performance of the Work. Any Work needed to correct unsatisfactory conditions need to be submitted to the Engineer for approval prior to the Work being done.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Preparation:

1. Dissimilar metals shall be separated from each other by painting each metal surface in contact with a coating as specified in Specification 09 91 00 – Painting.
2. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.
3. Establish straight, side and crosswise benchmarks.
4. Use proper size and length fastener for strength requirements.
5. All surfaces shall be checked for square and straightness.
6. Measure the wall lengthwise and crosswise to confirm lengths, widths, and clearances of roof specialties system components and verify clearances for thermal movement.

3.02 INSTALLATION

A. General:

1. Unless otherwise specified, all roof specialties shall be installed in accordance with the manufacturer's instructions to provide a complete watertight and weatherproof construction, free from bends and buckles and as shown on the Contract Drawings. Ample provision shall be made for expansion and contraction. Repair or replace all materials that have been damaged during installation.

B. Sheet Underlayment:

1. Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply over entire parapet or roof-wall edge, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (150 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 90 days.

C. Scuppers, Conductors and Downspouts:

1. Install products in accordance with manufacturer’s instructions..
   a. Installation shall be in accordance with roofing manufacturer’s installation instructions, details and warranty requirements.
   b. Provide sealants, fasteners and accessories as recommended by SMACNA.
2. Install products to allow water to drain from edge of roof.
3. Install products to allow for thermal movement.
4. Joint Sealants: Apply joint sealants in accordance with manufacturer’s instructions.
5. Review lengths of straight pieces before cutting to avoid creating relatively short sections adjacent to full-length sections.
6. Isolate products from ACQ treated wood blocking or other galvanically incompatible material with appropriate membrane material.
7. Confirm subdrainage size and provide appropriately size adaptor. Where downspout daylight, provide precast concrete splash block and 45-degree elbow directed away from building.~~:~~

D. Copings:

1. Install copings true and straight. Fasten as recommended by manufacturer. Seal and flash in accordance to primary roofing manufacturer's recommendations.

2. Install in manufacturers standard lengths with anchor plates and concealed joint cover at each joint. All screws shall be of stainless steel. Mitered and welded corners shall be used for all changes in direction.

E. Roof Curbs:

1. Center curbs over openings.

2. Anchor to wood blocking installed under Section 06 10 00 - Rough Carpentry.

F. Leave units ready to receive flashing provided herein and to be installed as the membrane roofing is installed.

3.03 FIELD TESTING / QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect roof specialties system installation, including accessories. Report results in writing.

B. Remove and replace applications of roof specialties system where inspections indicate that they do not comply with specified requirements.

C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Check levels and adjust as necessary after roofing and flashing is complete.

B. Protect materials from damage by other trades. Remove protective coatings at completion of project as directed by the Engineer.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the general requirements for roof hatches, custom stainless steel hardware and accessories for complete watertight systems. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install and place into satisfactory operation all roof hatch work and equipment access covers and curb.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry

B. Section 07 21 00 - Thermal Insulation

C. Section 07 53 00 - Elastomeric Membrane Roofing

D. Section 07 62 00 - Sheet Metal Flashing and Trim

E. Section 09 91 00 - Painting

1.04 REFERENCES

A. NYBC - New York City Building Code.

B. ASTM A666 - Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar, Standard Specification for

C. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate, Standard Specification for

D. ASTM B221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes, Standard Specification for

E. AMP/NAAMM AMP 500- Architectural Metal Products Division of the National Association of Architectural Metal Manufacturers, Finishes for Aluminum

F. SMACNA - Sheet Metal and Air Conditioning Contractors National Association, Incorporated, Architectural Sheet Metal Manual

G. OSHA 29 CFR 1910.27 - Occupational Safety and Health Act of 1970, Fixed Ladders

1.05 DESCRIPTION

A. Performance Criteria:

1. Roof hatch and equipment access cover Work shall be permanently watertight, and not deteriorate in excess of manufacturers' published limitations.

2. Detail and fabricate roof hatches to withstand a live load of 40 per square foot over the entire horizontal plane of the hatch and a concurrently acting point load of 200 pounds located at the center of the roof hatch. Specified loadings shall not cause any permanent deflections in the roof hatch or support curbs or damage to operating hardware.

3. Equipment Access Cover and Curb Design Criteria:

a. Detail and fabricate equipment access cover and curb to withstand additional dead load of 20 pounds per square foot, a live load of 40 pounds per square foot over the entire horizontal plane of the cover and a concurrently acting point load of 200 pounds located at the center of the equipment access cover. Specified loadings shall not cause any permanent deflections in the equipment access cover or support curbs.

b. Equipment access cover and curb design shall meet applicable loads specific to installed location.

B. Requirements of Regulatory Agencies:

1. Comply with applicable requirements of the New York City Building Code, SMACNA Sheet Metal Manual details and the requirements of OSHA 1910.27 for roof hatch minimum sizes, clearances and coordination with fixed ladders.

C. Do not proceed with the roof hatch work until curb and substrate construction, blocking, and other construction to receive the work is completed.

D. Coordinate the installation of roof hatch work with roofing and flashing work in order to provide continuity in the installation of roofing Work in a manner which maintains roofing manufacturer's guaranteed construction.

E. Schedule the installation of roof hatch work to coincide with the installation of roofing, drains, piping, blocking, nailers, framing at openings, curbs, and other adjoining and substrate work so that the roof hatches may be built into the Elastomeric Membrane Roofing as the work progresses as shown on approved Shop Drawings and without the need for field changes to approved installation details or methods of flashing in order to maintain permanently water- and weathertight conditions on the roof.

F. Proceed with and complete the work only when materials, equipment and knowledgeable tradesmen required for the installation of roof hatches, flashing and trim systems are at the site and are ready to follow and integrate the work of this Section with work requiring the installation of sheet metal flashing and trim and Elastomeric Membrane Roofing.

1.06 QUALITY ASSURANCE

A. Source Quality Control:

1. Obtain materials only from manufacturers who will, if requested, send a qualified technical representative to the Site for the purpose of advising installer of proper procedures and precautions during the installation of the roof hatches.

B. Engage manufacturers who have been successfully providing roof hatches of the type specified and who will submit a list of successful installations along with telephone numbers of owners, architects or engineers responsible for the work.

C. Engage manufacturers who have been successfully providing roof equipment access covers of the type specified and who will submit a list of successful installations along with telephone numbers of owners, architects or engineers responsible for the work.

D. Professional Engineer:

1. Engage a registered professional engineer legally qualified to practice in the State of New York and experienced in providing engineering services of the kind indicated.

2. Responsibilities include, but are not necessarily limited to, the following:

a. Carefully reviewing system performance and design criteria stated in the Contract Documents.

b. Preparing written requests for clarification or interpretation of performance or design criteria for submittal to Engineer by Contractor.

c. Preparing, or supervising the preparation of design calculations, and reviewing and approving related Shop Drawings prepared by the equipment access cover and curb manufacturer prior to submission to Engineer, and providing comprehensive engineering analyses verifying compliance of the system with the requirements of the Contract Documents.

d. Signing and sealing all calculations and engineering analyses.

e. Certifying that:

1) It has performed the design of the equipment access cover and curb system in accordance with the performance and design criteria stated in the Contract Documents, and

2) The said design conforms to all applicable local, state and federal codes, rules and regulations and to the prevailing standards of practice.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings for approval by the Engineer. Submittals shall include, but not be limited to:

1. Copies of manufacturer's proposed fabrication details and material specifications for roof hatches and equipment access covers and curbs.

2. Include flashing and roughing-in drawings showing this work coordinated with Sections 07 53 00 - Elastomeric Membrane Roofing, 07 21 00 - Thermal Insulation, 06 10 00 - Rough Carpentry and 07 62 00 - Sheet Metal Flashing and Trim as appropriate to the location of the item.

B. Manufacturer’s specifications, installation and coordination instructions and other data as may be requested by Engineer substantiating that products comply with the requirements.

C. Equipment Access Cover and Curb: Complete design calculation and Shop Drawings shall be prepared, signed and stamped with the seal of a Licensed Professional Engineer, licensed and registered to practice in the State of New York and recognized as an expert in the required work unless the design and details have been shown on the Contract Drawings.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver all materials without damage and in manufacturer’s original, unopened and undamaged protective wrappings bearing name and model number of approved items.

B. Storage of Materials:

1. Minimize the amount of time roof hatches are stored on-site. If roof hatches do arrive on-site before they can be incorporated into the orderly assembly of the roofing work, store in a completely protected and secure enclosure, under cover and away from all other construction traffic.

2. Do not store in contact with earth, wood or concrete or in contact with other surfaces that could cause staining or other types of surface marks or blemishes of any kind.

C. Handling of Materials:

1. Do not subject roof hatches to bending or stress of any kind.

2. Handle and protect units during installation in a manner recommended by the roof hatch manufacturer.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to the City the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

1. Equipment Access Cover and Curb: Provide one of the following:

a. RPRC-1 and RPC-3LW2X4 as custom manufactured by Roof Products, Inc. (RPI), Chattanooga, TN.;

b. Or approved equal.

2. Ladder Access Roof Hatch: Provide one of the following:

a. Type S50TB with Ladder up Safety Post as manufactured by Bilco Company, Hillside, NJ;

b. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Equipment Access Cover and Curb:

1. Provide manufacturer's custom units, modified as necessary to comply with the requirements. Custom fabricate units wherever necessary for size, type and profile, using manufacturer's standard detailing to the extent applicable.

2. Frame:

a. Material: ASTM A 653 G90 hot-dipped galvanized steel. Minimum 18 gauge or heavier gauge as engineered by manufacturer.

b. Corners: Mitered and welded. Bolted connections are not accepted.

c. Base Plates: Integral to frame and welded.

d. Internal Reinforcement: As required by Access Curb and Cover design by manufacturer.

e. Wood Nailers: Factory installed, pressure treated. Size and width as required by manufacturer.

3. Cover:

a. Material: ASTM A 653 G90 hot-dipped 14 gauge galvanized steel.

b. Interior liner: 18 gauge Galvanized steel.

c. Internal Reinforcement: As required by Equipment Access Cover and Curb design.

d. Integral lifting lugs.

e. Internally insulated with minimum 5-inch thick three-pound density fiberglass insulation, Minimum R-Value of 20 insulation.

4. Curb:

a. Fabricate structural curb to support cover and additional load of ballasted solar panel assembly.

b. Material: ASTM A 653 G90 hot-dipped galvanized steel.

1) Minimum 18 gauge, minimum or as engineered by manufacturer.

c. Corners: Mitered and welded. Bolted connections not accepted.

d. Base Plates: Integral to frame and welded.

e. Internally reinforced with galvanized 1 inch by 1 inch by 12 gauge angles for curbs exceeding 3 foot length. Reinforce internal bulkhead at wider curbs to support lateral loads.

f. Wood Nailers: Factory installed, pressure treated. Size and width as suitable for support of items installed on curbs.

g. 3/4-inch plywood top with support channels as required.

h. Insulation: Factory installed 1-1/2 inch thick three-pound density fiberglass insulation.

i. Curb Height: Minimum 12 inch above finished roof.

j. Construct curbs to match roof slope with plumb and level top surface for mounting mechanical equipment.

k. Counter Flashing: 18 gauge galvanized steel.

5. Clear Opening Size:

a. Sodium Bisulfite Tank clear opening size: 10 feet by 10 feet, unless otherwise noted on Contract Drawings.

b. Sodium Hypochlorite Tank clear opening size: 12 feet by 12 feet, unless otherwise noted on Contract Drawings.

6. Finishes:

a. Exterior and interior galvanized steel shall be painted per Section 09 91 00, Painting.

B. Ladder Access Roof Hatch:

1. Provide manufacturer's standard thermally broken units, modified as necessary to comply with the requirements. Custom fabricate units wherever necessary for size, type and profile, using manufacturer's standard detailing to the extent applicable. Hatch shall be thermally broken type.

2. Materials:

a. Aluminum: Sheet and extrusions of the alloys and tempers specified by the manufacturer for strength, durability and proper application of finish.

b. Cover and Curb: 11 gage; ASTM B221 and ASTM B209, 6063T5 alloy

c. Cover and Curb Liner: 14 gage; ASTM B221 and ASTM B209, 3003H14 alloy

d. Finish: Class I high density clear anodized coating, AMP 500 Aluminum Association Designation A41

e. Insulation (Curb and Cover): 3" concealed polyisocyanurate insulation, between aluminum panels with R-Value of 20.

f. Gaskets: Fingered design; polyvinylchloride

3. Equip units with custom self-lifting mechanism. Provide custom ASTM A666 stainless steel hardware including hold-open devices, hinges, compression spring operators enclosed in telescopic tubes, latch, and operating handles for inside operation. Equip units with hardware for manual release operation from outside.

4. Provide manufacturer’s recommended operable steel safety posts mounted at center of roof ladder rungs.

5. Provide manufacturer’s railing and gate around hatch in compliance with OSHA. Railing and gate shall be supported by manufacturer’s reinforced roof hatch curb.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Shop-fabricate each unit complete with framing, gaskets, structure, curbs, flashing, well-liners, hardware, accessories, anchorage provisions and other components. Disassemble only to the extent necessary for delivery and installation.

B. Construct units for live loading specified using manufacturer's custom fabrication details. Reinforce as required with aluminum structural sections to order to provide resistance to the loading specified.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Inspection

1. The Contractor shall examine the substrate and the conditions under which the roof hatch work is to be performed, and notify Engineer in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

B. Preparation

1 Clean the substrate of dust, debris, substances and interferences detrimental to the Work and prepare substrates as recommended by the roof hatch manufacturer.

3.02 INSTALLATION

A. Separate dissimilar metals from substrates and from each other by painting each metal surface in the area of contact with a 15-mil thick application of bituminous coating, as recommended by the manufacturers of the dissimilar metals.

B. Bed flanges of set-on accessories in a compound which is compatible with roofing and flashing and which is acceptable to, and consistent with material and detailing requirements of, the manufacturer of roofing for guaranteed construction. On sloping decks, flash flanges with other work for proper water shed.

C. Anchor roof hatch permanently to the substrate, by approved methods which are adequate for the sizes and locations of units and which shall provide permanent resistance to loading specified.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Protect roof hatch Work until Final Acceptance.

B. Do not permit workmen, or others, to step directly on roof hatches in place, or to place or move equipment over roof hatch surfaces. Protect surfaces during installation of Elastomeric Membrane Roofing, sheet metal flashing work and other adjoining work.

C. Neutralize excess flux as work progresses with five percent to ten percent washing soda solution and rinse thoroughly.

D. Clean exposed surfaces of every substance which is visible or might cause corrosion or prevent uniform oxidation of the metal surfaces. Exercise extreme care to remove fluxes and ferrous metal particles, including welding splatter and grinding dust.

E. Do not leave metal debris and discarded materials at the site of the work. Clean each site of the work as the work progresses on a daily basis.

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the general requirements for firestopping systems for penetrations and joints in building floors and walls at and through fire rated walls and floors and in order to maintain fire resistance rating of enclosure.

B. Complete technical services from the approved firestopping manufacturers and on-site technical representation by their Technical Representatives during the time of delivery, storage and installation of the work of this Section and during other work which may affect the work of this Section as specified herein is also included.

C. The Contractor shall provide all labor, materials, equipment and incidentals necessary to perform the work of this Section as shown on the Contract Drawings, specified herein or required otherwise for a complete job.

D. The Contractor shall implement practices and procedures to meet the project's sustainability goals as identified in the Contract Documents. The Contractor shall ensure that the sustainability requirements of this Section are implemented to the fullest extent.

E. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used.

1.04 REFERENCES

A. NYCBC -- New York City Building Code

B. ASTM E 84 -- Test Method for Surface Burning Characteristics of Building Materials.

C. ASTM E 119 -- Test Methods for Fire Tests of Building Construction and Materials.

D. ASTM E 814 -- Test Method for Fire Tests of Through-Penetration Fire Stops.

E. ASTM E 1966 -- Test Method for Fire-Resistive Joint Systems.

F. ASTM E 2174 -- Standard Practice for On-Site Inspection of Installed Fire Stops.

G. ASTM E-2393 -- Standard Practice for On-Site Inspection of Installed Fire Stop Joint Systems.

H. ASTM E 2307 -- Test Method for Determining Fire Resistance of Perimeter Barrier Systems Using Intermediate-Scale, Multi-Story Test Apparatus.

I. CFR 59, Subpart D-2005 -- National Volatile Organic Compound Emission Standards for Architectural Coatings.

J. CFR 40 CFR 59, Subpart D (EPA Method 24) -- National Volatile Organic Compound Emission Standards for Architectural Coatings.

K. FM Global 4991-2001 -- Approval of Firestop Contractors (FCIA) Building Materials Approval Guide, 2007.

L. Intertek ETL SEMCO -- Directory of Listed Building Products, 2007.

M. UL 1479-2003 -- Fire Tests of Through-Penetration Firestops (ANSI).

N. UL 2079-2004 -- Tests for Fire Resistance of Building Joint Systems (ANSI).

O. UL Fire Resistance Directory.

P. UL Qualified Firestop Contractor Program Requirements, 2006

1.05 DESCRIPTION

A. The Work shall include but is not limited to:

1. Penetrations in fire-resistance-rated walls.

2. Penetrations in horizontal assemblies.

3. Penetrations in smoke barriers.

4. Joints in or between fire-resistance-rated constructions.

5. Joints at exterior curtainwall/floor intersections.

6. Joints in smoke barriers.

B. Coordinate the schedule of firestopping, which denotes the quantity and type of all firestopping required, with the schedule of firestopping required by Subcontractors and other contractors.

1. Provide a schedule of required firestops. Schedule is to include:

a. Quantity of penetrations.

b. Material being penetrated (i.e., concrete slab, masonry wall, include thickness of material).

c. Quantity, size and material of penetrant (i.e., single ¾" EMT conduit, five 2" metal conduit, insulated ¼" copper refrigerant pipes, 1" PVC condensate pipe, 2" gas fire suppression pipe).

d. Height above finished floor (AFF).

C. Fire Rating: Where caulking and sealant systems are applied within a fire rated room, corridor, egress path, and as indicated in the Contract Drawings, those caulking and sealant systems shall maintain the fire rating of the location in which application is being done.

D. Substitutions

1. Do not change products, system components, colors or manufacturers after Shop Drawing and Samples approvals by Engineer.

2. Clearly identify, in a manner which is highlighted to Engineer, all proposed substitutions, modifications, variations, unspecified features and "or equal" products. Provide complete comparative data with specified products at time of Shop Drawing submission.

E. Sustainable Design Requirements

1. Low Emitting Materials: Sealants and sealant primers used on site and within the building's weatherproofing system shall comply with the following limits for VOC content:

a. Architectural Sealants: 250 g/L.

b. Sealant Primers for Nonporous Substrates: 250 g/L.

c. Sealant Primers for Porous Substrates: 775 g/L.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL

and found to comply with its "Qualified Firestop Contractor Program Requirements."

B. Fire-Test-Response Characteristics: Penetration firestopping and fire-resistive joint systems and shall comply with the following requirements:

1. Penetration firestopping and fire-resistive joint systems tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.

2. Penetration firestopping and fire-resistive joint systems are identical to those tested per testing standard description. Provide rated systems complying with the following requirements:

a. Penetration firestopping and fire-resistive joint systems products bear classification marking of qualified testing and inspecting agency.

b. Classification markings on penetration firestopping and fire-resistive joint systems correspond to designations listed by the following:

1) UL in its "Fire Resistance Directory."

2) Intertek ETL SEMKO in its "Directory of Listed Building Products."

3) FM Global in its "Building Materials Approval Guide.":

C. Special Inspections: Provide Special Inspections in accordance with NYCBC Chapter 17 and Section 01 45 33, Code required Special Inspections and Procedures.

D. Pre-Installation Meeting: Conduct conference at Site to review the following:

1. Status of all submittals, including samples.

2. Status of substrate preparation.

3. Status of environmental conditions.

4. Review testing requirements of the Special Inspections and governing codes.

1.07 SUBMITTALS

A. The Contractor shall submit the following to the Engineer for review and approval.

1. Product Data:

a. Copies of manufacturer’s technical data and installation instructions for each component of the firestopping Work, including certification that firestopping Work meets the specified requirements.

b. UL Design or equal assembly for each type of firestopping, penetration type and location.

2. Certificates:

a. From Installer indicating penetration firestopping and fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

3. Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for firestopping.

B. Shop Drawings:

1. Plans indicating proposed layout and locations of all firestopping Work.

2. Product Schedule: For each penetration firestopping fire-resistive joint system. Include location and design designation of qualified testing and inspecting agency. Refer to Part 3 for format of schedules to be followed.

a. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping and fire-resistive joint systems condition, submit illustration, with modifications marked, approved by penetration firestopping and fire resistive joint systems manufacturer's fire-protection engineer as an engineering judgment or equivalent fire- resistance-rated assembly.

b. Guarantee: Copies of written guarantee agreeing to repair or replace sealants which fail to perform as specified.

3. Sustainable Design Submittals:

a. Environmental Materials Reporting Form (EMRF) Recycled Content. Provide the following information:

1) Name of Product and Manufacturer.

2) Material cost breakdowns. Cost breakdowns must include total material-only cost (excluding installation, labor and equipment).

3) The percentage (by weight) of post-consumer and pre-consumer recycled content in the submitted product(s), if applicable.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Deliver materials in caulking and sealant manufacturer's original unopened and undamaged containers, with information accurately representing container contents as approved by Engineer at time of Shop Drawing and Samples submissions.

2. Include the following information on the label:

a. Name of material and supplier.

b. Formula or specification number, lot number, color and date of manufactures.

c. Mixing instructions, shelf life and curing time when applicable.

3. Failure to comply with these requirements shall be sufficient cause for rejection of the material in question, by Engineer, and his requiring its removal from the site. Supply new material conforming to the specified requirements at no additional expense to the City.

B. Storage of Materials:

1. Store materials so as to preclude foreign materials.

2. Do not store or expose materials to temperature above 90 F or store in direct sunshine.

3. Do not use materials which are outdated as indicated by shelf life.

4. Store sealant tape in a manner which will not deform the tape.

5. In cool or cold weather store containers where temperature approximates 75ºF for 16 hours before using.

6. When high temperatures prevail store mixed sealants in a cool place.

C. Handling:

1. Handle materials carefully to prevent inclusion of foreign materials.

2. Do not open containers or mix components until necessary preparatory work and priming has been completed.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Firestopping Systems: Provide one of the following:

1. 3M Fire Protection Products.

2. Tremco Fire System Group, an RPM Company, Beachwood, OH.

3. Hilti Incorporated.

4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Penetration Firestopping Performance:

1. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire- resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

2. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

   a. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.

   b. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

3. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

   a. Horizontal assemblies include floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.

   b. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.

   c. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

4. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.

   a. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.

5. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.

6. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

7. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

   a. Sealants: 250 g/L.

   b. Sealant Primers for Nonporous Substrates: 250 g/L.

c. Sealant Primers for Porous Substrates: 775 g/L.

8. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

   a. Permanent forming/damming/backing materials, including the following:

      1) Slag-wool-fiber or rock-wool-fiber insulation.

      2) Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.

      3) Fire-rated form board.

      4) Fillers for sealants.

   b. Temporary forming materials.

   c. Substrate primers.

   d. Collars.

   e. Steel sleeves

B. Fill Materials

1. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

2. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

3. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

4. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

5. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

6. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

7. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated

for mixing with water at Project site to form a non-shrinking, homogeneous mortar.

8. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

9. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

10. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

    a. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and non-sag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of non-sag grade for both opening conditions.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Mixing

1. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examination

1. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

2. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Preparation

1. Surface Cleaning: Clean out openings immediately before installing firestopping to comply with manufacturer's written instructions and with the following requirements:

a. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of firestopping.

b. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.

c. Remove laitance and form-release agents from concrete.

2. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.02 INSTALLATION

A. General: Install firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

D. The heights of the fire penetrations shall be at these approximate heights:

1. Above 10 feet above finished floor (AFF): 100% of the penetrations.

E. Identification:

1. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

   a. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."

   b. Contractor's name, address, and phone number.

   c. Designation of applicable testing and inspecting agency.

   d. Date of installation.

   e. Manufacturer's name.

   f. Installer's name.

3.03 FIELD TESTING / QUALITY CONTROL

A. Contractor shall provide the services of a field technical representative authorized by the manufacturer of the firestopping to perform on-Site, in-progress inspections at no additional cost to the DEP.

B. Certify that the completed Work is in accordance with these Specifications and without damage or deterioration at the time of Final Acceptance.

C. Inspection – Independent inspection agency employed and paid by DEP, will examine penetration firestopping in accordance with ASTM E – 2174, “Standard Practice for On-Site Inspection of Installed Fire Stops and ASTM E-2393, “Standard Practice for On-Site Inspection of Installed Fire Stop Joint Systems. Inspection agency to examine firestopping and will determine, in general, that firestopping has been installed in compliance with requirements of tested and listed firestop system, and installation process conforms to FM 4991 – Standard for Approval of Firestop Contractors or UL Qualified Firestop Contractor Program.

D. The inspector shall advise the Contractor of any deficiencies noted within one (1) working day.

E. Do not proceed to enclose firestopping with other construction until inspection agency has verified that the firestop installation complies with the requirements.

F. Where deficiencies are found, repair or replace the firestopping so that it complies with requirements of tested and listed system design.

3.04 STARTUP / DEMONSTRATION

A. Sample Penetration Firestopping Schedule (Contractor shall provide completed schedule based on construction and penetrations encountered.)

1. Submit a schedule in the format indicated below. List each type of penetration firestopping product required. Include all information listed for each product. Indicate location of product on the plans submitted under Article 1.4. Insert the number of the firestopping type in (--1--) below as means of identifying location of each penetration firestopping application on Drawings; insert number to complete drawing designations. Submit multiple system numbers for each location if required. Insert the UL-Classified Systems number in (--2--) below. Insert the product and manufacturer for each firestopping type in (--3--) below.
2. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
    a. Firestopping with No Penetrating Items; FS-(--1--):
        1) UL-Classified Systems: (--2--).
        2) Product and Manufacturer: (--3--)
    b. Firestopping for Metallic Pipes, Conduit, or Tubing FS-(--1--):
        1) UL-Classified Systems: (--2--).
        2) Product and Manufacturer: (--3--).
    c. Firestopping for Nonmetallic Pipe, Conduit, or Tubing FS-(--1--):
        1) UL-Classified Systems: (--2--).
        2) Product and Manufacturer: (--3--).
    d. Firestopping for Electrical Cables; FS-(--1--):
        1) UL-Classified Systems: (--2--).
        2) Product and Manufacturer: (--3--).
    e. Firestopping for Cable Trays with Electric Cables; FS-(--1--):
        1) UL-Classified Systems: (--2--).
        2) Product and Manufacturer: (--3--).
    f. Firestopping for Insulated Pipes; FS-(--1--):
        1) UL-Classified Systems: (--2--).
        2) Product and Manufacturer: (--3--).
    g. Firestopping for Miscellaneous Electrical Penetrants FS-(--1--):
        1) UL-Classified Systems: (--2--).
        2) Product and Manufacturer: (--3--).
    h. Firestopping for Miscellaneous Mechanical Penetrants; FS-(--1--):
        1) UL-Classified Systems: (--2--).
        2) Product and Manufacturer: (--3--).

i. Firestopping for Groupings of Penetrants; FS-(--1--):

1) UL-Classified Systems: (--2--).

2) Product and Manufacturer: (--3--).

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated firestopping and install new materials to produce systems complying with specified requirements.

C. Protect the sealants during the construction period so that they will be without deterioration, soiling, or damage at the time of Substantial Completion.

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the general requirements for caulking and sealant systems for openings and joints in building roofs and walls between concrete-in-place, masonry units, metal roof flashing, and other equipment and structures in order to provide a positive barrier against the passage of air and moisture.

B. Complete technical services from the approved caulking and sealant manufacturers and on-site technical representation by their Technical Representatives during the time of delivery, storage and installation of the work of this Section and during other work which may affect the work of this Section as specified herein is also included.

C. The Contractor shall provide all labor, materials, equipment and incidentals necessary to perform the work of this Section as shown on the Contract Drawings, specified herein or required otherwise for a complete job.

D. The Contractor shall implement practices and procedures to meet the project's sustainability goals as identified in the Contract Documents. The Contractor shall ensure that the sustainability requirements of this Section are implemented to the fullest extent.

E. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used.

1.04 REFERENCES

A. NYCBC -- New York City Building Code

B. ASTM C510 -- Staining and Color Change of Single or Multi component Joint Sealers, Standard Test Method for

C. ASTM C661 -- Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer, Standard Test Method for

D. ASTM C793 -- Effects of Laboratory Accelerated Weathering on Elastomeric Joint Sealants, Standard Test Method for

E. ASTM C794 -- Adhesion-in-Peel of Elastomeric Joints Sealants, Standard Test Method for

F. ASTM C920 -- Elastomeric Joint Sealants, Standard Specification for

G. ASTM C1247 – Durability of Sealants Exposed To Continuous Immersion In Liquids, Standard Test Method for

1.05 DESCRIPTION

A. System Design Requirements

1. The caulking and sealant systems to be furnished under the work of this Section shall include two-part elastomeric sealants, components, accessories and miscellaneous materials used for sealing joints in horizontal and vertical planes.

2. The Work shall include but is not limited to:

a. All joints between cast-in-place concrete and masonry;

b. All cast-in-place concrete to cast-in-place concrete expansion joints;

c. All joints between masonry and metal;

d. All control joints in masonry and concrete;

e. All isolation joints between equipment and other items; and

f. Joints were construction systems are discontinuous or inherently non-watertight.

3. The Work shall be performed at all locations whether or not indicated required to render the building watertight except where a construction system is specifically specified or shown as not relying upon the use of sealants in order to achieve weather- and water tightness.

4. Fire Rating:

a. Where caulking and sealant systems are applied within a fire rated room, corridor, egress path, and as indicated in the Contract Drawings, those caulking and sealant systems shall maintain the fire rating of the location in which application is being done.

B. Substitutions

1. Do not change products, system components, colors or manufacturers after Shop Drawing and Samples approvals by Engineer.

2. Clearly identify, in a manner which is highlighted to Engineer, all proposed substitutions, modifications, variations, unspecified features and "or equal" products. Provide complete comparative data with specified products at time of Shop Drawing submission.

C. Sustainable Design Requirements

1. Low Emitting Materials: Sealants and sealant primers used on site and within the building's weatherproofing system shall comply with the following limits for VOC content:

a. Architectural Sealants: 250 g/L.

b. Sealant Primers for Nonporous Substrates: 250 g/L.

c. Sealant Primers for Porous Substrates: 775 g/L.

1.06 QUALITY ASSURANCE

1. Engage a single manufacturer who shall provide the services of a Technical Representative who shall assist Contractor and Engineer by providing technical opinions on the adequacy of materials and methods of installation based on Shop Drawings approved by Engineer.

a. Provide such services during the time of delivery, storage, handling and installation of all caulking and sealant system components.

2. Test caulking and sealants for compatibility with the substrates specified for conformance to current industry standards, and recommend remedial procedures as required.

B. Installer Qualifications: Engage a single installer skilled, trained and with successful experience in the application of the types of material required and who agrees to employ only tradesmen with specific skill and successful experience in this type of work.

C. Performance Criteria: Do not provide exposed caulking and sealant work for metal batten roofing, sheet metal flashing and trim or custom preformed metal

siding work in order to render the work watertight. These construction systems shall be detailed, fabricated and provided such that they are inherently watertight without the use of additional caulking, sealant, elastomeric compounds, asphaltic compounds or other similar materials.

D. Compatibility: Before purchase of each specified sealant, investigate its compatibility with the joint surfaces, joint fillers and other materials in the joint system. Provide only materials (manufacturer's recommended variation of the specified materials) which are known to be fully compatible with the actual installation condition, as shown by manufacturer's published data or certification.

1.07 SUBMITTALS

A. The Contractor shall submit the following to the Engineer for review and approval.

1. Samples:

a. Actual cured material samples of each type of caulking and sealant specified, 4-inches long, in each of the manufacturer's standard colors.

b. Samples will be reviewed by Engineer for color and texture only.

c. Compliance with other requirements is the responsibility of Contractor.

B. Shop Drawings:

1. Copies of manufacturer's specifications, recommendations and installation instructions for each type of sealant, caulking compound and associated miscellaneous material required. Include manufacturer's published data, indicating that each material complies with the requirements and is intended for the applications shown.

2. Test Reports:

a. Compatibility tests for substrates, based on adhesion-in-peel standard test procedures and ASTM C920.

b. Copies of certified laboratory test reports indicating conformance with the requirements specified.

3. Guarantee:

a. Copies of written guarantee agreeing to repair or replace sealants which fail to perform as specified.

4. Sustainable Design Submittals:

a. Environmental Materials Reporting Form (EMRF) Recycled Content. Provide the following information:

1) Name of Product and Manufacturer.

2) Material cost breakdowns. Cost breakdowns must include total material-only cost (excluding installation, labor and equipment).

3) The percentage (by weight) of post-consumer and pre-consumer recycled content in the submitted product(s), if applicable.

5. VOC Reporting Form.

a. For all sealants and sealant primers used on site and within the building's weatherproofing system, provide the VOC content in grams/Liter (g/L) less water and other exempt compounds.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Deliver materials in caulking and sealant manufacturer's original unopened and undamaged containers, with information accurately representing container contents as approved by Engineer at time of Shop Drawing and Samples submissions.

2. Include the following information on the label:

a. Name of material and supplier.

b. Formula or specification number, lot number, color and date of manufactures.

c. Mixing instructions, shelf life and curing time when applicable.

3. Failure to comply with these requirements shall be sufficient cause for rejection of the material in question, by Engineer, and his requiring its removal from the site. Supply new material conforming to the specified requirements at no additional expense to the City.

B. Storage of Materials:

1. Store materials so as to preclude foreign materials.

2. Do not store or expose materials to temperature above 90 F or store in direct sunshine.

3. Do not use materials which are outdated as indicated by shelf life.

4. Store sealant tape in a manner which will not deform the tape.

5. In cool or cold weather store containers where temperature approximates 75°F for 16 hours before using.

6. When high temperatures prevail store mixed sealants in a cool place.

C. Handling:

1. Handle materials carefully to prevent inclusion of foreign materials.

2. Do not open containers or mix components until necessary preparatory work and priming has been completed.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Exterior and Interior Joints in Vertical Planes: Provide one of the following:

1. Dymeric 240FC as manufactured by Tremco Incorporated, an RPM Company, Beachwood, OH.
2. Sikaflex-2C NS as manufactured by Sika Corporation, Lindhurst, NJ.
3. Or approved equal.

B. Exterior and Interior Joints in Horizontal Planes: Provide one of the following:

1. THC 900/ 901 as manufactured by Tremco Incorporated, an RPM Company, Beachwood, OH.
2. Sikaflex-2C SL as manufactured by Sika Corporation, Lindhurst, NJ.
3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Exterior and Interior Joints in Vertical Planes:

1. Urethane-based, two-component elastomeric sealant complying with the following:
   a. ASTM C 920 Adhesion-in-Peel, ASTM C 920and ASTM C794: Minimum 10 lbs/linear inch with no adhesion failure.
   b. Hardness (Standard Conditions), ASTM C661: 20-25 (Shore A).
   c. Stain and color change, ASTM C 920 and ASTM C510: No discoloration or stain.
   d. Accelerated Aging, ASTM C793: No change in sealant characteristics after 250 hours in weather meter.
   e. Rheological Vertical Displacement at 120 F, ASTM C 920: No sag.

B. Exterior and Interior Joints in Horizontal Planes:

1. Polyurethane-based, two-component elastomeric sealant complying with the following:

a. ASTM C 920Water Immersion Bond, ASTM C1247: Elongation of 25% with no adhesive failure.

b. Hardness (Standard Conditions), ASTM C661: 30-40.

c. Stain and Color Change, ASTM C1247 and ASTM C510: No discoloration or stain.

d. Accelerated Aging, ASTM C793: No change in sealant characteristics after 250 hours in weather meter.

C. Provide colors selected by Engineer from caulking and sealant manufacturer's standard color charts. Engineer will select a maximum of ten colors for the Work. Manufacturers supplying sealants other than those specified above must provide the same colors available from those specified.

D. Miscellaneous Materials:

1. Joint Cleaner: Provide the type of joint cleaning compound recommended by the sealant and caulking manufacturer, for the joint surfaces to be cleaned.

2. Joint Primer and Sealer: Provide the type of joint primer and sealer recommended by the caulking and sealant manufacturer, for the joint surfaces to be primed or sealed.

3. Bond Breaker Type: Polyethylene tape or other plastic tape as recommended by the caulking and sealant manufacturer, to be applied to sealant-contact surfaces where bond to the substrate or joint filler must be avoided for proper performance of caulking and sealant. Provide self-adhesive tape wherever applicable.

4. Sealant Backer Rod: Compressible rod stock polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable non absorptive material as recommended for compatibility with caulking and sealant by the caulking and sealant manufacturer. Provide size and shape of rod which will control the joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide a highly compressible backer to minimize the possibility of sealant extrusion when joint is compressed.

5. Low Temperature Catalyst: Provide the type recommended by the caulking and sealant manufacturer.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Mixing

1. Comply with sealant manufacturer's written instructions for mixing 2-component sealants.

2. Thoroughly mix components before use.

3. Add entire contents of activator can to base containers. Do not mix partial units.

4. Mix contents for a minimum of 5 minutes or as recommended by the sealant manufacturer, until color and consistency are uniform.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examination

1. The Contractor shall examine the joint surfaces, substrates, backing, and anchorage of units forming sealant rabbet, and the conditions under which the caulking and sealant work is to be performed, and notify Engineer in writing of any condition detrimental to the proper and timely completion of the Work and the performance of the sealant systems. Do not proceed with the caulking and sealant work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

B. Joint Surface Preparation

1. Clean joint surfaces immediately before installation of sealant compound. Remove dirt, insecure coatings, moisture and other substances which would interfere with bonds of sealant compound as recommended by sealant manufacturer's written instructions.

2. Etch concrete and masonry joint surfaces to remove excess alkalinity, unless sealant manufacturer's written instructions indicate that alkalinity does not interfere with sealant bond and performance.

a. Etch with 5 percent solution of muriatic acid.

b. Neutralize with dilute ammonia solution.

c. Rinse thoroughly with water and allow to dry before sealant installation.

3. If necessary, clean porous materials such as concrete and masonry by grinding, abrasive blasting or mechanical abrading. Blow out joints with oil-free compressed air, or by vacuuming joints prior to application of primer or sealant.

4. Roughen joint surfaces on vitreous coated and similar non-porous materials, wherever sealant manufacturer's data indicates lower bond strength than for porous surfaces. Rub with fine abrasive cloth or wool to produce a dull sheen.

3.02 INSTALLATION

A. Comply with sealant manufacturer's written instructions except where more stringent requirements are shown or specified and except where manufacturer's technical representative directs otherwise.

B. Prime or seal the joint surfaces wherever recommended by the sealant manufacturer. Do not allow prime or sealer to spill or migrate onto adjoining surfaces. Allow primer to dry prior to application of sealants.

C. Apply masking tape before installation of primer, in continuous strips in alignment with the joint edge to produce sharp, clean interface with adjoining materials. Remove tape immediately after joints have been sealed and tooled as directed.

D. Do not install sealants without backer rods or bond breaker tape.

E. Roll the back-up rod stock into the joint to avoid lengthwise stretching. Do not twist, braid, puncture or prime backer-rods.

F. Employ only proven installation techniques, which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of the joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.

G. Install sealants to depths as recommended by the sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead.

1. For horizontal joints in sidewalks, pavements and similar locations sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75 percent of joint width, but not more than 5/8-inch deep or less than 3/8-inch deep.

2. For vertical joints subjected to normal movement and sealed with elastomeric sealants, but not subject to traffic, fill joints to a depth equal to 50 percent of joint width, but not more than 1/2-inch deep or less than 1/4-inch deep.

A. Project Conditions / Environmental Conditions:

1. Do not proceed with installation of caulking and sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.

2. Proceed with the work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength.

3. Wherever joint width is affected by ambient temperature variations, install elastomeric sealants only when temperatures are in the lower third of manufacturer's recommended installation temperature range, so that

sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures.

4. When high temperatures prevail avoid mixing sealants in direct sunlight.

B. Remove excess and spillage of compounds promptly as the Work progresses.

C. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.

3.03 FIELD TESTING / QUALITY CONTROL

A. Where questions of compatibility of sealants and substrate arise the sealant manufacturer shall test the substrate in question for compatibility with the specified sealant and report his findings, with recommendations, to Engineer. Any required sealant change shall be at no additional expense to the City.

B. Do not proceed with installation of elastomeric sealants over joint surfaces which have been painted, lacquered, waterproofed or treated with water repellent or other treatment or coating unless a laboratory test for durability (adhesion), in compliance with Paragraph 4.3.9 of ASTM C 920 has successfully demonstrated that sealant bond is not impaired by the coating or treatment. If laboratory test has not been performed, or shows bond interference, remove coating or treatment from joint surfaces before installing sealant.

C. After nominal cure of exterior joint sealants which are exposed to the weather, test for water leaks. Flood the joint exposure with water directed from a 3/4-inch garden hose, without nozzle, held perpendicular to wall face, 2 feet-0 inch from joint and connected to a water system with 30 pounds per square inch minimum normal water pressure. Move stream of water along joint at an approximate rate of 20 feet per minute.

D. Test approximately 5 percent of total joint system, in locations which are typical of every joint condition, and which can be inspected easily for leakage on opposite face. Conduct test in the presence of Engineer, who will determine the actual percentage of joints to be tested and the actual period of exposure to water from the hose, based upon the extent of observed leakage, or lack thereof.

E. Where nature of observed leakage indicates the possibility of inadequate joint bond strength, Engineer may direct that additional testing be performed at a time when joints have been fully cured, followed by natural exposure through both extreme temperatures and returned to the lowest range of temperature in which it is feasible to conduct testing. Perform testing as directed at any time within 24 months of installation date.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Protection: Do not allow caulking and sealants to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces including rough

textured materials. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either the primer/sealer or the caulking and sealant materials.

B. Repair sealant installation at leaks or, if leakage is excessive, replace sealant installation as directed.

C. Clean adjacent surfaces of sealant or soiling resulting from the Work. Use solvent or cleaning agent recommended by the sealant manufacturer. Leave all finish work in a neat clean condition.

D. Protect the sealants during the construction period so that they will be without deterioration, soiling, or damage at the time of the City's Final Acceptance.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 08 11 19 – STAINLESS-STEEL DOORS AND FRAMES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish and install all doors, frames, transoms, sidelights, and associated equipment shown on the Contract Drawings and specified herein.

B. The Contractor shall implement practices and procedures to meet the project's sustainability goals as identified in the Contract Documents. The Contractor shall ensure that the sustainability requirements of this Section are implemented to the fullest extent.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 07 90 00 - Joint Protection

B. Section 08 71 01 - Finish Door Hardware

C. Section 08 81 03 - Glass, Plastic and Glazing

1.04 REFERENCES

A. Definitions

1. Environmental Product Declaration - A third-party-verified International Organization for Standardization (ISO) Series 14025 Type III declaration that quantifies environmental information on the life cycle of a product to enable comparisons between products fulfilling the same function.

B. Reference Standards

1.	ANSI/SDI A250.8	-	Steel Door Institute, Recommended Specification for Standard Steel Doors and Frames.
2.	ISO 14025	-	Environmental labels and declarations - Type III environmental declarations
3.	NFPA 80	-	National Fire Protection Association, Standard For Fire Doors and Other Opening Protectives
4.	NFPA 105	-	National Fire Protection Association, Standard For the Installation of Smoke Door Assemblies and Other Opening Protectives
5.	NFPA 252	-	National Fire Protection Association, Standard Methods of Fire Tests of Door Assemblies
6.	OTC Phase II		Ozone Transport Commission phase II regulations
7.	UL 10B	-	Underwriters Laboratories, Fire Tests of Door Assemblies
8.	UL 10C	-	Underwriters Laboratories, Positive Pressure Fire Tests of Door Assemblies

1.05 DESCRIPTION

A. The Contractor shall be responsible for coordinating all work in this Section with work covered under Section 08 71 01 - Finish Door Hardware.

B. Sustainable Design Requirements

1. Recycled Content of Stainless Steel Doors and Frames: Postconsumer recycled content plus one-half of pre-consumer recycled content shall not be less than 30 percent.

2. Low Emitting Materials: Paints, coatings, sealants, and adhesives used on site and within the building's weatherproofing system shall meet the VOC content limits of OTC Phase II.

1.06 QUALITY ASSURANCE

A. Provide stainless steel doors and frames and accessories manufactured by a single firm specializing in the production of this type of Work and complying with specified standards of ANSI, NFPA, SDI and UL.

B. Materials and Equipment Compliance:

1. Materials and equipment submitted for DEP's approval by the Contractor shall have met, at the time of their submittal, the certification and material acceptance requirements of the NYC Department of Buildings, unless otherwise required by the Authority Having Jurisdiction over the Work.

2. All materials provided under this Section shall comply with the Contract Documents.

3. Comply with all applicable requirements of governing authorities and codes for all work.

C. Fire rated Assemblies: Wherever fire-resistance classification is shown or scheduled for stainless steel doors and frames (3-hour, 1-1/2-hour, and similar designations), provide fire-rated assemblies investigated and tested as complete assemblies including type of fire door hardware to be used. Identify each fire door, frame and stick system assembly with recognized testing laboratory labels, indicating applicable fire rating of both door, frame and stick assembly.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings for approval by the Engineer. Submittals shall include, but not be limited to the following:

1. Samples.

2. Shop Drawings.

B. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed materials compliance with the Contract Documents.

C. Samples shall include:

1. Corner sections of frames and trim.

2. Cut-away corner sections of hollow metal doors showing internal reinforcement specified.

3. Insulating material.

D. Shop Drawings shall include, but not be limited to:

1. Complete layout and installation drawings and schedules with clearly marked dimensions. Drawings shall indicate details of construction, profiles, gauges, reinforcing and location of all doors and frames.

E. Sustainability Submittals:

1. Environmental Product Declarations

a. The Contractor shall provide product-specific type III Environmental Product Declaration (EPD) conforming to ISO 14025, 14044.

2. Envision Submittals

a. The Contractor shall report information pertaining to the sustainable procurement, regional sourcing, and/or recycled content of new materials to be procured during the Work, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall coordinate with its vendor on sustainable product requirements as stipulated by the Contractor's approved New Materials Sustainable Implementation Plan, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall submit vendor shop drawings for review by the Engineer that clearly illustrate the vendor is meeting the requirements as approved in the Contractor's New Materials Sustainable Implementation Plan.

3. VOC Reporting Form. Provide the following information:

a. For all paints, coatings, sealants and adhesives used on site and within the building's weatherproofing system provide the VOC content in grams/Liter (g/L) less water and other exempt compounds.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Materials shall not be delivered to the project site before the time of installation.

2. Materials shall be delivered in sufficient quantities to allow continuity of the work.

B. Storage of Materials:

1. Materials shall be stored in original, undamaged packaging with manufacturer's labels and seals intact.

2. All materials shall be stored in a dry, enclosed area, off the ground and away from all possible contact with water, ice or snow.

3. Damage to materials during storage shall be prevented primarily by minimizing the amount of time they are stored at the site before being incorporated into construction systems.

4. Protection shall be arranged to protect all hardware which may be attached.

C. Handling of Materials:

1. Materials shall be handled carefully in order to avoid damage or breakage.

2. Materials shall not be exposed to detrimental conditions or physical damage. Materials which are so exposed shall be removed from the site and shall not be incorporated into the work.

3. Packages shall not be opened until all necessary preparatory work is complete and installation is to begin immediately. Materials shall not be allowed to become wet or soiled or covered with ice or snow.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Door Component Inc., North Plainfield, NJ;

B. Medallion Entry Systems, Inc., Indianapolis, IN;

C. Or an approved equal.

2.02 MATERIALS / EQUIPMENT

A. Stainless Steel Doors

1. Doors shall be of the finest commercial quality No. 16 gauge Type 316 stainless steel, 1-3/4-inch thick, of sizes shown. Doors shall be series "CH" Seamless Honeycomb Core doors.

2. Door louvers in fireproof doors shall be Model L as manufactured by:

3. Finish of all doors and frames shall be #4 finish.

4. All doors shall be provided with stainless steel tags, 1/2-inch diameter x 1/16-inch thick, stamped with the door number and black Japan-filled; numbers shall conform to those in the Door Schedule.

5. Doors shall have a one-piece Kraft honeycomb core securely bonded under heat and pressure to both face sheets. Honeycomb core shall have a 1" hexagonal cell impregnated with phenolic resin. There shall be no seams

on the faces or edges of the doors. Vertical edges shall be continuously heliarc welded, full height of the door. Exterior doors shall be capped to prevent moisture penetrating the door.

a. Exterior door leafs shall be insulated with U-Factor of 0.36.

6. Double doors shall have applied stainless steel astragals, 1/8-inch x 1- 1/2-inch.

7. Heads and jambs of frames shall be matched, mitered, welded and finished to present a smooth surface for finishing. Provide a minimum of 3 anchors per jamb, as well as clip angle for floor anchorage. Prepare frames for all hardware at factory from templates furnished. All hardware cutouts shall be reinforced with 1/8-inch plate welded to frame; 3/16-inch plate shall be used for hinge reinforcements.

8. Jambs shall be constructed to be set on the finished floor. Rubber mutes shall be shipped attached to lock jambs on single doors and on head members for double doors.

9. Glass for all doors shall be secured with moldings of No. 20 gauge stainless steel fastened with stainless steel counter-sunk oval head machine screws. The moldings shall be assembled as frames with corners welded.

10. All exterior doors shall be fully weather-stripped, as called for under Section 08 71 01 - Finish Door Hardware.

11. Louvers in fireproof doors shall be constructed of No. 18 gauge stainless steel and shall be equipped with a fusible link and automatic mechanism as approved by the New York City Building Department Office of Technical Certification and Research (OTCR) and finished to match face of door.

12. Proper concealed reinforcements of sheet or bar steel shall be provided for hardware and for all attached work. Reinforcement for butt side of doors shall be a continuous 3/16-inch stainless steel plate. Lock reinforcement shall be No. 12 gauge stainless steel sheet. Reinforcement for door closures, holders, checks and brackets shall be No. 12 gauge plate of length as required for finish hardware.

13. Reinforce tops and bottoms of door with minimum No. 16 gauge horizontal stainless steel closing channels, as integral part of door construction, welded continuously to the outer sheets. Close top and bottom edges to provide weather seal, using 16 gauge flush-mounted inverted closure channels continuously adhered to face sheets with structural silicone adhesive.

14. Edge profiles shall be provided on both stiles of doors beveled 1/8 inch in 2 inches.

B. Stainless Steel Frames

1. Materials shall be free from defects impairing strength, durability, and/or pressed as required for their respective function. Molded work shall have sharply defined profiles and arises, be clean and sharp. Work shall be of

proper dimensions to receive work of others. The indicated and specified thicknesses of the metal are minimum.

2. Gauges for steel used in the work shall be as follows:

	Steel Work	U.S. Gauge
1	Combination Metal Frames and Trim:	
	a. Exterior Combination Frames & Trim	No. 12
	b. Interior Combination Frames & Trim	No. 16
	c. Interior Combination Frames & Trim for Fire Rated Frames	No. 14
	d. Exterior Scribe Molding	No. 14
	e. Interior Scribe Molding	No. 18
	f. Exterior and Interior Angle Floor Knees, Adjustable Anchors, Slides and Adjustable Anchors	No. 16
	g. Fillers	As Required
2	Hardware Reinforcement:	
	a. Butts, Checks, Overhead Door Holders, Bracking Pulls	3/16" thick
	b. Locking Latches	No. 12
3	Trim	No. 16

C. Stainless Steel Combination Frames and Trim

1. Stainless steel combination frames and trim shall be placed at door openings, as shown on the Contract Drawings.

2. Stainless steel combination frames and trim shall be of size and approximate design shown on the Contract Drawings, have integrally molded trim and loose molds according to contours of details, reinforced, and drilled tapped for hardware. The type, as detailed, covers the general run of frames for the work but the forming shall be varied from that shown where indicted by special details or necessitated by other conditions.

3. Miter corners accurately, heliarc weld, and dress exposed joints to render same inconspicuous. Spreaders shall be of an approved type.

4. Frames shall extend to rough concrete slab, bottoms provided with suitable angle clips for securing to jambs. Heads of frames for openings wider than 3 feet shall be reinforced with angles or channels formed of No. 10 gauge stainless steel spot welded. Where waterproofing occurs, frames shall extend 1 inch below finished floor. Where required to receive labeled

ratings, frames shall be fabricated of gauges required and shall be provided with the necessary labels.

a. Provide stainless steel labels permanently attached to section of frame concealed by closed door.

5. Slots shall be provided at upper sections of vertical members for securing temporary wood blocking to which shall be nailed the braces for holding jambs in place while building walls. All doors frames shall be provided with rubber door silencers, not less than two (2) per jamb.

6. Rubber door silencers shall be shipped attached to lock jamb on single doors and on head members for double doors.

7. Provide holes as approved for fastening wood blocking and trim where such are required by the Drawings.

8. Finish for stainless steel frames shall be No. 4 Finish.

D. Anchors for Stainless Steel Frames

1. Door frames in concrete openings shall be anchored with 4 hex head stainless steel expansion bolts for each jamb and two hex head stainless steel expansion bolts for each head; where steel lintels occur, machine bolts shall be used. Removable stops shall be installed to cover the bolt heads, the stops to be fastened with counter sunk oval head screws.

2. Door frames in brick or hollow tile openings shall have adjustable anchors spaced 12 inches from the top and bottom of rough bucks and intermediate anchors shall be spaced not more than 30 inches apart on each side. Anchors shall slide on a No. 14 ga. 6-inch long steel strap securely welded to rough bucks. The leg extending into the wall shall be crimped No. 14 ga. steel at least 8 inches long where possible and 3 inches wide, except that the width shall not exceed the thickness of the masonry, nor shall the edge of the anchor come closer than 1/2 inch to the finished face of a wall.

3. Door frames in gypsum wall board partition walls shall be provided with welded-in steel anchors, which shall be screw-adjusted after the frame is installed, positioning the jambs solidly against wall structure.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Fabrication and Workmanship

1. All metal work shall be accurately fabricated and neatly assembled so as to be free from dents, tool marks, warpage, buckle or open joints. All lines shall be straight and true to curvatures as required, arises and angles as sharp as practical, moldings true to profile, mitres formed in true alignment and abutting profiles shall intersect accurately.

2. Molded members and moldings shall be as shown on the Contract Drawings, unless otherwise approved. Stock molding shall be as shown on the Contract Drawings unless otherwise approved. Stock moldings which

closely approximate the contours shown on the Contract Drawings will be accepted.

3. All items of template hardware, drilling and tapping shall be located by templates so that accurate alignment will be secured. Templates should be located before manufacturing is commenced.

4. All members shall be accurately fastened together so as to provide rigid construction in the assembled work. Removable members shall be secured with countersunk head tamperproof machine screws not more than 12 inches apart. All connections, except those of removable members shall be welded or interlocked.

5. All exposed face joints between members shall be continuously welded and dressed smooth and flush to be practically invisible.

6. Sinkages, cutouts and concealed reinforcement shall be provided as required for the proper installation and attachment of all hardware.

7. Sinkages shall be provided for butts lock fronts and strikes so that the exposed surfaces of hardware will finish flush with adjacent surfaces.

B. Labeled Work

1. Door openings to receive fire ratings as indicated on the Contract Drawings shall have frames and doors and equipment of gauges meeting the requirements for the rating noted by the OTCR. Frames and doors shall bear the necessary label and shall be labeled separately.

2. Each labeled door and frame shall be cut and reinforced to receive the type hardware required.

C. Hardware

1. Furnish and apply, in connection with this work, all hardware not requiring special finish such as screws, anchors, braces, bolts, etc., as required to erect this work properly.

2. Finishing hardware will be furnished under Section 08 71 01 Finish Door Hardware. This Contractor shall, however, receive, check, store and apply the finishing hardware insofar as it occurs in connection with work under this Section. Protect door knobs by covering with cloth pads securely wired in place and do not apply escutcheons and other trim until directed to do so, by the Engineer.

3. Specified manufacturer's supplemental and special reinforcement for hinges, surface applied closers, holders, coordinators, stops and strikes shall be manufacturer's standard but not less than specified and recommended for maximum heavy-duty construction.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. All doors and frames specified herein shall be neatly installed in designated locations indicated on Drawings.

B. Install in strict accordance with manufacturer's printed instructions and SDI standards and recommendations.

C. Fixed units shall be securely fastened in place and operative units adjusted to work properly.

D. Combination frames and trim shall be securely anchored in place with jambs filled solidly with mortar.

E. Do all necessary cutting, drilling and fitting for securing work in position including all necessary cutting, drilling and tapping of the work to accommodate the work of other trades. Drilling and tapping for non-template hardware shall be performed at the site.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. The Contractor shall provide protection against stains, dirt or damage to the finished installation. The doors shall be adjusted at installation for proper operation. At conclusion of construction, doors shall have any final adjustments made in order to place the doors in perfect operating condition.

B. Check and re-adjust all operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including all steel that is warped, bowed, scratched or otherwise damaged.

C. Upon completion of the project all finished work of this Section shall be carefully cleaned. Defective finish shall be removed and refinished, and all work left clean and perfect.

END OF SECTION

SECTION 08 16 13 – FIBERGLASS REINFORCED PLASTIC DOORS AND FRAMES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish and install all fiberglass reinforced plastic (FRP) doors, frames, and transoms and associated equipment shown on the Contract Drawings and specified herein.

B. The Contractor shall implement practices and procedures to meet the project's sustainability goals as identified in the Contract Documents. The Contractor shall ensure that the sustainability requirements of this Section are implemented to the fullest extent.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 08 71 01 - Finish Door Hardware

1.04 REFERENCES

A. ASCE 7-16 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures

B. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics

C. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position

D. ASTM D638 - Standard Test Method for Tensile Properties of Plastics

E. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics

F. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C With a Vitreous Silica Dilatometer

G. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

H. ASTM D2344 - Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials

J. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

K. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

L. NFPA 80 - National Fire Protection Association, Standard For Fire Doors and Other Opening Protectives

M. NFPA 105 - National Fire Protection Association, Standard For the Installation of Smoke Door Assemblies and Other Opening Protectives

N.	NFPA 252	-	National Fire Protection Association, Standard Methods of Fire Tests of Door Assemblies
O.	UL 10B	-	Underwriters Laboratories, Fire Tests of Door Assemblies
P.	UL 10C	-	Underwriters Laboratories, Positive Pressure Fire Tests of Door Assemblies Used

1.05 DESCRIPTION

A. Provide FRP door and frame components including, but not limited to, astragals, cores, faces, stiles, rails, heads, jambs, and internal reinforcement. Ensure all shapes are composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements in accordance with code requirements, and dimensions specified.

B. Ensure fiberglass reinforcements are a combination of continuous roving, continuous strand mat, and surfacing veil in sufficient quantities as needed by the application and/or physical properties required.

C. Verify resins are of isophthalic polyester with chemical formulation necessary for corrosion resistance, strength and other physical properties as required.

1. Chemical resistance to:

a. Sodium Bisulfite, 50% concentration.

b. Sodium Hypochlorite, 15% concentration.

D. Ensure all finished surfaces of FRP items and fabrications are smooth, resin-rich, free of voids and without dry spots, cracks, and un-reinforced areas. Completely cover all glass fibers with resin to protect against their exposure due to wear or weathering.

E. The Contractor shall be responsible for coordinating all Work in this Section with Work covered under Section 08 71 01 - Finish Door Hardware.

F. Sustainable Design Requirements

1. Low Emitting Materials: Paints, coatings, sealants, and adhesives used on site and within the building's weatherproofing system shall meet the VOC content limits listed below.

1.06 QUALITY ASSURANCE

A. Provide FRP doors and frames and accessories manufactured by a single firm specializing in the production of this type of Work and complying with specified standards of ASTM, ANSI, NFPA, and UL.

B. Materials and Equipment Compliance:

1. Materials and equipment submitted for DEP's approval by the Contractor shall have met, at the time of their submittal, the certification and material acceptance requirements of the NYC Department of Buildings, unless otherwise required by the Authority Having Jurisdiction over the Work.
2. All materials provided under this Section shall comply with the Contract Documents.
3. Comply with all applicable requirements of governing authorities and codes for all work.

C. Door and Frame Performance:

1. Design exterior and interior doors, frames and hardware to resist equivalent static design loads in accordance with ASTM F1642, with frame deflections not to exceed L/160 of the unsupported member lengths. Use equivalent static design loads for connections of the door frame to the surrounding walls or hardware and associated connections, in accordance with ASTM F2248 and ASTM E1300. Design supporting elements and their connections based on their ultimate capacities. Provide calculations prepared by a Professional Engineer that substantiates compliance with these requirements, including insulation materials. Use frames that provide an equivalent level of performance. Provide framing members with shape and thickness sufficient to withstand a design wind load of not less than 30 pounds per square foot of supported area with a deflection of not more than 1/175 times the length of the member and a safety factor of not less than 1.65.
2. Design doors and frames to provide for expansion and contraction of the component parts caused by an ambient temperature range of minus 0 to 100 degrees F causing buckling, opening of joints, overstressing of fasteners, or other harmful effects.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings for approval by the Engineer. Submittals shall include, but not be limited to the following:

1. Samples.
2. Shop Drawings.

B. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed materials compliance with the Contract Documents.

C. Samples shall include:

1. Corner sections of frames and trim.
2. Cut-away corner sections of doors showing internal reinforcement specified.

D. Shop Drawings shall include, but not be limited to:

1. Complete layout and installation drawings and schedules with clearly marked dimensions. Drawings shall indicate details of construction, profiles, gauges, reinforcing and location of all doors and frames.

E. Sustainable Design Submittals:

1. Environmental Materials Reporting Form (EMRF) Recycled Content. Provide the following information:

a. Name of Product and Manufacturer.

b. Material cost breakdowns. Cost breakdowns must include total material-only cost (excluding installation, labor and equipment).

c. The percentage (by weight) of post-consumer and pre-consumer recycled content in the submitted product(s), if applicable.

F. VOC Reporting Form. Provide the following information:

1. For all paints, coatings, sealants and adhesives used on site and within the building's weatherproofing system provide the VOC content in grams/Liter (g/L) less water and other exempt compounds.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Materials shall not be delivered to the project site before the time of installation.

2. Materials shall be delivered in sufficient quantities to allow continuity of the work.

B. Storage of Materials:

1. Materials shall be stored in original, undamaged packaging with manufacturer's labels and seals intact.

2. All materials shall be stored in a dry, enclosed area, off the ground and away from all possible contact with water, ice or snow.

3. Damage to materials during storage shall be prevented primarily by minimizing the amount of time they are stored at the site before being incorporated into construction systems.

4. Protection shall be arranged to protect all hardware which may be attached.

C. Handling of Materials:

1. Materials shall be handled carefully in order to avoid damage or breakage.

2. Materials shall not be exposed to detrimental conditions or physical damage. Materials which are so exposed shall be removed from the site and shall not be incorporated into the work.

3. Packages shall not be opened until all necessary preparatory work is complete and installation is to begin immediately. Materials shall not be allowed to become wet or soiled or covered with ice or snow. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. FRP Doors and Frames:

1. CORRIM Company, Oshkosh, WI.
2. Chem-Pruf Door Co Ltd, Brownsville, TX.
3. Tiger Door, Brownsville, TX.
4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Provide and install a seamless press-molded constructed FRP door. Laminate FRP face sheets to be applied while wet and uncured to an internal door stile and rail subframe/core assembly which is pressure molded under heat. Integrally fuse the composite door panel over the entire surface area, do not adhesive-bond at the perimeter stile and rail.

B. Provide door stiles and rails which are high-modulus pultruded FRP square or rectangular tube subframe. Miter and join tubes internally at the corners with solid polymer blocks to yield a one piece unit. Provide a mid-rail tube across the width of the door at lockset height and additional horizontal rails where specified. Chemically weld all connections. No mechanical fastening at the tube joints is permitted.

C. Provide a triangular shaped 3/8 inch phenolic resin impregnated kraft paper honeycomb cell core for maximum rigidity and compressive strength. Use of polyurethane foam or balsa wood cores are not permitted.

D. Provide internal reinforcement composed of high-modulus pultruded solid FRP or high-density polymer compression blocks at all hardware and corner locations. No aluminum, steel, or wood blocking for reinforcement is permitted. A minimum pull-out force strength of 900 pounds per screw is required for all hinge locations.

E. Door faces are to utilize a chemical resistant thermosetting polyester resin with fiberglass reinforcing layers. Provide structural reinforcement which is knitted

multi-layer material with layers of unidirectional fiberglass orientated in both vertical and horizontal directions for high stiffness, impact and warp resistance. Furnish door faces as indicated by the door elevation drawings.

F. Ensure the exposed finish of the FRP door faces are to be an ultra-violet light stabilized marine grade Neopentyl Glychol (NPG)-isophthalic polyester gelcoat integrally molded to a 25/30 mil wet thickness.

G. Provide an integral heavy pultruded FRP astragal on the stile edge of the inactive leaf for double doors of the same materials as specified for door stiles and rails. Cutouts for door lights and louvers are to be manufactured and not field fabricated. Cutouts are to be totally enclosed by internal pultruded FRP stiles and rails as specified and incorporated into the door subframe with the opening completely fused to both door faces.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. FRP Door

1. Total door thickness to be nominal 1-3/4 inches thick.

2. Provide doors with completely seamless construction on all six surfaces.

3. Face: FRP face sheets shall be manufactured using a corrosion resistant resin system with light stabilizing additives. The resin shall be reinforced with fiberglass, 50% average by weight for enhanced strength. Face sheets shall be a minimum of 0.125 inch thick fiberglass. Face sheets shall be smooth.

4. Stiles and Rails: Stiles and rails shall be pultruded fiberglass solid sections or tubes. Pultrusion is a fiberglass fabrication process that results in a much stronger, more durable product. Non-rated and 20 minute doors will have a full width horizontal pultruded fiberglass tube every 24 inches in height for internal reinforcement. A solid fiberglass block shall be used at all hardware reinforcements and corner intersections. A minimum of 1,000 pounds screw withdrawal force shall be required per screw. Absolutely no metal or wood reinforcements, including #2 SPF (Spruce Pine Fir), will be allowed in any part of the stile and rail configuration.

5. Cores:

a. Core material shall be Polypropylene plastic honeycomb core with a non-woven polyester veil for unparalleled plate bonding, 180 PSI typical compression range or

b. Polyurethane Foam Core: A 1-1/2 inch thick rigid block of polyurethane shall be laminated to the interior of the panels. The polyurethane insulation shall be Class A and CFC free. Foam properties comply with ASTM E-84 and NYC Construction Codes.

c. Exterior door: The “R” factor shall be 12.

6. Hardware Preparation: Doors shall be reinforced and mortised for hardware with 1-1/2 inches x 1-1/2 inches of solid fiberglass to allow application of hinges and locks, in accordance with the hardware schedule, hardware manufacturer's instructions and templates.

    a. Reinforcement Blocking: Non-swelling polymer or firestop blocking will be used for all lockset, surface mounted hardware and through bolted hardware blocking.

    b. Pilot holes for full mortise butt hinges will be pre-drilled by factory.

    c. All hardware shall be attached / installed by using pilot hole and stainless steel wood screws.

B. FRP frames shall be rigid, neat in appearance, free from defects and the finish shall match the doors. Fabricate FRP doors and frames as shown on the drawings and in accordance with best shop practices. Field measurements shall be taken as required for coordinating with adjoining work.

1. Provide frames for doors, as indicated in door schedule. Non-rated: Standard one-piece FRP profile with integral stop:

    a. Stop: 5/8 inches.

    b. Jamb: 5-3/4 inch x 2 inch equal rabbet.

    c. Head: 4 inch header, modified depth with equal rabbet.

    d. Thickness: 3/16 inches thick.

2. All frames shall be 100% pultruded fiberglass with an average 50% glass content by weight which results in an industrial fiberglass frame as strong as a 14-gauge hollow metal frame.

3. Head and jamb members shall be one piece frame, resin bonded and assembled at factory.

C. Reinforcements and Braces / Supports: Provide structural and hardware reinforcement and braces at the following locations and as recommended by manufacturer:

1. Frames shall be reinforced and mortised for hardware in accordance with the hardware schedule, manufacturer's instructions and templates. Absolutely no metal reinforcements will be allowed in any part of the FRP frame configuration.

2. Corner Reinforcement: 4 inches x 4 inches x 5-3/8 inches x 1/4 inch thick pultruded fiberglass angle. Attached to head bar at factory using stainless steel screws.

3. Mortise Hinge Reinforcement: 3 inches x 7 inches x 9/16 inch (or 3/8 inch) thick FRP material attached to frame by means of bonding and stainless steel countersunk screws.

4. Closer Reinforcement: 1-1/2 inches x 19 inches x 3/16 inch thick FRP material attached to frame by means of bonding.

5. Strike Reinforcement: 1-1/2 inches x 9 inches x 3/4 inch thick FRP material attached to frame by means of bonding and stainless steel countersunk screws.

D. Anchors:

1. Provide anchorage devices and fasteners where necessary for fastening fabricated FRP door frame to the adjacent construction-in-place as recommended by the FRP frame manufacturer and as required of chemical resistance.

a. Provide Expansion Type Anchor for concrete of corrosive-resistant steel a minimum 3/8-inch diameter bolt with expansion shield or insert. Provide chemical resistant coating at all exposed anchor surfaces.

2. Anchoring Systems: Furnish at least three anchors in each jamb of frames up to 90 inches high and one additional anchor for each 30 inches in height above 90 inches, in shapes, sizes and spacing shown or required for anchorage into adjoining wall construction.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. All doors and frames specified herein shall be neatly installed in designated locations indicated on the Contract Drawings.

B. Install in strict accordance with manufacturer's printed instructions.

1. Frames shall be anchored and grouted in place.

C. Fixed units shall be securely fastened in place and operative units adjusted to work properly.

D. Combination frames and trim shall be securely anchored in place with jambs filled solidly with mortar.

E. Do all necessary cutting, drilling and fitting for securing work in position including all necessary cutting, drilling and tapping of the work to accommodate the work of other trades. Drilling and tapping for non-template hardware shall be performed at the site.

3.03 FIELD TESTING / QUALITY CONTROL

A. Frame Installation Tolerances

1. Squareness: Plus or minus 1.6 mm 1/16 inch, measure at the door rabbet on a line 90 degrees from the jamb perpendicular to the frame head.
2. Alignment: Plus or minus 1.6 mm 1/16 inch, measure at the jamb on a horizontal line parallel to the wall plane.
3. Twist: Plus or minus 1.6 mm 1/16 inch, measure at the opposite face corners of the jambs on parallel lines, and perpendicular to the wall plane.
4. Plumb and True: Plus or minus 1.6 mm 1/16 inch, measure at the jambs to the floor.

B. Door Clearance Tolerances

1. Jambs and Head: Plus 1/8 inch or minus 1/16 inch.
2. Pairs of Doors: Plus 1/8 inch or minus 1/16 inch.
3. Bottom of Door and Top of Threshold: Maximum 3/8 inch.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. The Contractor shall provide protection against stains, dirt or damage to the finished installation. The doors shall be adjusted at installation for proper operation. At conclusion of construction, doors shall have any final adjustments made in order to place the doors in perfect operating condition.

B. Check and re-adjust all operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including all FRP that is warped, bowed, scratched or otherwise damaged.

C. Upon completion of the project all finished work of this Section shall be carefully cleaned. Defective finish shall be removed and refinished, and all work left clean and perfect.

END OF SECTION

SECTION 08 51 13 – ALUMINUM WINDOWS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install and place into satisfactory service all high-performance, thermal-barrier, custom architectural grade aluminum windows and frames, and auxiliary system components, of the performance grade specified.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 05 13.01 - Galvanizing

B. Section 08 81 03 - Glass, Plastic and Glazing

1.04 REFERENCES

A.	NYCBC	-	New York City Building Code
B.	ASTM B117	-	Operating Salt Spray (Fog) Apparatus, Standard Practice For
C.	ASTM B136	-	Stain Resistance of Anodic Coatings on Aluminum, Standard Method for Measurement of
D.	ASTM B137	-	Coating Mass per Unit Area on Anodically Coated Aluminum, Standard Test Method for Measurement of
E.	ASTM B209	-	Aluminum and Aluminum-Alloy Sheet and Plate, Standard Specification for
F.	ASTM B221	-	Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes, Standard Specification for
G.	ASTM B244	-	Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments, Standard Test Method for Measurement of
H.	ASTM B584	-	Copper Alloy Sand Castings for General Application, Standard Specification for
I.	ASTM D522	-	Mandrel Bend Test of Attached Organic Coatings, Standard Test Methods for
J.	ASTM D523	-	Specular Gloss, Standard Test Method for
K.	ASTM D968	-	Abrasion Resistance of Organic Coatings by Falling Abrasive, Standard Test Method for
L.	ASTM D1308	-	Effect of Household Chemicals on Clear and Pigmented Coting Systems, Standard Test Method for
M.	ASTM D2244	-	Calculation of Color Tolerances and Color Differences From Instrumentally Measured Color Coordinates, Standard Practice for
N.	ASTM D2247	-	Testing Water Resistance of Coatings in 100% Relative Humidity, Standard Practice for
O.	ASTM D3363	-	Film Hardness by Pencil Test, Standard Test Method for
P.	ASTM E283	-	Determining the Rate of Air Leakage through Exterior Windows, Skylights, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen, Standard Test Method for
Q.	ASTM E329	-	Agencies Engaged in Construction Inspection, Testing

Or Special Inspection, Standard Specification for

R. ASTM E330 - Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference, Standard Test Method for

S. ASTM E331 - Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference, Standard Test Method for

T. American Architectural Manufacturers Association and the Window and Door Manufacturers Association, AAMA/NWWDA, 101/I.S.2 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors

U. American Architectural Manufacturers Association, AAMA 502 - Voluntary Specification for Field Testing of Windows and Sliding Glass Doors

V. American Architectural Manufacturers Association, AAMA 800 - Voluntary Specifications Test Methods for Sealants

W. American Architectural Manufacturers Association, AAMA 910 - Voluntary 'Life Cycle'/Specifications and Test Methods for Architectural Grade Windows and Sliding Glass Doors

X. American Architectural Manufacturers Association, AAMA 1503.1 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections

Y. American Society of Civil Engineers, ASCE 7 - Minimum Design Loads for Buildings and Other Structures

Z. Steel Structures Painting Council, SSPC Paint 12 - Paint Specification No. 12: Cold-Applied Asphalt Mastic (Extra Thick Film)

AA. Federal Specification, FS RR-W-365: Wire Fabric (Insect Screening)

1.05 DESCRIPTION

A. This Section describes exterior, high-performance, minimum 3-1/4-inch frame depth, factory-fabricated and factory-glazed, aluminum windows with integral structural polyurethane thermal-breaks and true divided muntins complying with the requirements of AAMA/NWWDA 101/I.S. 2 - Architectural Performance Class and Section 4 - Optional Performance Grades, all with Architectural Class I anodized finish or with a complete selection of factory-applied, four coat, custom and premium exotic color, custom blended full strength polyvinylidene fluoride finishes and colors with extended life topcoat, as selected in the Contract; all designed, detailed and fabricated as required to resist specified loadings, and resistance to air and water penetration specified and in accordance with the requirements of governing authorities having jurisdiction; associated high-performance operating hardware, auxiliary system items, accessories, fasteners and similar items for completely functioning systems.

B. Design Requirements

1. Comply with applicable standards and recommendations by AA, AAMA, and ASCE, except to the extent more stringent requirements are specified or required by governing authorities having jurisdiction at the Site.

2. Comply with AAMA/NWWDA 101/I.S.2 including "non-mandatory" Appendix B, C, and D except where more stringent Wind Velocity Maps are included in ASCE 7 or other governing authorities having jurisdiction.

C. Modifications: Aluminum window and frame requirements shown are intended to establish basic dimensions of units, modules, profiles, mullion depths, sight lines, support locations of members and the visual design intention. Within these limitations Contractor shall be responsible for the structural adequacy, weather resistance, thermal and condensation resistance, and the detailing and fabrication of all aluminum window and frame system, including anchorage, and to make whatever modifications of, and additions to, the details as may be required to fulfill the minimum performance requirements of AAMA Optional Performance Grade and the requirements of non-mandatory Appendixes specified, at no additional expense to the City. Maintain the visual design concept as shown, including member sizes, profiles, support locations and alignment of components.

D. Performance Criteria:

1. General:

a. The design wind load pressures for aluminum windows and frames shall be determined in accordance with analytical procedures established by ASCE 7 and shall take into consideration the load magnification effect caused by gusts in resonance with along-wind vibrations of flexible building and other structures. Professional engineer who prepares, signs, stamps its seal on Shop Drawings submitted to Engineer shall take into consideration the need for wind-tunnel tests in order to include the effects of across-wind loading, vortex shedding or instability due to galloping or flutter of Project locations where channeling effects or buffeting in the wake of upwind obstructions warrant special consideration, or for those buildings or structures having unusual geometric shapes or response characteristics.

b. On Projects where the professional engineer believes such conditions may exist, provide Engineer and the City with recommendations for further testing required to establish the design criteria for aluminum windows and frames. Identify all costs associated with such testing. Do not proceed with testing until given written approval by the City.

c. After carefully reading system performance criteria and other requirements of the Section, professional engineer to whom design of the aluminum window and frame system is delegated shall make all requests for clarification of requirements that may be necessary in writing, to Engineer.

2. Loading Analysis Criteria:

   a. Wind Loads: Provide structural analysis, calculations and details indicating compliance with the NYCBC, ASCE 7-93 and ASCE 7-88, based on project location, heights and wind speed of 115 miles per hour (MRI 100 years), Ground Roughness (Exposure) Category D; Importance Factor based on ASCE 7 - Category IV - Essential Facility, and corresponding formula coefficients, to determine velocity pressures.

   b. Seismic Loads: Provide aluminum window and frame system, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of the NYCBC or ASCE 7, Section 9, whichever are more stringent.

   c. Dead Loads: Provide aluminum window and frame system components that do not deflect an amount that will reduce glazing bite below 75 percent of required glazing bite dimension when carrying full dead load. Provide minimum of 1/8 inch clearance between members and top of fixed panels, glazing, or other fixed part immediately below. Provide a minimum of 1/16 inch clearance between members and operable windows and doors.

   d. Live Loads: Provide aluminum window and frame system, including anchorage that accommodates supporting structure's deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.

   e. Deflection of Framing Members, ASTM E330: Maximum deflection of L/175 at center of single span when subjected to both positive and negative applicable design pressures, with no permanent deformation or damage of any main frame, sash, panel or sash member in excess of 0.2 percent of the span when the load is removed.

   f. Provide complete loading analysis performance calculations and Shop Drawings for all aluminum window and frame system components prepared, signed and stamped with the seal of a licensed professional engineer licensed to practice in the State of New York and recognized as an expert in the specialty involved.

3. Water and Air Infiltration Tests: A 5 foot-10 inch by 3 foot-1 inch window with a 4 foot-10 inch by 2 foot-10 inch minimum vent size shall comply with the following:

   a. Static Test Pressure Water Penetration Testing, ASTM E331 and AAMA 910: After the AAMA 910 life cylce test, no evidence of uncontrolled water penetration to the interior of the building through the aluminum windows and frames when subjected to a static air pressure difference of 12 pounds per square foot.

b. Air Infiltration Testing, ASTM E283: After the AAMA 910 life cycle test, maximum air infiltration of 0.08 cubic feet per minute per square foot, when subjected to a static air pressure difference of 6.24 pounds per square foot.

4. Aluminum Window Classification (Grade): Based on AAMA/NWWDA 101/I.S.2, provide the following:

   a. Performance Class: In addition to General Requirements of Section 1, Gateway Performance Requirements established in Table 2.1, the Specific Performance Requirements of Section 2.2 and the Material and Component Requirements of Section 3, provide Optional Performance Class - Architectural AW, for all aluminum windows and frames.

   b. Performance Grade: As a minimum, provide Optional Performance Grade 65 aluminum windows and frames tested for structural test pressure of 1.5 times design pressure, unless structural calculations based on performance criteria specified identifies the need for more stringent optional performance grade for any area of the Project.

   c. Product Type: Provide F - Fixed Window, as noted below unless shown on the Contract Drawings.

      1) Fixed: AW-PG100-FW.

5. Provide design, detailing and fabrication based on the most stringent combination of standards, testing and engineering analysis specified.

6. Thermal Movements: Aluminum window and frame system, including anchorage, shall withstand thermal expansion and contraction movements of system and supporting elements resulting from not less than an ambient temperature change of 120 degrees F, which may cause a surface curtain wall material temperature change of 180 degrees F. Limit the deflection as for wind pressure loading. Thermal movements shall not cause permanent deformation, cracking, opening of joints, undue stress on fasteners, or other effects detrimental to weathering performance.

7. The design of the aluminum window and frame system, including anchorage, as shown and specified is intended to prevent excessive condensation on the indoor faces of the work, with the heating and ventilating system in operation, and under the following conditions. Provide aluminum window and frame system design, detailing and fabrication in compliance with AAMA 1503.1 that achieves and maintains this design intention:

   a. Outdoor: Ambient temperature 0 degrees F; 15 mph wind.

   b. Indoor: Ambient temperature of 75 degrees F; relative humidity of 25 percent.

   c. Excessive condensation is defined as visible water.

d. Condensation Resistance Factor: 58 minimum for frame.

8. Provide internal drainage to lead all infiltrated water to the exterior through weep slots.

9. Testing: Wherever manufacturer's standard window units comply with the requirements and have been tested in accordance with the specified tests, provide certification by the manufacturer of compliance with such tests; otherwise, perform the required tests through a AAMA accredited and recognized testing laboratory or agency and provide certified test results.

E. Scheduling and Coordination:

1. Review installation procedures under other Sections and coordinate them with the work specified herein.

2. Notify other Contractors in advance of installation to provide them with sufficient time for the installation and coordination of interrelated items that are included in their Contracts and that must be installed in conjunction with the work included in this Section.

3. Schedule the arrival of aluminum window and frame components and accessories to minimize the time they are stored at the Site before installation.

4. Do not proceed with the installation of aluminum window and frame system until Contractor can provide finished work complying with all requirements of the Sections.

5. Where aluminum window and frame systems require the building in of plates, inserts and other items, furnish required inserts to avoid delay in the work of other trades. Provide setting drawings, templates, and directions for installation of plates, inserts and anchors, required by the Work of this Section but installed under other Sections.

6. Coordinate with other work by furnishing Shop Drawings, inserts and similar items at the appropriate times for proper sequencing of construction without delays.

F. Field Measurements:

1. Verify dimensions in areas of installation before fabrication and indicate dimensions on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delay.

2. Coordinate supports, adjacent construction, and equipment locations to ensure actual dimensions correspond to dimensions established for aluminum window and frame system work.

1.06 QUALITY ASSURANCE

A. Installer Qualifications:

1. Engage a single installer skilled, trained and with successful experience in the installation of aluminum window and frame systems and with specific skill and successful experience in the erection of the types of units and components required; and who agrees to employ only tradesmen with specific skill and successful experience in this type of work. Submit names and qualification to Engineer along with the following information on a minimum of three successful projects:
    a. Names and telephone numbers of owner, architects or engineers responsible for projects.
    b. Approximate contract cost of the aluminum window and frame system.
    c. Size of area installed.
2. Provide aluminum finish applicators experienced in the handling and application of the finish coatings specified, acceptable to the coating or aluminum manufacturer.

B. Professional Engineer:
1. Engage a registered professional engineer licensed in the State of New York and experienced in providing engineering services of the kind indicated.
2. Responsibilities include, but are not necessarily limited to, the following:
    a. Carefully reviewing system performance and design criteria stated in the Contract Documents.
    b. Preparing written requests for clarification or interpretation of performance or design criteria for submittal to Engineer by Contractor.
    c. Preparing, or supervising the preparation of design calculations, and reviewing and approving related Shop Drawings prepared by the aluminum window and frame system manufacturer prior to submission to Engineer; testing plan development, and test-result interpretations; and providing comprehensive engineering analyses verifying compliance of the system with the requirements of the Contract Documents.
    d. Signing and sealing all calculations and engineering analyses.
    e. Certifying that:
        1) It has performed the design of the system in accordance with the performance and design criteria stated in the Contract Documents, and
        2) The said design conforms to all applicable local, state and federal codes, rules and regulations and to the prevailing standards of practice.

C. Erection Tolerances:

1. Limit variations from plumb, level or dimensioned angle to the following:

   a. 1/8-inch maximum deviation in 10 foot vertical or angular run, and in 20 foot horizontal runs.

   b. 1/4-inch maximum deviation in 40 foot runs, all directions.

2. Limit variations from theoretical member locations shown, based on established floor lines and column lines, including variations from plumb and level, to the following:

   a. 3/8-inch total maximum deviation for members at all locations.

   b. 1/8-inch maximum change in deviation for members for 10 foot runs, all directions.

3. Limit offsets in end to end and edge to edge alignments of adjoining and consecutive members, which form planes, continuous runs and profiles, to the following:

   a. 1/16-inch maximum offset in flush alignment, including members which are to be 1/2-inch or less out of flush, and including members which are separated 2-inches or less by a reveal or protrusion in the plane of the aluminum windows and frames.

   b. 1/8-inch maximum offset in alignments which are to be out of flush by more than 1/2-inch or separated by a reveal or protrusion of more than 2- inch width.

D. Testing Agency Qualifications: To qualify for approval, an independent testing agency shall demonstrate to Engineer's satisfaction, based on evaluation of criteria submitted by testing agency, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the work in accordance with ASTM E329 and AAMA qualifications.

E. Mock-Up:

1. Before proceeding with final purchase of materials and fabrication of aluminum window and frame components, prepare a mock-up at the Project Site, including all components shown on Shop Drawings approved by Engineer, indicating the final relationship and configurations of the various parts and components and the quality of workmanship that shall be achieved in the work.

2. Build mock-up full height and width of opening, in a location selected by Engineer, and part of an area to receive the work of this Section.

3. Include all items that are part of the aluminum window and frame system including anchorages, insulating glass and dry-seal joint system.

4. Incorporate materials and methods of fabrication and installation that are identical with Project requirements. Accepted mock-up may be incorporated into the finished work.

5. Build as many mock-ups as required to obtain Engineer's acceptance. Disassemble rejected mock-ups and remove all components from Site. Do not incorporate rejected mock-up components into the work.

6. Aluminum window and frame installation that proceeds without an approved mock-up shall be stopped, and a mock-up prepared for Engineer's approval.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings for approval by the Engineer. Submittals shall include, but not be limited to:

1. Samples: Submit for approval the following:

a. Each required aluminum finish, on 12-inch long extrusions and 6-inch square sheets, of the alloys to be used for the work.

b. Establish samples of the required finish, for Engineer's acceptance, prior to fabrication. Where normal color and texture variations are to be expected, include three or more units in each sample, to show the range of such variations. Provide minimum possible color range variation. Engineer reserves the right to reject material finishes with objectionable variations from the established samples.

c. Polyvinylidene fluoride coating manufacturer's complete color charts showing all colors and finishes, including custom, special and premium colors.

d. Each component and cut-away corner of each window complete with finish and operating hardware, 2 foot-0 inches long by 2 foot - 0 inches wide, minimum, before Engineer's visit to manufacturer's facility for approval of actual aluminum window and frame systems to be incorporated into this Project.

e. Engineer reserves the right to require samples demonstrating design, detailing and fabrication techniques and workmanship for each system auxiliary component and accessory, before fabrication proceeds.

f. One of each type fastener employed, with statement of intended use.

g. Samples will be reviewed by Engineer for color, finish and workmanship only. Compliance with all other requirements is the responsibility of Contractor.

2. Shop Drawings: Submit for approval the following:

a. Window location chart and schedules of typical aluminum window and frame elevations showing all configurations of operators, sash

and muntins, custom panning and other cladding and flashing, fully dimensioned and coordinated with actual measurements obtained at the Project Site and required operating hardware and other auxiliary system components and accessories. Indicate clearly, and in a manner that is highlighted to Engineer, all deviations from the Contract Documents.

b. Details of each aluminum window and frame system detailing conditions at openings, details of construction, location and installation requirements of operating hardware and reinforcements, and details of joints, connections and every typical composite member. Show all window and frame reinforcements including welds, plate lengths, locations and gauges for each component of operating hardware and internal reinforcement. Indicate metal thicknesses; types of fasteners and support locations; and erection tolerances.

c. Copies of manufacturer's specifications, roughing-in diagrams, technical data and installation instructions for each aluminum window and frame system. Transmit copy of each instruction to the installer. Provide setting drawings, templates, instructions and directions for installation, operating instructions and maintenance data.

3. Operation and Maintenance Manual (O&M Manual): Upon completion of the work, furnish copies of detailed maintenance manual including the following information:

a. Product name and number.

b. Name, address and telephone number of manufacturer and local distributor.

c. Detailed procedures for routine maintenance and cleaning.

d. Detailed procedures for light repairs such as dents, scratches and staining.

e. Design calculations verifying compliance with performance criteria specified, acceptable to governing authorities having jurisdiction, prepared, signed and stamped with the seal of a registered professional engineer, as specified.

4. Certificates: Submit for approval the following:

a. Copies of material purchase receipts indicating types of materials purchased and incorporated into this Project, signed by a certified and licensed Notary Public, verifying that material purchased for the work complies with material designations specified as confirmed by approved Shop Drawings.

b. Proof of testing laboratory AAMA certification and copies of testing agencies background and experience in preforming similar tests to those specified.

c. Registered professional engineer who prepares, signs and stamps its seal shall provide a written statement confirming responsibility for the design and attest that the work prepared meets the Sections and the requirements of governing authorities having jurisdiction, and conforms to the prevailing standards of practice for the type of work specified.

d. Design calculations, signed and sealed by a Professional Engineer registered in the state of New York.

5. Test Reports: Submit for approval the following:

a. Valid AAMA "Notice of Product Certification" indicating that the aluminum windows and frames to be provided for this Project conform to AAMA/NWWDA 101 I.S.2.

6. Warranties: Submit for review:

a. Copies of written warranties agreeing to replace aluminum window and frame system components that fail to perform as specified.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Deliver aluminum window and frame system materials, components and accessories dry and undamaged, with manufacturer's protective wrapping intact.

2. Deliver aluminum window and frame system components in clearly and legibly labeled with AAMA designations and in undamaged cartons to provide protection during transit and storage.

3. Inspect aluminum window and frame system components upon delivery for damage. Remove and replace all damaged items.

B. Storage of Materials:

1. Do not store aluminum window and frame system components in contact with concrete or other materials that might cause corrosion or staining.

2. Store aluminum window and frame component under cover and in an area protected from the weather and with good air circulation around each piece. Avoid the use of non-vented plastic or canvas shelters which could create a humidity chamber. Immediately remove wrapping if it becomes wet.

3. Provide a 1/4 inch space between aluminum window and frame system components in order to promote air circulation.

C. Handling of Materials:

1. Do not subject aluminum window and frame components to bending or stress.
2. Do not damage edges or handle material in a manner that will cause scratches, warps or dents.
3. Handle material using appropriate hand wear and tools that do not damage finish of items to remain exposed.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to the City a manufacturer's warranty, in an acceptable and beneficial form, warranting to deliver without charge, replacement aluminum window and frame system components that develop leakage or air infiltration, deflections, or deterioration of metal in excess of normal weathering, and in excess of performance criteria specified, within three years of the date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Window Model and Manufacturers:
1. 8400TL by Kawneer, Norcross, GA.
2. YOW 350 XT by YYK AP, Austell, GA.
3. Series 3250i by EFCO Corporation, Monett, MO.
4. Or approved equal.

B. Exposed Aluminum Polyvinylidene Fluoride Based Coating:
1. Duranar Metallic XL Specialty Color 4-Coat System as manufactured by PPG Industries Coatings and Resins Division, Incorporated, Pittsburgh, PA.
2. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Extrusions:
1. Provide extruded, double tubular aluminum mullions, muntins, pressure plates, snap covers, two-piece snap trim, sills and glazing stops and trim, equal to ASTM B221, 6063-T5 alloy and temper as recommended by the aluminum window and frame manufacturer to comply with the requirements of performance, fabrication, application of finish and control of color for finishes.
2. Provide extrusions within commercial tolerances, formed true to details shown and free of defects impairing strength, durability, color or finish.

B. Sheets:

1. Provide aluminum sheet closures, auxiliary components and accessories, equal to ASTM B209, 5005 alloy for exposed sheet and 3003 alloy for non-exposed sheet or as recommended by the aluminum window and frame manufacturer to comply with the requirements of performance, fabrication, application of finish and control of color for finishes.

2. Provide thicknesses as follows:

a. Principal Formed Sheet Members: 0.125-inches minimum thickness.

3. Provide sheet free of defects impairing strength, durability, color or finish.

C. Fasteners: Epoxy adhesives or non-magnetic stainless steel, guaranteed by the manufacturer to be non-corrosive and compatible with the aluminum window members, trim, hardware, anchors and other components of the window units.

1. Do not use exposed fasteners, except where unavoidable for the application of operating hardware. Match the finish of the metal surrounding fastener, unless otherwise specified.

2. Provide Philips flat-head machine screws for exposed fasteners, unless otherwise specified.

D. Thermal Separators: Integral, structural polyurethane.

E. Glass and Glazing Accessories: As specified in Section 08 81 03 – Glass, Plastic and Glazing.

F. Weather-stripping: Provide double rows of manufacturer's replaceable EPDM stripping complying with ASTM D2000, secured in extruded aluminum ports at all vent perimeters.

G. Brackets, Gussets, Reinforcements and Splice Clips:

1. Provide aluminum brackets and reinforcements wherever possible. Where steel units are required for higher strength or other unavoidable necessity, hot-dip galvanize the pieces after fabrication, with 2.0 ounces zinc coating, complying with Section 05 05 13.01 - Galvanizing.

2. Where fasteners screw anchor into aluminum less than 0.125-inches thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads or provide standard, noncorrosive, pressed-in, spline grommet nuts.

H. Auxiliary Components and Accessories:

1. Provide extruded aluminum, nominal 0.062-inch thick wall, with exposed surfaces finished to match aluminum windows and frames in color and performance; concealed fasteners; all required weather seals; designed for unrestricted expansion and contraction.

2. Provide complete selection of exterior wrap-around custom panning accessories; two-piece head and jamb receptors; sills and sub sills with thermal-breaks, anchors and end dams; two-piece interior snap trim and clips; interior glazing adapters, expanders, receptors, stools and other trim necessary for a complete installation, as determined by Engineer.

3. Provide intermediate, thermally broken, expansion-type, vertical and horizontal integral mullions (stack; offset stack; and three-piece) and mullion covers in configurations and types as required for combinations of windows and sizes of window areas shown.

I. Bituminous Paint: Cold applied asphalt mastic complying with SSPC-Paint 12, compounded for 30-mil thickness per coat.

J. Expansion Anchor Devices: Where inserts are not provided to support the concrete structure, provide drilled-in expansion bolt anchors of either toothed-stainless steel or lead shield design.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. General: Provide specified manufacturer's standard fabrication and accessories, except to the extent more stringent requirements are specified. Include complete system for assembly of components and anchorage of window units. Include all components of glass and factory-applied glazing system.

B. Sizes and Profiles: The required sizes for window units and the profile requirements are shown on the Contract Drawings. The details shown are based upon standard details by one manufacturer. It is intended that similar details by other manufacturers will be acceptable, provided they comply with the size requirements, performance requirements and with minimum/maximum profile requirements shown and specified.

C. Frame and Vent: All members shall be double tubular; corners mitered, double-gusset reinforced, factory-sealed with sealant complying with AAMA 800 and crimped.

D. Water Control: Provide pressure equalization gasket on vent interior; vent and frame weeps, foam baffles, and exterior hoods to allow water to drain by gravity and resist wind-blown rain.

E. Provide field-mounted drip caps on vent exteriors above frame sill.

F. Aluminum Window And Frame Coatings

1. General:

a. After fabrication of the aluminum windows and frames, prepare surfaces for finishing in accordance with recommendations of the aluminum producer and the finisher or processor.

b. Finish all components of each assembly simultaneously so as to attain complete uniformity of color.

c. Sequence the finishing and processing of materials in a predetermined bay-by-bay, floor-by-floor, wall-by-wall plan, which will minimize color and texture differences between adjacent components.

d. All internal and external members of aluminum windows shall be anodized, as specified.

2. Exposed Aluminum Polyvinylidene Fluoride Based Coating: Apply full strength polyvinylidene fluoride based coatings at the factory by coil coating for sheet material and spray coating for extruded or factory-fabricated material. Provide a four coat finish system complying with the following:

a. Alkali clean and hot water rinse all surfaces to receive poly-vinylidene fluoride based finish.

b. Prepare a chemical conversion coating on the surface, using phosphates or chromates followed by a cold water rinse. Seal with a chromic acid rinse and dry, except where manufacturer recommends another method to achieve greater coating reliability.

c. Apply a base prime coat of epoxy paint to the prepared surface in its coil form, by reverse roller coating. Fully cure in a gas-fired oven to a dry film thickness of 0.2 - 0.4-mils. Follow with a barrier coat, 0.75 - 1.0-mil thick.

d. Apply color coat containing mica pearlescent or metallic flakes over the barrier coat by roller coating for coil material and airless or Ransburg electrostatic hand spray for extrusions and fuse at a peak metal temperature of 440 degrees F. Apply to a dry film thickness of 0.7-mil for coil coating and 1.2-mil for spray coating so that the total dry film is approximately 1.0-mil thick for coil material and 1.5-mil thick for extruded material.

e. Apply clear fluoropolymer top coat to provide a dry film thickness of 0.4-0.8- mils. The entire four coat system shall have a dry film thickness of 2.6-mil minimum.

f. Provide the following physical properties, as proven by the following laboratory test methods acceptable to Engineer:

1) Weathering, ASTM D4214: Chalking, not more than No. 8, after exposure for 5000 hours in Sunshine Arc Weather meter XWR using 60/60 cycle.

2) Color Change, ASTM D2244: No greater than 5 N.B.S units after removal of external deposits and after exposure for 5000 hours in Sunshine Arc Weather meter XWR using 60/60 cycle.

3) Humidity Resistance, ASTM D2247; no blisters after 3000 hours.

4) Salt Spray, ASTM B117: Few scattered blisters no larger than ASTM No. 4, and no more than 1/16 inch creep from areas scribed to bare metal after 3000 hours.

5) Dry Adhesion: No pick-off when tape tested over 1/16-inch cross hatch.

6) Wet Adhesion: No pick-off when tape tested over 1/16-inch cross hatch; extruded material only.

7) Boiling Water Adhesion: No pick-off when tape tested over cross hatch area after 1 hour immersion in distilled boiling water.

8) Water Immersion: No pick-off when tape tested over cross hatch area after immersion in aerated distilled water 80 ±10 degrees F after 500 hours.

9) Abrasion Resistance, ASTM D968: Coefficient of abrasion of 67 minimum.

10) Gloss, ASTM D523: 30±5 reflectivity at 60 degrees F.

11) Pencil Hardness, ASTM D3363: HB-H minimum.

12) Dry Film Thickness, ASTM D3363: Primer, 0.2-0.4 mils; barrier coat, 1.0 mils; color coating, 0.7-1.5 mils; clear topcoat, 0.4-0.8 mils.

13) Solvent Resistance: 100 Double MEK rubs minimum.

14) Flexibility, ASTM D522: No cracking prior to metal fracture.

15) Acid Resistance, ASTM D1308: 16 hour spot test with 5 percent hydrochloric acid - no effect.

16) Alkali Resistance, ASTM D1308: 16 hour spot test with 5 percent sodium hydroxide - no effect.

g. Provide specified polyvinylidene coating for all components of the aluminum window and frame system.

1) Complete selection of manufacturer's standard, custom and premium colors and coating system components for final selection by Engineer.

2) Engineer will select custom special extended life premium colors at time of Shop Drawing and Sample submission review, as specified in the Contract.

h. Protective Coating: Immediately upon completion of the aluminum mullions and frames finish, apply a transparent, color-coded, strippable-film coating, not less than 1.0 mil dry film thickness.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Provide engineering design calculations and details prepared, signed and stamped with the seal of a registered professional engineer licensed to practice in the State of New York and recognized as an expert in the required work.

B. Engineer reserves the right, in consultation with the City, to visit the aluminum window and frame manufacturer's facilities and determine if the proposed manufacturer's facilities are acceptable. Contractor shall include as part of the work arranging, and all costs for, three visits by four representatives of the City and Engineer to visit the manufacturer's facilities for the purpose of approving manufacturer's fabricating techniques and completed aluminum window and frame systems components proposed for installation as part of the work of this Project, unless additional visits are required to determine compliance with Contract requirements.

C. Where required by Engineer in order to verify types of metal used in the Work, provide metallurgy laboratory analysis of system component materials.

D. Obtain all aluminum window and frame system components, operating hardware, custom panning, flashing and accessories from the same manufacturer.

E. Engage a manufacturer who requires that a technical representative be present at the time of mock-up preparation, and start of installation and who requires that the completed work be inspected by a technical representative of the aluminum window and frame manufacturer.

F. Provide aluminum windows and frames labeled with AAMA or WDMA Hallmark labels.

G. Factory and Site Quality Control Procedures: Provide schedules, details, isometrics or explanatory sketches cross-referenced to Shop Drawings as required to insure that both fabrication and installation are in accordance with the Contract Documents. Factory quality control procedures shall include, but not necessarily be limited to, the following:

1. Finishing Fabrication: Procedures and controls for tolerances, joinery, sleeves, reinforcement gussets and finishes.

2. Finish and Match: Procedures required for the match of exposed surfaces.

3. Assembly and Pre-assembled Units: Welds, fasteners, glass, sealants, gaskets and separators.

4. Sealing and Pre-assembled Units: As required by the sealant manufacturer. Include sealant documentation as part of Shop Drawing submissions.

5. Material Handling: Procedures, care, protection, shipping, storage and other requirements to insure safe arrival and handling of materials.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Contractor shall examine the alignment of substrates and the sequence of work before erection of the custom aluminum window and frame systems work begins and notify Engineer in writing of unsatisfactory conditions. Do not proceed with the custom aluminum window and frame systems work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

B. Custom aluminum window and frame systems work shall not be installed when there is no assurance of adequate, long term protection by Contractor.

3.02 INSTALLATION

A. All windows shall be installed by factory-trained erectors in strict accordance with installation data provided by approved Shop Drawing submittal, and the specified requirements.

B. Do not install component parts that are observed to be defective in any way, including warped, bowed, dented, abraded and broken members, and including damaged glass.

C. Do not cut, or trim, component parts during erection, in a manner that would damage the finish, decrease the strength, or result in a visual imperfection or a failure in performance of the custom aluminum window and frame systems. Return component parts which require alteration to the shop for refabrication, if possible, or for replacement with new parts.

D. Install component parts level, plumb, true to line and with uniform joints and reveals. Provide required support secured to structure with non-staining and non-corrosive shims, anchors, fasteners, spacers and fillers. Use erection equipment that will not mar or stain finished surfaces, and will not damage the component parts.

E. Apply a bituminous coating of approximately 30-mil dry film thickness, or other permanent dielectric separator, on concealed contact surfaces of dissimilar materials before installation, wherever there is the possibility of corrosive or electrolytic action.

F. Apply sealant in accordance with manufacturer’s written recommendations at joints, wipe off excess and leave exposed sealant surface clean and smooth.

G. Anchor components parts securely in place as shown, by bolting, or other permanent mechanical attachment system, which will comply with performance requirements and permit movements which are intended or necessary.

3.03 FIELD TESTING / QUALITY CONTROL

A. Test installed units in conformance with AAMA 502 for air and water infiltration with the window manufacturer and the City present.

B. Select test units as directed by the Engineer and use an AAMA-accredited laboratory provided by Contractor.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Protection

1. Notify Contractor of protective treatment and other precautions required through the remainder of the construction period, to ensure that window units will be without damage or deterioration, other than normal weathering at time of Final Acceptance.

2. Contractor shall advise Engineer, in writing, of protection and surveillance requirements that Contractor shall provide at no additional expense to the City, to insure that aluminum windows and frame system will be without damage or deterioration at the time of Final Acceptance by the City.

3. Where protective coating has been supplied, remove coating completely immediately before installation and when construction activities no longer requires its retention.

4. Provide continuous protection of materials against damage primarily by storing materials under cover and above ground and away from other construction traffic.

5. Do not install aluminum windows and frames until all work that could damage aluminum window and frame systems has been completed.

6. Provide temporary closures until construction sequencing allows installation of aluminum window and frame systems at a time when the systems will not be subject to construction damages of any kind.

B. Adjustment

1. All windows shall be adjusted for smooth operation and weathertight closure providing a tight fit at contact points and at weatherstripping after installation is complete and readjusted when necessary prior to Substantial Completion.

2. At the completion of the work, restore adjacent work, marred by the work of this Section, to an undamaged and clean condition.

3. Adjacent work that has been physically damaged, or that does not respond adequately to cleaning, shall be replaced with new materials at no additional expense to the City.

C. Cleaning

1. Clean aluminum surfaces immediately after installation, exercising care to avoid damage of finish. Lubricate hardware and other moving parts.

2. Maintain the aluminum window and frame systems in a clean condition throughout the construction period, so that they will be without any evidence of deterioration or damage, other than the effects of normal weathering, at the time of Final Acceptance.

3. Select methods of cleaning that will promote the achievement of uniform appearance and stabilized colors and textures for materials that weather or age with exposure.

END OF SECTION

SECTION 08 71 01 – FINISH DOOR HARDWARE
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment and incidentals necessary to perform the work of this Section as shown, specified or required otherwise for a complete job.

B. Finish hardware is defined to include all items known commercially as finish hardware, as required for swing doors, except special types of unique and non-matching hardware specified in the same Section as the door and door frame.

C. Types of finish hardware work required include, but are not necessarily limited to, the following:

1. Heavy-duty pivot hinges
2. Heavy-duty mortise hinges
3. Electric Power Transfer
4. Electrified Mortise Lock Sets
5. Mortise Locksets
6. Vertical Rod Panic Exit Devices
7. Panic exit devices
8. Overhead surface-mounted door closers
9. Extra-heavy-duty overhead holders and stops
10. Magnetic Monitor Switch
11. Acoustic Stripping and Seals
12. Thresholds
13. Silencers
14. Floor stops
15. Miscellaneous items

D. The Contractor shall implement practices and procedures to meet the project's sustainability goals as identified in the Contract Documents. The Contractor shall ensure that the sustainability requirements of this Section are implemented to the fullest extent.

E. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Doors and Hardware Institute

1. Recommended Locations for Architectural Hardware for Standard Steel Doors & Frames;

2. Recommended Locations for Builders' for Custom Steel Doors & Frames

B. South Coast Air Quality Management District (SCAQMD)

1. Rule 1113 -- Architectural Coatings

2. Rule 1168 -- Adhesives and Sealants

C. Green Seal (GS)

1. GS–11 -- Green Seal Standard for Paints and Coatings.

2. GC–03 -- Green Seal Environmental Criteria for Anti-Corrosive Paints.

D. ASTM C920 -- Standard Specification for Elastomeric Joint Sealants

1.05 DESCRIPTION

A. Where the finish, shape, size or function of a member receiving finish hardware is such as to prevent the use of or make unsuitable the types specified, furnish similar types having as nearly as practicable the same operation.

B. If finish hardware for any location is not specified, provide finish hardware equal in design and quality to adjacent finish hardware for comparable openings.

C. Furnish finish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements, as necessary for proper installation and function.

D. Unless otherwise specified, comply with the technical guidance of Door and Hardware Institute (DHI), for locating hardware on standard or customized steel doors and frames, as applicable.

E. Provide stainless steel finish hardware or matching finish hardware as specified for all doors and frames.

F. Sustainable Design Requirements

1. VOC Content: Products applied on site and within the building's weatherproofing system shall comply with VOC limits of authorities having jurisdiction and the following VOC limits of when calculated according to SCAQMD Rule 1113 and Rule 1168, Green Seal Standard GS–11, Green Seal Criteria GC–03:

   a. Architectural Sealants: 250 g/L

   b. Sealant Primers for Nonporous Substrates: 250 g/L

   c. Sealant Primers for Porous Substrates: 775 g/L

   d. Multipurpose Construction Adhesives: 70 g/L

   e. Flat Paints and Coatings: VOC not more than 50 g/L

   f. Non flat Paints and Coatings: VOC not more than 150 g/L

   g. Primers, Sealers, and Under coaters: VOC not more than 200 g/L

   h. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.

G. Coordination:

1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with the finish hardware.

2. Coordinate the work of other Sections in order to provide clearances and accurate positioning of recessed or cast-in-place items required by this Section.

1.06 QUALITY ASSURANCE

A. Supplier Qualifications: The finish hardware supplier shall have in his employ a member of the DHI as a certified Architectural Hardware Consultant who shall be responsible for checking, supervising and preparing written Field Report for complete finish hardware installation and with on-site presence during the time of installation and adjustment of the Work.

B. Requirements of Regulatory Agencies: Comply with the applicable requirements of governing authorities and codes for the types of finish hardware specified.

C. Source Quality Control: Obtain all similar products and accessories from the same manufacturer.

D. Substitutions

1. Clearly identify, in a manner which is highlighted to the Engineer, all proposed substitutions, modifications, variations, unspecified features and "or approved equal" products. Provide complete comparative data, comparing "or approved equal" with specified products, at time of Shop Drawings submission.

E. Do not make substitutions after the Engineer's approval of final finish hardware schedule and sample at time of Shop Drawing submission.

1.07 SUBMITTALS

A. Contractor shall submit the following to the Engineer for review and approval:

1. Actual unit of each finish hardware item specified incorporating all standard and special features and finishes specified, demonstrated and identified by supplier's representative to the Engineer. Samples shall be presented at time of Shop Drawing submittal as the Engineer will not review or approve Shop Drawings without concurrent sample submissions.

2. The Engineer's review will be for general quality and features of units, compliance with all other requirements is the exclusive responsibility of the Contractor.

3. Approved samples may be incorporated into the finish hardware work.

B. Shop Drawings:

1. Copies of manufacturer's data for each item of finish hardware. Include whatever information may be necessary to show compliance with requirements, and include instructions for installations and for maintenance of operating parts and exposed finishes. Wherever needed, furnish templates to fabricators of other work which is to receive finish hardware.

2. Copies of the finish hardware schedule. Include a separate key schedule, showing clearly how City's final instructions on keying of locks have been fulfilled. Finish hardware schedules are intended for coordination of the Work. Review and acceptance by the Engineer does not relieve the

Contractor of his exclusive responsibility to fulfill the requirements as shown and specified.

3. Based on the finish hardware requirements specified, organize the final finish hardware schedule into "hardware sets," indicating complete designation of every item required for each door or opening. Furnish initial draft of schedule at the earliest possible date, in order to facilitate the fabrication of other work (such as stainless steel frames) which may be critical in the Project construction schedule. Furnish final draft of schedule after samples, manufacturer's data sheets, coordination with Shop Drawings for other work, delivery schedules and similar information have been complete and accepted.

4. Copies of manufacturers' specifications and installation instructions for required materials and components which are not included in other submittal specified in other Sections of this Specifications. Coordinate the requirements of this Section with other submittal and coordinate the submittal of other data in other Sections with the Sections' submittal.

5. Maintenance Manual: Upon completion of the Work, furnish copies of detailed maintenance manuals, including the following information:

   a. Product name and manufacturer.

   b. Name, address and telephone number of manufacturer and local distributor.

   c. Detailed procedure for routine maintenance and cleaning.

   d. Detailed procedures for repairs such as dents, scratches and staining.

   e. Parts identification manual and maintenance manuals for each piece of finish hardware.

C. Cylinders and Keying System:

1. Provide a great grandmaster keying system.

2. Equip all locks with manufacturer's special 6-pin tumbler cylinder, with construction master key feature, which permits voiding of construction keys without cylinder removal.

3. Comply with Engineer's instructions for master keying and, except as otherwise specified, provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.

4. Key Material: Provide keys of nickel silver only.

5. Key Quantity: Furnish 3 keys for each lock and 5 keys for each master and grandmaster system. Provide one extra key blank for each lock.

D. Test Reports: Submit for approval certified laboratory test reports for required performance tests.

E. Sustainable Design Submittals:

1. VOC Reporting Form. Provide the following information:

F. Finish hardware schedule

G. For all paints, coatings, sealants and adhesives used on site and within the building's weatherproofing system provide the VOC content in grams/liter (g/L) less water and other exempt compounds, if applicable.

H. Written field report on condition of each item of finish hardware actually present on each door at the project site with each item referenced to the approved Shop Drawings. Final approval or final payment shall not be provided to Contractor until field report has been submitted to and approved by the Engineer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Deliver finish hardware sufficiently in advance of its setting for proper inspection.

2. Pack each piece of finish hardware separately, complete with screws, keying, instructions and templates, tagged to correspond with the approved finish hardware schedule.

3. Deliver individually packaged finish hardware items at the proper time to the proper locations for installation.

B. Storage of Materials:

1. Provide secure lock-up for finish hardware stored at the project site, but not yet installed.

2. Store finish hardware in manufacturers' original packages.

C. Handling of Materials: Control the handling and installation of finish hardware items which are not immediately replaceable, so that the completion of the Work will not be delayed by finish hardware losses, both before and after installation.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Heavy Duty Pivot Hinges:

1. H147 Bottom Pivot, H180 Top Pivot and M190 Heavy-Duty Intermediate Pivots as manufactured by:

a. Rixson, a subsidiary of Yale Security, Incorporated, Monroe, NC.

b. Or approved equal.

B. Heavy Duty Mortise Hinges:

1. SP3386 StormPro Tornado Resistant, NRP, Heavy-Duty Mortise as manufactured by:

a. McKinney, an ASSA ABLOY Group Company.

b. Or approved equal.

C. Electric Power Transfer:

1. EPT-10 Electric Power Transfer as manufactured by Von Duprin or EPT-2 for magnetic monitor switches, Indianapolis, IN.

2. Or approved equal.

D. Electric Mortise Lock Sets

1. Heavy-Duty Mortise Lockset L9080 PEL RX with RX (request to exit) function, Lever Handle 03N (plug only to show) with MS750 24 VAC, 3 amp transformer as manufactured by Schlage, Carmel, IN. Provide EL (electric locking) series at all doors except at exterior doors and as noted otherwise.

2. Or approved equal.

E. Mortise Lock Sets

1. Heavy-Duty Mortise Lock Set, Newport N9M (ANSI No. 14), by Corbin Russwin, an ASSA ABLOY Group Company.

2. Or an approved equal.

F. Panic Exit Devices

1. ED5200A 3-Hour Fire Listed Surface Rim Exist Device, Finish BHMA 630 (ANSI A156.3, Type 1, Grade 1) by Corbin Russwin, an ASSA ABLOY Group Company.

2. Or an approved equal.

G. Heavy Duty Floor Mounted Door Closer

1. SC H27CWF by Rixson, a Subsidiary of Yale Security, Inc., an ASSA ABLOY Group Company, Monroe, NC.

2. Or approved equal.

H. Overhead Surface-Mounted Door Closer

1. DC8000 Parallel Arm Mounting Heavy-Duty Non-Hold Open Arm with Stop (DC8210 Series), by Corbin Russwin, an ASSA ABLOY Group Company.

2. Or approved equal.

I. Extra Heavy-Duty Overhead Holders and Stops

1. 904H – US32D Extra Heavy-Duty Surface-Mounted Overhead Door Holder/Stop as manufactured by Glynn-Johnson Part of Worldwide Ingersoll-Rand, Dublin, Ireland

2. Or approved equal.

J. Flash Bolts and Automatic Flush Bolts (forged/wrought brass parts)

1. FB458 Manual Flush Bolts, US26D finish, as manufactured by Ives, Part of Worldwide Ingersoll-Rand, Dublin, Ireland.

2. Or approved equal.

K. Astragals

1. 357C by Pemko Manufacturing Company, Memphis, TN.

2. Or approved equal.

L. Magnetic Monitor Switch

1. RX (exit device) or LX (latch-bolt) magnetic monitor switch with PT 750 24 VAC transformer by Von Duprin, Indianapolis, IN.

2. Or approved equal.

M. Weather-stripping (bumper type)

1. No. 170AA by Zero International, Inc., Bronx, NY.

2. Or approved equal.

N. Acoustic Seals

1. 3708AA (Head and Jambs), 368AA (Semi-Mortised Automatic Door Bottom), and 564A (Threshold) by Zero International, Inc, Bronx, NY.

2. Or approved equal.

O. Thresholds

1. 655A (interior saddles) by Zero International, Inc.

2. Or approved equal.

P. Offset Thresholds

1. 566A (exterior doors) by Zero International, Inc. Provide Offset Threshold of similar design as required.

2. Or approved equal.

Q. Silencers

1. SR 64 by Ives, Part of Worldwide Ingersoll-Rand, Dublin, Ireland.

2. Or approved equal.

R. Stops

1. FS13, US26D finish, by Ives, Part of Worldwide Ingersoll-Rand.
2. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Requirements for All Products

1. Hand of Door: Contract Drawings show the swing or hand of each door leaf (left, right, reverse bevel, etc.). Furnish each item of finish hardware for proper installation and operation of the door swing as shown.
2. Manufacturer's Nameplate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable nameplates).
3. Base Metals: Produce finish hardware units of the basic metal and forming method specified, using the manufacturer's standard metal alloy, composition, temper and hardness. Do not substitute materials or forming methods for those specified.
4. Fasteners: Manufacture finish hardware to conform to published templates, generally prepared for machine screw installation. Do not provide finish hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.
5. Furnish screws for installation, with each finish hardware item. Provide Phillips flat-head screws except as otherwise specified. Finish exposed (exposed under any condition) screws to match the hardware finish or, if exposed in surfaces on other work, to match the finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.
6. Provide fasteners which are compatible with both the unit fastened and the substrate, and which will not cause corrosion or deterioration of finish hardware, base material or fastener.
7. Provide concealed fasteners for finish hardware units which are not exposed when the door is closed, except to the extent no standard manufacturer units of the type specified are available with concealed fasteners. Do not use through bolts for installation when the bolt head or the nut on the opposite face is exposed in other work under any condition, except where it is not possible to adequately reinforce the Work and use machine screws or concealed fasteners of another standard type of satisfactorily avoid the use of through bolts.
8. Tools for Maintenance: Furnish a complete set of specialized tools as needed for City's continued adjustment, maintenance, removal and replacement of finish hardware.

B. Heavy-Duty Pivot Hinges

1. Templates and Screws: Provide only template-produced units.

2. Base Metal: Fabricate hinges from forged bronze with US 26D Satin Chrome finish.

3. Number of Hinges: Provide three hinges on each door leaf of less than 60-inches height; provide one additional hinge for next 30-inches of door height; provide two additional hinges for each 30-inches or fraction thereof for doors above 90-inches tall.

4. Hinge Size: Except as otherwise specified or as required to comply with UL and NFPA, provide hinges of the following sizes:

   a. Exterior and Interior Doors, maximum 48-inches wide: Top and bottom pivots; intermediate pivots based on number of hinges as specified; minimum of one intermediate pivot required on all doors.

5. Types of Hinges: Provide all doors with offset hung, bottom, top and intermediate units with hardened steel pivot pins treated to prevent rusting or binding, permanently seated in an oil impregnated sintered bronze bearing lubricated for the life of the door and capable of supporting a minimum door weight of 800 pounds and recommended by the manufacturer for use on heavy-duty high traffic doors subject to extreme abuse. Provide single acting, mortised mounted units sized for a maximum door width of 4 foot-0 inches. Top pivot shall have a sloped top surface.

C. Heavy-Duty Mortise Hinges

1. Templates and Screws: Provide only template-produced units.

2. Base Metal: Fabricate hinges from stainless steel with US 32D Satin Stainless Steel finish.

3. Number of Hinges: Provide four hinges on each door leaf of less than 86-inches height; provide one additional hinge for next 30-inches of door height.

4. Hinge Size: Except as otherwise specified or as required to comply with UL and NFPA, provide hinges of the following sizes:

D. Electric Power Transfer

1. Provide this accessory at all locations where electrified hardware is provided through door leafs.

E. Electrified Mortise Locks Sets

1. Strikes: Provide manufacturer's standard wrought box strike, for each location and use shown. Provide stainless steel curved lip strikes, unless otherwise recommended by manufacturer, finish to match lock or latch set trim. Device to be UL certified to respond by solenoid operation to lock or unlock and contain a request to exit function microswitch interconnected with interior knob.

2. Lock Throw: Provide minimum of 1-inch anti-friction latch bolt and 1-inch dead bolt throw wherever available on manufacturer's functions specified.

3. Materials: Provide the following materials:
   a. Latch Bolt: Stainless steel.
   b. Dead Bolt: Stainless steel.
   c. Case: Stainless steel.
   d. Hub: Nickel steel.
   e. Scalp: Stainless steel.
   f. Escutcheon: 8-1/2-inches by 1-3/4-inches stainless steel; US 32D; Satin Stainless Steel.
4. Backset: Provide minimum backset of 2-3/4-inches.
5. Finish: US32D Satin Stainless Steel.

F. Mortise Locks Sets
1. Strikes: Provide manufacturer's standard wrought box strike, for each location and use shown. Provide stainless steel curved lip strikes, unless otherwise recommended by manufacturer, finish to match lock or latch set trim.
2. Lock Throw: Provide minimum of 1-inch anti-friction latch bolt and 1-inch dead bolt throw wherever available on manufacturer's functions specified.
3. Materials: Provide the following materials:
   a. Latch Bolt: Stainless steel.
   b. Dead Bolt: Stainless steel.
   c. Case: Stainless steel.
   d. Hub: Nickel steel.
   e. Scalp: Stainless steel.
   f. Escutcheon: 8-1/2-inches by 1-3/4-inches stainless steel; US 32D; Satin Stainless Steel.
4. Backset: Provide minimum backset of 2-3/4-inches.
5. Finish: Us32d Satin Stainless Steel.

G. Panic Exit Devices
1. Strikes: Provide manufacturer's standard wrought stainless steel jamb-mounted top latch bolt and bottom latch bolt for each location and use shown.
2. Exit Doors: Where required by governing regulations or where shown or scheduled, provide panic exit devices of the type required. Provide units for 1-3/4-inch thick doors.
3. Lock Throws: Provide minimum of 3/4-inch latch bolt throws.

4. Provide surface-applied two-point latching exit devices as specified.
5. Provide the following materials:
    a. Latch Bolt: Stainless steel.
    b. Case: Stainless steel.
    c. Cylinders: Brass.
    d. Front: Stainless steel.
    e. Chassis: Brass.
    f. Crossbar: Oval, seamless, knurled crossbar with interlocking expansion collets and roll pins; satin stainless steel; 0.062-inches minimum thickness with steel reinforcing tube.
6. Backset: Provide minimum backset of 2-3/4-inches.
7. Finish: US 32D Stainless Steel.
8. Function: ANSI No. 4: entrance by trim when latch bolt is retracted by key or set in a retracted position by key; no thumbpiece.

H. Overhead Surface-Mounted Door Closers

1. Provide all doors, unless specially scheduled or specified as being provided with floor mounted or concealed overhead closers, with surface-mounted overhead door closers. Provide both active and inactive door leafs with closers.
2. Size of Units: Except as otherwise specified, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather, and anticipated frequency of use.
3. Where parallel arms are specified, and for closers on exterior doors, provide closer unit one size larger than recommended for use with standard arms.
4. Use parallel arm arrangement for doors that would otherwise have the door closer appearing in finished corridors or entries.
5. Comply with UL, Building Materials Directory, and List of Inspected Fire Protection Equipment and Materials, and NFPA No. 80 for doors requiring door closers. Modify closers specified as required.
6. Provide hold open feature for all non-fire rated doors unless otherwise specified.
7. Provide corner bracket mounting on exterior doors. Select all arms to clear weatherstripping, and overhead door holders.
8. Provide long arm to allow door to swing 180 degrees where long arm will eliminate floor mounted stops.
9. Provide closers with spring power adjustment feature capable of increasing spring power 15 percent minimum in all closer sizes.

10. Provide individual regulating valves for closing and latching speeds, and separate adjustable backcheck valve.
11. Provide delayed closing action feature on all door closers. Position valve at top of closure.
12. Provide the following materials and features in addition to others specified herein:
    a. Full Metal Cover: Aluminum.
    b. Case: Cast iron.
    c. Arms: Plated to match full metal covers.
    d. Other Parts: Steel.
    e. Extreme temperature fluid.
    f. Security torx machine screws.
    g. Ten year warranty.
    h. Provide manufacturer's optional corrosion protection.
13. Finishes: S26D Satin Chrome. Color coordinate all arms and other accessories.
14. Highly Corrosive Atmospheres: Provide all closers with specified manufacturers.

I. Extra Heavy-Duty Overhead Holders and Stops

1. Provide surface-mounted extra heavy-duty overhead holders and stops on all leafs of all doors with hold open feature.
2. Material: Provide the following materials:
    a. Arm: Stainless steel; 1/4-inch thick.
    b. All Other Parts: Stainless steel.
3. Coordinate placement of extra heavy-duty overhead holder and stop with weatherstripping for non-interference.
4. Design and reinforce connections of extra heavy-duty holder and tops where they are fasteners to other materials, to resist a superimposed load of 30 pounds per square foot acting on the plane of the doors. Mount to door using a minimum of four countersunk mounting holes with four 3/8-inch diameter stainless steel sex bolts.
5. Provide all manufacturer recommended door reinforcements and coordinate the furnishing of hardware templates required for the installation of the units.
6. Finish: US 32D stainless steel, satin finish.

J. Flush Bolts

1. Provide flush bolts on the inactive leaf of all pairs of doors, unless otherwise specified.
2. Provide flush bolts at the top and bottom of door.
3. Materials: Provide the following materials:
    a. Flush Bolt Levers: Forged Brass.
    b. Flush Bolt Plate: Forge Brass.
    c. Flush Bolt Guide and Strike: Wrought Brass.
    d. Flush Bolt Rods: 1/2-inch round rods, bronze, 12-inch minimum length.
4. Provide extension flush bolts with 3/4 inch throws and with top bolt not over 6 foot-0 inches above finished floor. Provide bottom flush bolt 12-inches long.
5. Where required by governing authorities provide cast bronze automatic flush bolts bearing the UL label.

K. Astragals

1. Provide metal astragal bar, not less than 1/8-inch by 2-inches, for exposed flathead screw mounting on active leaf of all pairs of doors.
2. Provide astragal of extruded aluminum with clear anodized finish.

L. Magnetic Monitor Switch

1. Provide stainless steel magnetic monitor switch which incorporates a magnet set into the door leaf head and an actuator set into the corresponding position in the frame which will electronically monitor the door leaf position.
2. Provide magnetic monitor switch; flush (full mortized) mounted into frame and door leaf head.
3. Finish: US 4.

M. Weatherstripping And Acoustic Seals

1. Provide perimeter weatherstripping at all exterior doors. Provide acoustic stripping and seals for interior doors where scheduled.
2. Continuity of Stripping: Except as otherwise specified, it is required that the stripping at each opening be continuous and without unnecessary interruptions at door corners and hardware.
3. Replaceable Seal Strips: It is required that the resilient or flexible seal strip of every unit be easily replaceable and readily available from stocks maintained by the manufacturer.

4. Provide bumper-type weatherstripping at jambs and head, including a resilient insert and metal retainer strip, surface-applied of the following metal, finish and resilient bumper material:
   a. Housing: Extruded aluminum with clear anodized finish; 0.062-inch minimum thickness of main walls and flanges.
   b. Dimensions: 1-1/2 inches by 15/16-inches; stop-mounted.
   c. Seals: Closed-cell extruded sponge neoprene.
5. Provide heavy-duty automatic acoustic drop-seal sound-stripping door-bottom unit with threshold of manufacturer's standard design, with operating seal bar of the following material, retained in an extruded metal bar, and capable of operating to close a 1-inch gap (from door bottom to floor or threshold). House mechanism and operating bar in the following metal housing, for mounting on doors as follows:
   a. Housing: Extruded aluminum, 0.062-inch thick, with clear anodized finish on exposed surfaces.
   b. Seal: Closed-cell sponge neoprene.
   c. Mounting: Semi-mortise. Mount on stop-face of doors, except mount on binge-face of swing-in exterior doors.

N. Thresholds
1. Thresholds for all exterior doors shall be supplied by custom entry door system manufacturer. All interior doors shall be provided with thresholds.
2. Metal: Extruded aluminum; custom satin brushed aluminum; US 26 finish.
3. Surface Pattern: Fluted tread, manufacturer's standard.
4. Provide countersunk stainless steel screws and expansion shields.
5. Width: 5-inches wide and of length sufficient to span full width of rough openings; coped and scribed neatly at and around door frames.
6. Construction:
   a. Single-piece, complying with manufacturer's recommendations.
7. Profile: Provide manufacturer's unit which conforms to the minimum size and profile requirements specified.
8. Coordinate thresholds for full compatibility with recessed floor mounted closers.
9. Thickness: 1/2 inch minimum.

O. Offset Thresholds
1. Thresholds for custom entry door system doors shall be supplied by custom entry door system manufacturer. All doors shall be provided with thresholds of the types specified herein.

2. Metal: Extruded aluminum; custom satin brushed aluminum; US 26 finish.
3. Surface Pattern: Fluted tread, manufacturer's standard.
4. Provide countersunk stainless steel screws and expansion shields.
5. Width: 7-3/4 inches and 8-3/4-inches wide and of length sufficient to span full width of rough openings; coped and scribed neatly at and around door frames.
6. Construction:
   a. Single-piece, complying with manufacturer's recommendations.
   b. When threshold abuts a wall at the ends, provide straight ends substituted for mitered returns.
7. Profile: Provide manufacturer's unit which conforms to the minimum size and profile requirement specified.
8. Coordinate thresholds for full compatibility with recessed floor mounted closers and with 1/2-inch thick polyacrylate terrazzo at all locations of step down conditions.
9. Thickness: 1/2-inch minimum.

P. Silencers
1. Provide silencers for all door frames.
2. Provide pneumatic design that once installed, forms an air pocket to reduce noise.
3. Provide minimum of three per strike side of door jambs.

Q. Stops
1. Stops shall be semi-automatic cast bronze extra heavy-duty floor mounted door holder, one per leaf.
2. Activation of holder accomplished by flipping engagement tongue forward. Release by firmly pushing door.

R. Sealants
1. Provide butyl rubber sealant complying with ASTM C920for use with thresholds.
2. Adhesives, sealants, and primers, shall comply with VOC limits established by City standards or other local restrictions, as applicable.

S. Hardware Finishes
1. Provide matching finishes for hardware units at each door or opening, to the greatest extent possible. Reduce difference in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of finish hardware exposed at the same door or

opening. In general, match all items to the manufacturer's standard finish for the latch set for color and texture.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examination

1. The Contractor, installer and architectural hardware consultant shall examine the substrate to receive finish hardware, and ascertain the conditions under which the work will be performed, and notify Engineer in writing of unsatisfactory conditions. Do not proceed with the finish hardware Work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.

B. Preparation

1. Templates: Furnish finish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of finish hardware. Upon request, check the Shop Drawings of such other work, to confirm that adequate provisions are made for the proper installation of the finish hardware.

3.02 INSTALLATION

A. Mount finish hardware units at heights recommended in "Recommended Locations for Builders' Hardware" by National Builders Hardware Association, except as otherwise specified or required to comply with governing regulations.

B. Install each finish hardware item in compliance with the manufacturer's instructions and recommendations.

C. Set units level, plumb and true to line and locations. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Cut and fit threshold and floor covers to profile of door frames, and recessed floor mounted closers with mitered corners and hair-line joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts and similar items, if any.

F. Screw thresholds to substrate with No. 10 or larger stainless steel screws of the proper type for permanent anchorage.

G. Set thresholds in a bead of butyl rubber sealant to completely fill concealed voids and exclude moisture from every source. Do not plug drainage holes or block weeps. Remove excess sealant before sealant cures to a firm set.

3.03 FIELD TESTING / QUALITY CONTROL

A. Provide a written field report, prepared by installer's architectural hardware consultant, identifying actual condition, location, manufacturer, and product designation for each item of finish hardware actually present on each door at the Site, including whether finish hardware is adjusted and operating properly. Compare actual units present with each item referenced to the approved Shop Drawings and Contract requirements.

B. Installer's architectural finish hardware consultant shall provide opinions to, and assist the Engineer in determining, acceptability of installation as work proceeds. All comments and discussions, conversations and meetings with the Engineer shall be included in written field report for submission to the Engineer for review and approval at completion of finish hardware installation.

C. As part of written field report to be submitted to the Engineer for approval, recommend remedial actions for work not in compliance with the Sections. No payment for remedial action shall be made until remedial recommendations and actions have been approved by the Engineer and incorporated into the Work.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Provide a Final Report on the actual finish hardware present on each door of the work. Compare this field Report to approved Shop Drawings submittal and present to the Engineer with remedial recommendations. No payment for remedial action shall be made until remedial recommendations have been approved by the Engineer and implemented by the Contractor.

B. Adjust and check each operating item of finish hardware and each door to ensure proper operation or function of every unit. Lubricate moving parts with the type lubrication recommended by manufacturer (graphite-type if no other recommended). Replace units which cannot be adjusted and lubricated to operate freely and smoothly as intended for the application.

C. Final Adjustment: Where finish hardware installation is made more than one month prior to Final Acceptance or occupancy of a space or area, return to the Work during the week prior to Final Acceptance or occupancy, and make a final check and adjustment of all finish hardware items in such space or area. Clean and relubricate operating items as necessary to restore proper function and finish of finish hardware and doors. Adjust door control devices to compensate for final operating of heating and ventilating equipment.

D. Provide each manufacturer's authorized technical representative to instruct and train the City's personnel in proper adjustment and maintenance of finish hardware during the final adjustment of finish hardware.

E. Finish hardware which is blemished or defective will be rejected even though it was set in place before defects were discovered. Remove and replace with new finish hardware. Repair all resultant damage to other work.

F. Continued Maintenance Service: Approximately 6 months after the acceptance of finish hardware in each area, the installer, accompanied by the representative of the latch and lock manufacturer, shall return to the project and readjust every item of hardware to restore proper function of doors and finish hardware. Consult with and instruct City's personnel in recommended additions to the maintenance procedure. Clean and lubricate operational items wherever required. Replace finish hardware items which have deteriorated or failed due to faulty design, materials or installation of finish hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the finish hardware.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 08 81 03 – GLASS, PLASTIC AND GLAZING
CONTRACT WP-169 CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Furnishing all labor, materials, equipment and appliances required for the complete execution of work as shown on the Contract Drawings and specified herein.

B. Principal items of work include:

1. Insulated glass
2. Glazing clips, tapes, gaskets and compound
3. Setting glass and glazing
4. Laminated Safety Glass

C. The Contractor shall implement practices and procedures to meet the project's sustainability goals as identified in the Contract Documents. The Contractor shall ensure that the sustainability requirements of this Section are implemented to the fullest extent.

D. The following index of this Section is presented for convenience:

Article	Title	Section Page
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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 07 90 00 -- Joint Protection

1.04 REFERENCES

A. NYCBC -- New York City Building Code

B. CPSC 16 CFR 1201 -- Federal Safety Standard for Architectural Glazing Materials

C. ANSI Z97.1 -- Performance Specifications and Methods of Test For Safety Glazing Material Used in Buildings

D. ASTM C1036 -- Standard Specification for Flat Glass

E. ASTM E119 -- Standard Test Methods for Fire Tests of Building Construction and Materials

1.05 DESCRIPTION

A. Glass Sizes and Types

1. Each light of glass shall bear the manufacturer's label, showing kind, thickness and quality and the label shall not be removed until the work has been inspected and approved by the Engineer.

2. All glass shall be the best quality of its respective kind, free from integral or surface defects and shall not be clouded, cracked or broken.

B. Sustainable Design Requirements

1. Recycled Content of Glass: Postconsumer recycled content plus one-half of pre-consumer recycled content shall not be less than 10 percent.

2. Low Emitting Materials: Sealants and adhesives used on site and within the building’s weatherproofing system shall meet the VOC content limits listed below or in the detail specifications.

a. Architectural Sealants: 250 g/L.

b. Sealant Primers for Nonporous Substrates: 250 g/L.

c. Sealant Primers for Porous Substrates: 775 g/L.

d. Multipurpose Construction Adhesives: 70 g/L

e. Structural Glazing Adhesive: 100 g/L.

C. Fire Rating

1. Where Glass, Plastic and Glazing systems are used within a fire rated room, corridor, egress path, and as indicated in the Contract Drawings, those Glass, Plastic and Glazing systems shall maintain the fire rating of the location in which they are placed.

1.06 QUALITY ASSURANCE

A. In addition to complying with pertinent codes, regulations and safety standards, comply with the recommendations contained in the "Manual of Glazing" of the Flat Glass Marketing Association.

B. Provide at least one person who shall be thoroughly trained and experienced in the skills required, who shall be completely familiar with the referenced standards and the requirements of the Contract Documents, and who shall personally direct all installations performed under this Section.

C. Coordinate with the various glass, door and window manufacturers to ascertain the proper type of glazing compounds to be used so that all design criteria are met and so that the required manufacturers' guarantees are not invalidated.

D. IGCC Certification- Insulating Glass Certification Program: Provide insulating glass units complying with requirements indicated which are permanently marked with certification label.

E. Glass thickness specified shall be considered as minimum values and that thicker glass or wider insulating spaces, or both, may be required by door and window manufacturers in order to produce a product, which meets the thermal requirements specified in other Sections. Secure and coordinate all requirements from each manufacturer prior to ordering or installing such items.

F. All glass shall be factory labeled on each pane and shall contain, as a minimum, grade, type and quality of glass and trademark. Glass without factory labels shall be considered unacceptable. After inspection and approval by Engineer, remove labels from all glass.

G. Check openings to verify that frames are plumb and true, square and secure. Clean surfaces to be sealed; perform work under satisfactory weather conditions; provide shelter and proper temperature.

H. Take field dimensions for cutting glass and fabricating units.

I. All glass sizes shall be determined by measuring the frames to receive the glass at the site and/or from guaranteed dimensions provided by the frame supplier. Glass sizes shall comply with the manufacturer's specified tolerances for each type of glass including cutting tolerance, minimum edge clearance, minimum face clearance, and cover on glass.

1.07 SUBMITTALS

A. Contractor shall submit the following to the Engineer for review and approval, in accordance with the procedures and requirements set forth in Section 01 33 00 – Submittal Procedures.

1. Samples
2. Shop Drawings

B. Samples shall include:

1. Two 12" square pieces of each type of glass specified.
2. One bead, approximately 1/4 inch wide x 3 inches long of sealant, indicating color and set of cured material.

C. Shop Drawings shall include but not be limited to:

1. Complete layout and installation drawings and schedules with clearly marked dimensions.
2. Manufacturer's descriptive data of glass and glazing materials.
3. Recommended installation instructions.
4. Manufacturer's certification that the materials meet specification requirements.

D. Sustainable Design Submittals:

1. Environmental Materials Reporting Form (EMRF) Recycled Content. Provide the following information:
   a. Name of Product and Manufacturer.
   b. Material cost breakdowns. Cost breakdowns must include total material-only cost (excluding installation, labor and equipment).
   c. The percentage (by weight) of post-consumer and pre-consumer recycled content in the submitted product(s), if applicable.
   d. Indicate the location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. For assemblies, include the percentage by weight that is considered regional.
2. VOC Reporting Form. Provide the following information:
   a. For all sealants and adhesives used on site and within the building's weatherproofing system provide the VOC content in grams/Liter (g/L) less water and other exempt compounds.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivered materials shall match to approved samples in every respect. Deliver materials in the manufacturer's original unopened labeled containers, clearly marked with their name and brand. Transport large panes of glass in vertical position with spacers to prevent contact between panes and edges.

B. Store glass in a dry, well-ventilated location at a constant temperature, maintained above dew point. Handling shall be kept to a minimum and all glass shall be protected from soiling, condensation or moisture of any kind.

C. Glass delivered to the job site with manufacturer's markings, or when markings are applied at the job, use either neutral or slightly acidic adhesive. In no case shall marking materials or adhesives be alkaline. Any staining of glass by alkaline material will be cause for rejection.

D. The edges of all tempered and insulating glass shall be protected from damage and edges shall not be modified in any way after the glass leaves the factory. Nipping of any glass to reduce size shall not be permitted.

E. All glass shall be delivered with manufacturer's labels showing type, thickness and quality of material (and UL label as required). These labels shall not be removed until the glass is set and final approval has been secured.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Insulating Glass: The Contractor shall obtain from the insulating glass manufacturer and provide to the City a manufacturer’s warranty, in an acceptable and beneficial form, warranting to deliver without charge, a replacement for any unit, which develops material obstruction to vision due to film formation or dust collection on the interior glass surfaces resulting from failure of the hermetic seal other than through glass breakage for a period of 20 years from the date of Substantial Completion.

B. Laminated Glass: The Contractor shall obtain from the laminated glass manufacturer and provide to the City a manufacturer’s warranty, in an acceptable and beneficial form, warranting to deliver without charge, a replacement for any light of laminated glass, which develops edge separation or other defects, which materially obstruct vision through the glass for a period of 5 years from the date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The products accepted as manufactured by:

1. PPG Industries, One PPG Place Pittsburgh, PA.
2. Libby - Owens – Ford, Toledo, OH.
3. Cardinal IG, Eden Prairie, MN.
4. Viracon, Inc., Owatonna, MN.
5. Guardian, Inc., Webster, MA.
6. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Unless otherwise specified, all glass shall conform to FS DD-G-451c. ASTM C1036 All product references are Viracon trade names. All substitutions shall perform equal to or better than products specified.

B. Insulating glass (unit type 1) shall be one and five-eights (1-1/4) inches thick hermetically sealed units consisting of an outer light of 9/16 inch heat strengthened clear laminated panels and an inner light of 1/4 inch thick heat strengthened clear glass with VH11-50 E Coating System (Solarban 70 or equal), each separated by 1/2 inch entrapped, dehydrated air, edges dual sealed and silicone second sealed. Each panel to have 0.060 clear polyisobutylene (PVB) inner layer.

1. Transmittance:
   a. Visible Light: 45%
   b. Solar Energy: 22%
   c. Ultraviolet: <1%
      1) (Ultraviolet defined as 300 to 380 nanometers (nm)
2. Reflectance:
   a. Visible Light-Exterior: 13%
   b. Visible Light-Interior: 13%
   c. Solar Energy: 22%
3. ASHRAE U-Value:
   a. Winter Nighttime: 0.28 Btu (hr. x sq. ft. x °F)
   b. Summer Daytime: 0.26 Btu (hr. x sq. ft. x °F)
4. Shading Coefficient: 0.40
5. Solar Factor (SHGC): 0.34
6. Relative Heat Gain: 85 Btu/hr x sqft

C. Clear Heat-Strengthened Float Glass: Kind HS, Condition A, Type I, Class 1, and Quality q3.

D. Clear Float Glass - Type I, Class 1, and Quality g3.

E. Glazing Materials

1. Use a resilient, non-hardening glazing compound, capable of withstanding the climatic conditions at the Project site, such as silicone or polysulfide sealants.
2. Secure recommendations from window and glass manufacturers as to the proper type of glazing compound, which should be used so as not to delaminate glass, stain materials or otherwise create defects in the work.

a. Make exposed surfaces smooth, even and uniform in appearance. Slope glazing compound to readily shed water.

b. Glazing compound for glazing metal sash, doors, etc., shall meet the requirements of ASTM E119respectively for physical qualities and shall be as manufactured by:

1) H.B. Fred Kuhls, Brooklyn, NY.

2) Tremco Manufacturing Co., Beachwood, OH.

3) Pecora Paint Co., Harleysville, PA.

4) Gibbs and Hohman, Munster, IN.

5) Or approved equal.

c. Preformed vision strips and tape shall be used in conjunction with setting all glass in exterior windows and shall be similar and equal to Tremco vision strips and "Tremco 440" Tape as manufactured by:

1) Tremco Manufacturing Co., Beachwood, OH.

2) Or approved equal.

d. Tapes and vision strips shall be as selected from the manufacturer's standard products.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Perform glazing when ambient temperature is above 40°F.

B. Perform glazing on dry surfaces only.

C. Sheet glass shall be cut and set with waves running horizontally.

D. All measurements and size for the work shall be obtained and verified by the Contractor who shall be responsible for the correct and accurate fitting of all his work.

E. All glass shall be set in such manner as to avoid possibility of breakage.

F. Rabbets shall be thoroughly cleaned and shall have been prime coated before glass is set.

G. Glass shall be well bedded and back glazed and all surplus compound and markings shall be carefully removed from doors, sash and adjoining work, while still fresh. Compound shall be finished in true, even lines, neatly and smooth faced. All glass shall be set in strict accordance with the manufacturer's printed directions.

H. All glass when set and glazed shall be free from rattle and all exterior glazing shall be executed in such a manner that the work will be watertight. Insulating glass shall be set in compliance with the manufacturer's instructions.

I. Glazing molds shall be removed and replaced in their correct locations in such a manner as not to mar molding or the screws securing same.

J. All glazing shall be done at the building after the work into which glass is to be set has been installed. All openings shall be properly marked after being installed, to show that the openings have been glazed.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Before and after installation, all work shall be properly protected against damage.

B. On completion and prior to turning the project over to DEP, all metal work and glass shall be cleaned and left in perfect condition. Glass shall be washed outside and inside.

C. Make required adjustments.

D. Thoroughly clean all glass and mirrors just before final acceptance by DEP, or sooner if authorized by Engineer.

E. Remove excess glazing compound and foreign materials.

F. Replace broken or defective glass and hardened, uneven, defective or otherwise non-complying glazing compound.

END OF SECTION

SECTION 08 91 20 – FIXED LOUVERS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish all labor, materials, equipment and appliances required for the complete execution of the Work as shown on the Contract Drawings, specified in the Contract, and as specified herein.

B. The extent of louver Work is shown on the Contract Drawings and includes the following:

1. Individual louver openings where indicated.

2. Blank-off metal panels where required.

3. Bird screen or insect screen as required.

C. Remove sections of louver where indicated on the Drawings.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the

applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 07 90 00 - Joint Protection

1.04 REFERENCES

A. AMCA 500 - Air Movement Control Association (AMCA) Louvers, Dampers, and Shutters, Test Method for

B. AA - The Aluminum Association Incorporated, Aluminum Standards and Data

1.05 DESCRIPTION

A. Structural Performance: Design, engineer, fabricate and install metal louvers to withstand the effects of loads and stresses from wind and normal thermal movement without evidencing permanent deformation of louver components including blades, frames and supports, noise or metal fatigue caused by louver blade rattle or flutter; and permanent damage to fasteners and anchors.

1. Wind Load: Uniform pressure (velocity pressure) of 30 lb. per sq. ft. acting inwards or outwards.

2. Normal thermal movement is defined as that resulting from the following maximum change (range) in ambient temperature. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.

a. Temperature Change (Range): 100 deg. f (55.5 deg. C)

B. Air-Performance, Water-Penetration and Air-Leakage Ratings: Provide louvers complying with performance requirements indicated as demonstrated by testing manufacturer's stock units of height and width indicated according to AMCA 500.

1.06 QUALITY ASSURANCE

A. Codes and Standards: All units shall conform to AA - Aluminum Standards and Data, latest edition.

1.07 SUBMITTALS

A. The following shall be submitted for review and approval by the Engineer.

1. Cut Sheets

2. Samples, including proposed finishes as specified herein

3. Shop Drawings

1.08 DELIVERY, STORAGE, AND HANDLING

A. Brace and support units to prevent deformation during delivery.

B. Factory wrap units with approved materials to protect finish during delivery and storage.

C. Handle units with care to prevent bending or scratching.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The Airolite Co, Schofield, WI

B. Penn Ventilator Co., Inc., Birmingham, AL

C. Airflex Corporation, Farmingdale, NY

D. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Double Drainable Fixed Louver:

1. Individual louver shall be Airflex Industrial Model No. FDD-6-SS or approved equal; fixed 45-degree, 6 inch deep dual drainable storm proof blade of the following characteristics:

a. Frames and blades shall be stainless steel 316 alloy .064" thick.

b. Fasteners: Of same basic metal and alloy as fastened metal, unless otherwise indicated. Do not use metals which are corrosive or incompatible with materials joined.

1) Use types, gages and lengths to suit unit installation conditions.

2) Use Philips flat-head machine screws for exposed fasteners unless otherwise indicated.

c. Anchors and inserts of type, size and material required for type of loading and installation indicated. Use non-ferrous metal or hot-dip galvanized anchors and inserts for exterior installation and elsewhere as required for corrosion resistance.

d. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).

2. Manufacturer to submit test data on 4 feet x 4 feet louver units. Test data shall show the following results at 1100 fpm free area velocity.

Minimum Free Area	Maximum Pressure Drop	Maximum Water Penetration
7.32 sq. ft.	0.24 in	0.005 oz.
0.678 m	6.10 mm	1.53 g

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Provide continuous stainless steel angle support. Length of angle shall ensure proper edge distance for fasteners in opening and to frame of louver.

B. Finish

1. Exposed sides of all stainless steel components shall be Airflex Industrial finish A1221 Glass Bead or approved equal to match finish of window wall system, as per the approved submittal of the finish sample.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Anchor louver frames using stainless steel bolts into holes drilled and tapped in sub-frames or with strap anchors to masonry in accordance with the manufacturer's approved directions.

B. Isolate aluminum from contact with masonry or dissimilar metals with heavy coat of bituminous paint or neoprene gaskets.

C. Mount bird screens of all louvers unless indicated otherwise on inside face with clips, machine screw into frames. Screws shall be stainless steel.

D. Verify size, location and placement of continuous louvers and individual louver units prior to fabrication wherever possible. Coordinate field measurement and shop assembly to minimize field adjustment. It is important to recognize that both fabrication and installation be done by the same company in order to achieve the quality required.

E. Locate and place louver unit’s plumb, level and in proper alignment.

F. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weather-tight connection.

G. Form closely fitted joints with exposed connections accurately located and secured.

H. Provide perimeter reveals and openings of uniform width for sealants and joint fillers as indicated.

I. Repair finishes damaged by cutting, welding, soldering and grinding operations required for fitting and jointing. Restore finishes so there is no evidence of corrective work. Return items which cannot be refinished in field to shop, make required alterations and refinish entire unit or provide new units.

J. Install concealed gaskets, flashings, joint fillers and insulation as louver installation progresses where required to make louver joints weather-tight. Comply with Section 07 90 00 – Joint Protection for sealants applied during installation of louver.

K. Protect louvers and vents from damage of any kind during construction period including use of temporary protective coverings where needed and approved by louver manufacturer. Remove protective covering at time of Substantial Completion.

L. Restore louvers and vents damaged during installation and construction period so that no evidence remains of correction work. If results of restoration are unsuccessful, remove damaged units and replace with new units.

M. Do all cutting and fitting required for the installation in a neat manner.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Upon completion remove any and all protective coatings, and clean off all parts of the work in accordance with Contract Documents.

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. Painting, as specified herein, shall include, but not be limited to, preparation of surfaces, shop painting of items furnished, and field painting of structures, piping, conduit, ducts and equipment, and marking of piping and electrical conduit.

B. Painting shall be provided as shown on the Contract Drawings, specified herein or in the Contract, or as required for a complete installation.

C. The following index of this Section is presented for convenience:

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D. The following schedule, attached after the End of Section designation, is a part of this Section:

1. Material Paint Schedule

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the

applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 40 05 97 - Identification for Process Equipment.

1.04 REFERENCES

A. SSPC - The Society of Protective Coatings (formerly of Steel Structures Painting Council)

1. SSPC-SP 1 Solvent cleaning
2. SSPC-SP 6 Commercial blast cleaning
3. SSPC-SP 10 Near white cleaning
4. SSPC-SP 2 Hand tool cleaning
5. SSPC-SP 11 Power tool cleaning to bare metal
6. SSPC- SP 15 Commercial grade power tool cleaning
7. SSPC-SP 16 Brush off Blast Cleaning of Non Ferrous Metals

B. ASTM - American Society for Testing Materials

1. ASTM D3359 - Measuring Adhesion by Tape Test
2. ASTM D16- Terminology Relating to Paint, Varnish, Lacquer, and related Products

C. NSF- National Sanitation Foundation Standards

1.05 DESCRIPTION

A. Safety Requirements

1. All painting materials specified herein, and ingredients of coatings containing substances that are potentially toxic or hazardous shall be shipped with warning labels. These products shall be applied in strict conformance with the safety requirements of the following:

a. Manufacturer
b. National Paint and Coatings Association (NPCA)
c. Society of the Plastics Industry (SPI)
d. Manufacturing Chemist Association (MCA)
e. Society of Protective Coatings (SSPC)
f. United States Government Occupational Safety and Health Administration (OSHA)
g. Health and Safety Requirements of the State of New York (PESH-Public Employees Safety and Health)

h. Health and Safety Requirements of the City of New York (COSH-Citywide Office of Safety and Health)

B. Environmental Requirements

1. Weather:

a. Air and surface Temperatures: Prepare surfaces and apply and cure coatings within air and surface temperature range in accordance with manufacturer's instructions.

b. Surface Temperature: Minimum of 5 degrees F (3 degrees C) above dew point.

c. Relative Humidity: Prepare surfaces and apply and cure coatings within relative humidity range in accordance with manufacturer's instructions.

d. Precipitation: Do not prepare surfaces or apply coatings in rain, snow, fog or mist.

e. Wind: Do not spray coatings if wind velocity is above manufacturer's limit.

2. Ventilation

a. Provide ventilation during coating evaporation stage in confined or enclosed areas in accordance with AWWA D102.

3. Dust and Contaminants:

a. Schedule coating Work to avoid excessive dust and airborne contaminants.

4. Protect Work areas from excessive dust and airborne contaminants during coating application and curing.

1.06 QUALITY ASSURANCE

A. Paint Quality Assurance Records

1. The following information shall be recorded for every paint project and submitted to the Project-Manager:

a. Date

b. Shift

c. Part Temperature

d. Dew Point

e. Paint Batch Number/s

f. Mixing Time for Each Part and the Combined Parts of a Paint System

g. Pot Life

h. Curing Time of Primer and Finish Layers

i. Paint thickness measurements (DFT)

j. Holiday Test Results and Repair Data

k. Peel Test Results and Repair Data

l. Foreman or Supervisor's Signature

B. Test Surfaces

1. The Contractor shall paint certain areas of concrete and other surfaces, where directed, using approved coatings for use by the Engineer for comparisons with coating systems applied during the progress of the Work.

2. Such coated areas shall not be subsequently painted during the entire period of construction or during the period one-year after the date of Final Acceptance.

3. At or about one year after Final Acceptance, the test surfaces shall be inspected by the City for any deterioration such as cracks, blisters, flakes and excessive chalking.

4. The Contractor shall supply all material and labor and shall perform any remedial Work on all such deteriorated surfaces using the coating system represented by the test surface at no additional cost to the City.

C. Painting Requirements

1. General: The Contract does not specify the surface treatment for every individual part of the Work, however this Contract shall be provided with a complete painting job throughout the Work as specified herein. All items customarily or specified to be shop painted shall be primed and finished in the shop. Field painting will not be allowed unless requested in writing to the Engineer, and written consent is given by the Engineer. In general, only areas that are to be field welded are not to be painted until field erected.

2. Manufacturer's Standard Finished Items: The following items shall be furnished with the manufacturer's standard prime and finish coats applied in the shop: pumps, motors, gears, gear housings, air compressors, wall fans, temperature control and instrument panels, process air blowers, engines, filters, strainers, air dryers, meters, gas boosters, gas turbines, generators, panelboards, transformers, boilers, condensing units, water chillers, cooling towers, condensers, heat exchangers, humidifiers, air handling units, sound attenuators, air conditioning and dehumidification units, convector cabinets, unit heaters, enclosures for finned tube radiators, cabinet heaters, boilers, wood seats, lockers, metal toilet partitions, metal urinal screens, aluminum fascia, motor control centers, aluminum light standards, and hoisting equipment. Steel reinforcing bars for concrete shall

be coated in accordance with the Contract. When powder coatings are required by the Contract, the powder coatings shall be in accordance with the requirements of the manufacturer of the item.

3. Painted Items: The following items shall be painted as specified herein: steel water storage tank, structural steel and wrought metals, composite metal floor deck, pipelines, hangers and supports, sluice gates, pumps and pumps parts, valves, valve and sluice gate operators and stands, guard housings, air filter equipment, effluent strainers, heat exchangers, air receivers, tanks, air silencing equipment, storage tanks, gas domes, sediment tanks, steel stair framing, steel lintels, hollow metal doors and frames, gypsum wallboard, interior concrete block, interior concrete walls, columns, beams and ceilings, covering over insulation on piping, electrical conduit systems, small piping and copper tubing, ducts, covering over ducts, and PVC piping, valves and fittings.

4. Unpainted Items: The following items shall not be painted, unless otherwise specified: registers, grilles, dampers and linkage, fire sprinklers, name and identification plates and tags, floor gratings, brass pipe and fittings, brass valves, stainless steel, wood, stop log panels, spray-on fireproofing steel to receive spray-on fireproofing, surfaces to receive field welding, and fraying surfaces of high strength bolted connections.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings for approval by the Engineer. Submittals shall include, but not be limited to:

1. Catalog cuts and reference materials.

2. Color Chart: The Contractor shall submit the manufacturer's standard color chart for color selection for painting of items other than process piping, valves, pipe line equipment, pump casings, blowers and other mechanical equipment and their drive units, all of which shall be in conformance with the "BACKGROUND COLOR" of the General Color Code specified in Section 40 05 97 – Identification for Process Equipment.

3. Paint Samples:

a. Two one-quart samples of each required kind of paint material, or the ingredients thereof which are to be mixed on the job.

b. Samples shall be labeled, and shall include the certificate of the manufacturer stating the actual percentages by weight and volume of all ingredients entering into the mixture.

c. Upon request, further samples shall be provided as the Work progresses.

d. Painting materials shall not be applied without written approval of samples by the Engineer.

4. Painted Surface Samples:
   a. Upon request, duplicate samples of the results obtained by painting and finishing various materials on the Work shall be submitted. Such samples, and the approved paint applied thereto, shall be applied in strict conformance with these Sections.
   b. Finished areas shall be considered adequate for the purpose of determining the quality of the Work. All painting work shall be performed in a quality equal to the approved samples.
   c. Where equipment is customarily shipped with a standard finish, samples of the proposed color and finish shall be submitted for approval prior to shipping.
5. Certification:
   a. Affidavits from the manufacturer certifying that materials furnished conform to the requirements specified.
   b. And that paint products have been checked for compatibility.
6. Immersion Certification:
   a. Affidavits from the manufacturer certifying that coatings in immersion service contain no water soluble solvents or corrosion inhibitive (active) pigments with slight water solubility.
7. List of Paints:
   a. A list of paint products with mil thickness and solids by volume, including all paint applied in the shop and in the field. The list shall be in accordance with the requirements of this Section and the recommendations of the paint manufacturer.
8. Applicator's Quality Assurance:
   a. Submit list of a minimum of 5 completed projects of similar size and complexity to this work. Include for each project:
      1) Project name and location
      2) Name of owner
      3) Name of contractor
      4) Name of engineer
      5) Name of coating manufacturer
      6) Approximate area of coatings applied.
      7) Date of completion.
9. Warranty:
   a. Submit manufacturer's standard warranty.

1.08 DELIVERY, STORAGE, AND HANDLING

A. General: All products and materials shall be delivered, stored, and handled as specified in Contract Documents and as follows:

B. Delivery and Storage: All paint materials delivered and stored at the site shall be from the approved manufacturer only.

C. Packaging and Labeling: Paints, stains, varnish or ingredients of paints to be used on the job shall be properly prepared, packed, and labeled. All materials shall be delivered to the Site in original, unbroken containers bearing the manufacturer's printed labels, which shall specify the following:

1. Project and Contract No.
2. Name of manufacturer
3. Address of manufacturer
4. Generic name of paint or ingredients
5. Brand and trademark
6. Schedule letter as listed herein
7. Percent solids by volume
8. Net quantity
9. Date of manufacturer
10. Date packed

D. Storage: Painting materials shall be stored at the Site in manner and place which shall be in accordance with applicable codes and regulations, and in accordance with manufacturer's instructions. The storage space shall be kept clean at all times. Every precaution shall be exercised to eliminate fire hazards.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Standards of Quality: Proprietary protective coatings included herein by brand name or trade mark are given solely as standards of quality and for bidding purposes and do not preclude the use of an approved equivalent.

B. Latest Products: Unless specified otherwise, the proprietary protective coatings of the manufacturer's latest products in regular production on the date of receipt of order shall be provided.

C. Equivalents: Equivalent products shall be of a standard, regularly produced product of a manufacturer. Equivalent products shall be submitted on their applicable published printed literature that states the generic type, instructions for use, solids by volume, application rates, and chemical components of vehicles and solids. Equivalent products shall be accompanied by a list of projects where each of the coatings has been used on new construction and has rendered satisfactory service for at least three years. Should the manufacturer's literature of the product being offered call for higher film thickness, the greater film thickness shall be applied, and the submitted schedule shall so state.

D. Paints shall be as manufactured by the following manufacturers:

1. Tnemec Company, Inc., Kansas City, MO.
2. Sherwin Williams, Cleveland, OH.
3. International Paint, Houston, TX.
4. Carboline Company, St. Louis, MO.
5. PPG Amercoat, Little Rock, AR.
6. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. General:

1. Compatible shop and field coats shall be provided.
2. All coats of paint for any particular surface shall be from the same manufacturer.
3. Paint shall be of approved color as selected from the manufacturer's standard range of colors.
4. The Contractor shall submit proposed modifications to the specified painting systems for the Engineer's approval prior to use.
5. Paints containing lead or manganese driers shall not be submitted.

B. Classification of Paints: Alphabetical designations have been used in the following list to classify/group acceptable paints by the type and quality of materials desired. Equivalent material from the manufacturers named above or from other approved manufacturers may be used in any of these paint groups in accordance with the procedures for substitution. Refer to the “Material Painting Schedule”, attached after the “End of Section” designation, for applicability of these paint groups.

CLASSIFICATION OF PAINTS			
Paint Group	**Product Name and Number**	**Volume Solids %**	**Dry Film Thickness Mils per Coat**
A	**Tnemec:** Series V69 Hi-Build Epoxoline II	69	3.0-5.0
	Carboline: Carboguard 60/61 or Carboguard 635 or Carboguard 890 Series	72 65 75	4.0-8.0 4.0-6.0 4.0-8.0
	Sherwin Williams: Macropoxy 240	72	2.0-4.0
	International Paint: Integrated 345 or Devran 224V	70/77	3.0-4.0 (typically 4.0-6.0)
	PPG: Amerlock 2/400	85	4.0-8.0
B	**Tnemec:** Series V140-44 BR Pota-Pox Plus	69	4.0-6.0
	Carboline: Sanitile 120	38	1.0-2.0
	Sherwin Williams: Dura-Plate 235 (Waste Water)	68	3.0-5.0
	International Paint: Interseal 670 HS or Bar Rust 233HS	82/80	3.0-6.0 (typically 4.0-8.0)
	PPG: Amerlock 2/400	85	4.0-8.0
C	**Tnemec:** Series 1095 Endura-Shield	68	2.0-3.0
	Carboline: Carbothane 134 Series or Carbothane 134WB	70 50	2.0-3.0 2.0-3.0
	Sherwin Williams: Hi Solids Polyurethane 250 or Sherloxane 800	63 90	3.0-5.0 4.0-6.0
	International Paint: Interthane 990V or Devthane 379	71/63	2.0-3.0
	PPG: Pithane Ultra	70	2.0-3.0
D	**Tnemec:** Series V69 Hi-Build Epoxoline II	69	3.0-5.0
	Carboline: Carboguard 61 or Carboguard 691 or Carboguard 635 Series	72 80 65	4.0-8.0 4.0-20.0 4.0-8.0
	Sherwin Williams: Macropoxy 646	72	4.0-6.0
	International Paint: Interseal 670HS or Bar Rust 233H/236	82	3.0-6.0
	PPG: Amerlock 2/400	85	4.0-8.0
E	**Tnemec:** Series 90-97 Tnemec-Zinc	63	2.5-3.5

CLASSIFICATION OF PAINTS			
Paint Group	**Product Name and Number**	**Volume Solids %**	**Dry Film Thickness Mils per Coat**
	Carboline: Carbozinc 859 Series or Carboguard 890 Series or Carboguard 60/61	66 75 72	3.0-10.0 4.0-10.0 4.0-10.0
	Sherwin Williams: Corothane I Galvapac	67	2.5-3.5
	International Paint: Interzinc 52	59	3.0-5.0 (typically 2.0-3.0)
	PPG: Amercoat 68HS	70	2.5-5.0
F	**Tnemec:** Series 54 Envirofill Masonry Filler	68	As Required
	Carboline: Sanitile 100 Block Filler or Carbocrylic 3350	54	As Required
	Sherwin Williams: Heavy Duty Block Filler (dry) Kem Cati –Coat Epoxy Filler/ Sealer	50 72	8-10 10-20
	International Paint: Devran 224 or Intercrete 4820	77/NA	As Required
	PPG: Perma-Crete 4-100XI	55	8.0-11.0
G	**Tnemec:** Series 151 Elasto-Grip	17	1.0-1.5
	Carboline: Galoseal WB	31	0.5-1.0
	Sherwin Williams: Pro-Mar 200 Zero VOC / Primer	26	1.0-2.0
	International Paint: Intercryl 520	44	1.0-2.0 (typically 2.0-3.0)
	PPG: Seal Grip 17-921XI	28	1.6
H	**Tnemec:** Series 1026	43	2.0-3.0
	Carboline: Sanitile 155	38	2.0-3.0
	Sherwin Williams: Pro-Mar 200 Zero VOC Series Eg-Shel (dry wall) or Pro Industrial DTM Acrylic Gloss (pipe insulation)	42 40	1.5-2.0 2-4
	International Paint: Intercryl 530/WB	35	1.5-2.0 (typically 2.0-3.0)
	PPG: Speedhide Interior Latex 4510XI	37	1.5

CLASSIFICATION OF PAINTS			
Paint Group	**Product Name and Number**	**Volume Solids %**	**Dry Film Thickness Mils per Coat**
I	**Tnemec:** Series V140-AA83 Pota-Pox Plus	82	4.0-6.0
	Carboline: Carboguard 691/ Phenoline Tank Shield	80-100	4.0-20.0
	Sherwin Williams: Macropoxy 646 PW	72	4.0-6.0 (2-4 as concrete primer)
	International Paint: Interseal 670HS or Bar Rust 233H	82/80	4.0-6.0 (typically 4.0-8.0)
	PPG: Amerlock 2	85	4.0-8.0
J	**Tnemec:** Series 141 or Series 435	82 100	1.0-3.0 20-30
	Carboline: Carbozinc 621 / Plastite 4503 / Carboguard 691	80-100	4.0-10.0
	Sherwin Williams: Duraplate 235	68	3.0-5.0
	PPG: Amerlock 2	85	4.0-8.0
K	**Tnemec:** Series 141 or Series 435	82 100	1.0-3.0 20-30
	Carboline: Reactamine 760 Series Plasite 4550S	100 100	20.0-100.0 20.0-60.0
	Sherwin Williams: PolyCote 115 or Duraplate 6000	100 100	25.0-100.0/ 40.0-125.0
	International Paint: Enviroline 222	100	20.0-100.0 (typically 70.0-80.0)
	PPG: Amerthane 490	100	20.0-100.0
L	**Tnemec:** Series 141	82	6.0-14.0
	Carboline: Reactamine 28 or Carboguard 1340 WB	100 55	1.0-2.0 1.5-2.0
	International Paint: Interzone 954	85	14.0-18.0 (typically 18.0-20.0)
	PPG: Amerlock 2	85	4.0-8.0
M	**Tnemec:** Series 431 Perma- Shield PL	100	30.0-40.0
	Carboline: Reactamine ET	100	30.0-40.0
	Sherwin Williams: Duraplate UHS or Duraplate 6000	100 100	30.0-40.0 40-60
	PPG: Novaguard 890	100	25.0-30.0

CLASSIFICATION OF PAINTS			
Paint Group	**Product Name and Number**	**Volume Solids %**	**Dry Film Thickness Mils per Coat**
N	**Tnemec:** Series FC22 or 22 Epoxoline	100	20.0-30.0
	Carboline: Phenoline Tank Shield / Polyclad 777 Series	100	20.0-30.0
	Sherwin Williams: Sher Plate PW or Duraplate UHS	100 100	25.0-35.0 25-35
	International Paint: Interline 975P	100	30.0-40.0 (up to 50.0 mils max)
	PPG: Novaguard 810 ER	100	20.0-40.0

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Surface Preparation: Prior to painting, Surface preparation prior to painting shall be in accordance with the following guidelines and as recommended by the painting material manufacturer.

SURFACE PREPARATION GUIDELINES	
Class of Work	Preparation of Surface Prior to Painting
Structural Steel and Steel Encased in Concrete, Masonry or Fireproofing	All visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products and other foreign matter shall be removed by compressed air nozzle blasting, centrifugal wheels or other specified method. Discoloration caused by certain stains shall be limited to no more than 33 percent of each square inch of surface area in accordance with Society of Protective Coatings (SSPC-SP6).

SURFACE PREPARATION GUIDELINES	
Class of Work	Preparation of Surface Prior to Painting
Steel (other than structural, encased or galvanized) and Steel Submerged Under Water	All visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products and other foreign matter shall be removed by compressed air nozzle blasting, centrifugal wheels or other specified method. Discoloration caused by certain stains shall be limited to no more than 5 percent of each square inch of surface area in accordance with Society of Protective Coatings (SSPC-SP10).
Galvanized Steel and Other Metals	All welds, beads, blisters or protuberances, other than identification markings shall be smooth, and other imperfections shall be removed. All nonferrous metals and galvanized steel, whether shop primed or field primed, shall be solvent cleaned in accordance with Society of Protective Coatings (SSPC-SP1).
Canvas Pipe Covering	All adhering debris shall be removed and indentations or other unsightly spots shall be smoothed out to give a uniform, even surface. Surfaces shall be brushed clean.
Gypsum Wallboard and Plastered Surfaces	Gypsum wallboard shall be prepared as recommended by the wallboard manufacturer. Plaster surfaces shall be dry. Scratches, cracks, holes and other defects shall be filled flush with adjoining surfaces by approved methods, sandpapered smooth, and brushed clean.
Concrete and Masonry Surfaces	Concrete and masonry shall be dried for a minimum of 28 days and then the dry concrete and masonry shall be brushed and washed to remove all loose dirt, dust, free lime and other deleterious substances by approved methods. Protruding fins and other adhering matter shall be removed or ground until a smooth, even finish is obtained. Concrete surfaces to be painted shall be acid etched or otherwise roughened as recommended by the manufacturer of the coating to be applied, to produce a slightly granular surface required for adherence of coating to the concrete, unless otherwise indicated.
PVC	All adhering debris shall be removed and surface shall be roughened using suitable sandpaper. Surfaces shall be dry and free from dirt, oil, grease etc.

3.02 APPLICATION

A. General: All painting and coatings shall be applied in accordance with the manufacturer's recommendations and approved submittals. A representative of the paint manufacturer shall inspect the surfaces to be painted and shall advise on the proper application. The paint manufacturer representative shall periodically be consulted regarding ambient temperature and humidity conditions.

B. Shop Painting: The following items shall be provided with shop coats of primer and finish coats as herein specified before exposure to the weather:

1. Metals:

a. Structural steel

Note: Consider using hot dip galvanizing at crevices or hard to reach places on structural steel.

b. Miscellaneous steel and wrought iron

c. Ornamental wrought and light iron

d. Iron castings

2. Machinery and Equipment:

a. Mechanical and electrical equipment

3. Pipe:

a. All piping except galvanized iron, stainless steel, aluminum, copper, brass and bronze piping.

C. Field Painting: All painting at the site of the project is hereby designated as field painting for those items that cannot be shop painted or are touched up due to minor damage to the painted surface.

1. Repair and Repainting: Field coatings shall not be applied until all marred surfaces have been repaired or repainted. Shop coated surfaces shall be thoroughly cleaned and retouched prior to the application of successive paint coats in the field.

2. Unpainted Materials: Do not paint or finish copper, bronze, chromium plate, nickel, stainless steel, aluminum (except ducts and conduit adjacent to finish painted surfaces), monel metal, lead, lead coated copper and brass, except as otherwise indicated.

3. Items to Receive Coating: All ferrous metals and insulated surfaces shall be provided with a protective coating. Interior surfaces, exposed masonry walls and concrete walls, floors and ceilings shall be provided with protective coatings as specified.

4. Surface Condition: Only surfaces that are dry and free from dust, grease or other undesirable or interfering substances shall receive coatings. Coatings shall be as specified in the “Material Painting Schedule” , attached after the “End of Section” designation.

5. Application: Finish coats shall be applied after all adjacent work has been completed. Successive coats shall have different shades or tints of color wherever possible. Colors shall be as selected and approved by the Engineer. Prime and successive finish coats shall be cleaned, sand papered, or otherwise treated before the next coat is applied, in accordance

with the recommendations of the coating manufacturer, and as approved by the Engineer. All coats shall be inspected and approved by the Engineer, before application of any succeeding coats. All coats shall be applied to the dry film thickness (DFT) specified. Coatings shall be applied by skilled personnel under adequate illumination. All painted surfaces shall be left in a clean, orderly and acceptable condition.

6. Surface and Atmospheric Conditions: Paints shall not be applied when the surface temperature is less than 40 degrees F, when the relative humidity exceeds 85 percent, or when the surface to be painted is wet or damp, unless more stringent requirements are called for by the paint manufacturer.

D. Field Painting Operations: Surfaces to be given protective coating shall be thoroughly cleaned. Scratches and abrasions on equipment which has been shop coated shall be refinished and all surfaces to be field painted shall be approved by the Engineer before proceeding with painting. Painting shall be performed in a continuous and orderly operation to facilitate adequate inspection, however material subject to weathering or corrosion shall be given prime coats as quickly as practicable.

1. Method of Application: All paint material shall be applied by brush or roller. Spray painting will be permitted only with the specific approval of the Engineer. Surfaces which are so close together as to prevent the insertion of a standard size roller or brush shall be painted thoroughly with the prescribed number of coats by using special narrow rollers or brushes.

2. Adjacent Areas: Areas under and adjacent to painted surfaces shall be fully protected at all times. Dripped or spattered paint shall be promptly removed and any adjacent surfaces that have been damaged or discolored by overspray shall be repaired, refinished, and repainted.

3. Tinting: Successive coats of paint shall be tinted to make the various coats easily distinguishable. Undercoats of paint shall be tinted to the approximate shade of the final coat of paint. Final coats of paint shall not be applied until all other work has been completed, the dirt and rubbish removed and the surfaces suitably prepared. Paint to be applied shall be at room temperature.

4. Conditions for Application: Each coat of paint shall be given sufficient time to cure per the manufacturer's recommendation before application of the succeeding coat. Each succeeding coat shall be applied within the recoat time specified by the manufacturer; otherwise the painted surface shall be prepared per the manufacturer's recommendation before it is recoated. Exterior painting will not be allowed in dust laden air, during damp or threatening weather, or on moist or wet surfaces, or when the surface temperature is below 40 degrees F on a falling thermometer or under 50 degrees for catalyzed epoxy material; it will not be allowed in extreme heat or when metal is hot enough to cause the paint to blister and

produce a porous film. Do not apply interior painting until the building is thoroughly dry. If the temperature in the interior of the building, in the opinion of the Engineer, is too low painting will be stopped until the building is heated. Proper ventilation and sufficient heat shall be maintained to permit the paint to dry. The building shall be maintained to be free from dust.

5. Remedial Work: Any paint found defective shall be removed. Touch-up and remedial painting shall be provided as directed and as required until completion and acceptance of final work. If damage to the painted surface is excessive, as determined by the Engineer, that item shall be rejected and shipped back, at Contractor's expense, to be properly recoated before it can be accepted.

6. Application: Each coat of paint shall be applied as a continuous film of uniform thickness, free of pinholes and blemishes, to the maximum extent practicable. Any thin spots or areas missed in the application shall be repainted and permitted to dry before the next coat is applied. An approved low voltage wet sponge "holiday" detector shall be used as directed by the Engineer. All paint shall be carefully applied to a smooth even coating without runs or sagging. Enamels shall be brushed with a smooth even flow. Each coat of paint shall be dry, not only on the surface, but throughout the thickness of the paint film, before the next coat is applied. Finished surfaces shall be uniform in gloss, finish, and color, and free from flash spots and brush marks. In all cases, the resultant paint film produced shall be satisfactory in all respects to the Engineer.

7. Thinning: If the paint material must be diluted for application by spray gun, the coating shall be built up to the same film thickness achieved with undiluted material (i.e., one gallon of paint as originally furnished must not cover a greater surface area when sprayed than when applied unthinned by brush). Where thinning is necessary, only the products of the manufacturer furnishing the paint shall be used for the particular purpose, and thinning shall be done with the manufacturer’s knowledge, in accordance with his printed instructions.

8. Thickness and Adhesion Testing: Dry film thickness of each coat shall be as specified herein. Dry film thickness will be checked by the Engineer or a representative with a magnetic gauge for ferrous metal in accordance with SSPC 2 or Tooke gauge destructive test for concrete. Film thickness of shop coats or other previously applied coating shall be checked by the Engineer or a representative and recorded before painting in order to determine thickness of field coats. Dry film thicknesses for concrete surfaces shall be determined by measuring with a wet-film gauge and by material consumption. Paint adhesion shall be tested by the peel method in accordance with ASTM D 3359.

9. Inaccessible Items: Exposed members which will be inaccessible after erection shall be painted and cleaned prior to erection.

10. Coverage: All surfaces to be painted shall be completely covered. When color on undercoats shows through the final coat of paint, surfaces shall be covered by additional coats until paint is of uniform color and appearance and coverage is complete.

11. Safe Atmosphere: The Contractor shall provide sufficient temporary ventilation during painting operations in enclosed areas to remove moisture and solvents, and to keep the atmosphere safe from harmful or dangerous fumes and dust levels for personnel.

E. Workmanship: Only skilled painters shall perform the work and specialists shall be employed where required. Finished surface shall not show brush marks or other irregularities. Top and bottom edges of doors shall be painted as required for the adjacent surfaces. Undercoats on hollow metal shall be thoroughly and uniformly sanded with No. 00 sandpaper, or equal abrasive, to remove all surface defects and provide a smooth, even surface.

F. Mixing: All paints and coatings shall be mixed in accordance with the manufacturer's instructions on the printed label. The Contractor shall provide galvanized iron pans of sufficient size to contain all mixing pails and mix all paints and ingredients therein.

G. Rates of Application: Paints shall be applied so as to give coverage per gallon not greater than that recommended by the manufacturer. Quantities of paint used for successive coats on the various parts of the work shall be recorded in a manner satisfactory to the Engineer.

H. Touch-Up of Shop-Primed and Finished Items: Touch-up of any and all damaged portions and imperfections in shop-primed and finished items shall be accomplished using the same paint as used for the shop prime and finish. Surface shall be prepared prior to touch-up by wire brushing and sanding to remove rust, scale and loose paint.

I. Aluminum and Incompatible Surfaces: Where aluminum surfaces come in contact with incompatible metals, lime, mortar, concrete or other masonry materials, one field coat of Group A paint as specified under Article 2.03 "Classification of Paints" in this Section shall be applied to the incompatible surfaces.

J. Concealed Surfaces: All wall surfaces which will be concealed by equipment shall be painted before equipment installation.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. The Contractor shall touch up and restore any finish damaged. Paint or other finishes spilled, splashed or splattered shall be removed from all surfaces using care so as not to mar any surface or item being cleaned.

1. The Contractor shall rectify any failures or breakdowns, loosening of the paint or coatings within a year after acceptance of work, regardless of the paint systems used. This will require removal of the entire coating where failure occurs and repainting with the coating system previously specified. Patching will not be allowed.

END OF SECTION

MATERIAL PAINTING SCHEDULE																				
Materials and Conditions	**Paint Groups (refer to "Classification of Paints" table for acceptable paints in Groups A-N)** **Tn: Tnemec, Cb: Carboline, SW: Sherwin Williams, IP: International paint, PPG: PPG/Amercoat**																			
	Prime Coat					**Finish Coats**														
						1st					**2nd**					**3rd**				
Paint Manufacturer	**Tn**	**Cb**	**SW**	**IP**	**PPG**	**Tn**	**Cb**	**SW**	**IP**	**PPG**	**Tn**	**Cb**	**SW**	**IP**	**PPG**	**Tn**	**Cb**	**SW**	**IP**	**PPG**
Steel and Iron - Structural and Miscellaneous Uses:																				
Interior (Indoors) shop primed, field finished	B or E or I	A	A or D	A	A	B or I	A	D	A	B	B or I	A	D	A	B	--	A	D	A	B
Exterior (Outdoors) shop primed, field finished	B or I	A	A or D	A or B or E	A	C	A	D	A or B	B	--	A	D	A	B	--	C	C	C	C
Submerged, Buried or Continuously Wet Exposed to sewage, shop primed, field finished	B or I	A	A	B	B	J or K or L or M	A	B or J	B	B	--	D	B or J	D	B	--	D	B or J	D	--
Steel and Iron - Industrial Equipment (Exposed to wastewater):																				
Submerged, Buried or **continuously wet in wastewater**, completely shop coated inside and out, includes OEM factory finished items such as gates, valves, etc.	J or K or L or M	A Or K*	A or M*	D or K or L	A	J or K or L or M	A	B or J	D	B	--	A	B or J	D	B	--	--	B or J	D	B

MATERIAL PAINTING SCHEDULE																				
Materials and Conditions	**Paint Groups (refer to "Classification of Paints" table for acceptable paints in Groups A-N)** **Tn: Tnemec, Cb: Carboline, SW: Sherwin Williams, IP: International paint, PPG: PPG/Amercoat**																			
	Prime Coat					**Finish Coats**														
						1st					**2nd**					**3rd**				
Paint Manufacturer	**Tn**	**Cb**	**SW**	**IP**	**PPG**	**Tn**	**Cb**	**SW**	**IP**	**PPG**	**Tn**	**Cb**	**SW**	**IP**	**PPG**	**Tn**	**Cb**	**SW**	**IP**	**PPG**
Above grade, indoors, **exposed to waste water**, completely shop coated inside and out, includes OEM factory finished, items such as gates, valves etc.	J or K or L or M	A or N*	A or M*	D or K or L	A	J or K or L or M	A	B or J	A or D	B	--	A	B or J	A or D	B	--	--	B or J	A or D	--
Above grade, outdoors, **exposed to waste water**, completely shop coated inside and out, includes OEM factory finished, items such as gates, valves etc.	J or L or M	A or N*	A or M*	D or E or K or L	A	J or L or M	A	B or L	A or D	B	--	A or C	B or J	A or D	B	--	--	C	A or D	--
Inside of item immersed in sewage	J or K or L or M	A or N*	A or M*	D or K or L	B	J or K or L or M	A	B or J	D	B	--	A	B or J	D	B	--	--	B or J	D	B
Ductile Iron or Steel Process Piping, submerged, Buried or constantly wet, **exposed to sewage**, H2S exposures, OEM factory finished.	M*	A or K*	A Or M*	D or K	M	--	A	B	D or K	--	--	A	B or J	D or K	--	--	--	B or J	D or K	--
Steel and Iron - Industrial Equipment (Exposed to Potable water):																				

MATERIAL PAINTING SCHEDULE																				
Materials and Conditions	**Paint Groups (refer to "Classification of Paints" table for acceptable paints in Groups A-N)** Tn: Tnemec, Cb: Carboline, SW: Sherwin Williams, IP: International paint, PPG: PPG/Amercoat																			
	Prime Coat					**Finish Coats**														
						1st					**2nd**					**3rd**				
Paint Manufacturer	**Tn**	**Cb**	**SW**	**IP**	**PPG**	**Tn**	**Cb**	**SW**	**IP**	**PPG**	**Tn**	**Cb**	**SW**	**IP**	**PPG**	**Tn**	**Cb**	**SW**	**IP**	**PPG**
Shop primed, field finished	B or I	A or J	E or I	B or I	A	B or I	D	I	B or I	B	B or I	D	I	B or I	B	--	--	--	B or I	--
Exposed to Potable water (NSF) completely shop coated, inside and out, OEM factory finished items such as Gates, Valves etc.	B or I	A or J	E or I	B or I or N	A	B or I	D	I	B or I	B	B or I	D	I	B or I	B	--	--	--	--	--
Equipment above grade, indoors, **exposed to Potable water** (NSF), completely shop coated inside and out, OEM factory finished items such as Gates, Valves etc.	B or I	A or J	E or I	B or I or N	A	B or I	D	I	B or I	B	B or I	D	I	B or I	B	--	--	--	--	--
Equipment above grade, outdoors, **exposed to Potable water** (NSF), completely shop coated inside and out, OEM factory finished items such as Gates, Valves etc.	N*	A or J	E or I or N*	B or I or N	N*	--	D	I	B or I	--	--	D	I	B or I	--	--	--	--	--	--
Ductile Iron or steel process piping **exposed to Potable Water** (shop finished) alternate	N*	A or L or N*	E or I or N*	B or I or N	N*	--	A	I	B or I	--	--	C	I	B or I	--	--	--	--	--	--
MISCELLANEOUS USES:																				
Piping concealed in Masonry	B or I	A	A	A	A	A	A	D	A	B	A	--	D	A	B	--	--	--	--	--

MATERIAL PAINTING SCHEDULE																				
Materials and Conditions	**Paint Groups (refer to "Classification of Paints" table for acceptable paints in Groups A-N)** Tn: Tnemec, Cb: Carboline, SW: Sherwin Williams, IP: International paint, PPG: PPG/Amercoat																			
	Prime Coat					**Finish Coats**														
						1st					**2nd**					**3rd**				
Paint Manufacturer	**Tn**	**Cb**	**SW**	**IP**	**PPG**	**Tn**	**Cb**	**SW**	**IP**	**PPG**	**Tn**	**Cb**	**SW**	**IP**	**PPG**	**Tn**	**Cb**	**SW**	**IP**	**PPG**
Piping wrapped in Insulation	A	A	A or D	A or B	A	A	A	D	A or B	B	A	--	D	A or B	B	--	--	--	--	--
Heated Metal (Air Main Piping): Submerged, Buried and Exposed	J or L or M*	D or E or M*	D or M*	D	D	--	E	D	D	D	--	A or D	D	D	--	--	A or D	D	D	--
Concrete Masonry: Interior	F	--	F	--	F	A or D	F	D	F	B	D	A	D	D	B	D	A	D	D	--
Concrete: Interior excluding floors	A	B	--	--	A	A or D	A	D	D	B	D	A	D	D	B	--	--	--	D	--
Concrete: Immersion, Waste Water	A or J or L	J or L	--	--	N	A or J or L	D or I or K*	I	D	N	--	D	B or J or K	D	--	--	--	--	D or K	--
Pipe and Duct Insulation: Exposed	A	--	--	--	A	H	B	H	H	B	H	H	H	H	B	--	--	--	--	--
PVC (Interior)	A	--	--	--	A	A	B	D	A	B	A	A	D	A	--	--	--	--	--	--
PVC (Exterior)	A	--	--	--	A	A	B	D	A	C	A	C	C	A	--	C	--	C	C	--
Gypsum Wallboard and Plaster:	G	B	G	G	G	H	H	H	H	H	H	H	H	H	--	H				--

MATERIAL PAINTING SCHEDULE																				
Materials and Conditions	**Paint Groups (refer to "Classification of Paints" table for acceptable paints in Groups A-N)** **Tn: Tnemec, Cb: Carboline, SW: Sherwin Williams, IP: International paint, PPG: PPG/Amercoat**																			
	Prime Coat					**Finish Coats**														
						1st					**2nd**					**3rd**				
Paint Manufacturer	**Tn**	**Cb**	**SW**	**IP**	**PPG**	**Tn**	**Cb**	**SW**	**IP**	**PPG**	**Tn**	**Cb**	**SW**	**IP**	**PPG**	**Tn**	**Cb**	**SW**	**IP**	**PPG**
Nonferrous Metal and Galvanized steel: Interior	A	--	--	--	A	A	G	D	A	B	A	A	D	A	--	A	--	D	A	--
Nonferrous Metal and Galvanized Steel: Exterior	A	--	--	--	A	A	G	D	A	C	A	C	C	A	--	C	--	C	C	--
* Requires only one coat.																				

NO TEXT ON THIS PAGE

SECTION 09 96 35 – CHEMICAL RESISTANT CONCRETE COATING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Chemical resistant concrete coating, as specified herein, shall include, but not be limited to, preparation of surfaces, field coating of containment structures, walls, floors, and concrete pads and pedestals within containment areas.

B. Chemical resistant concrete coating shall be provided as shown on the Contract Drawings, specified herein or in the Contract, or as required for a complete installation.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 03 30 10 - Low Carbon Cast-in-Place Concrete

1.04 REFERENCES

A. SSPC - The Society of Protective Coatings (formerly of Steel Structures Painting Council)

1. SSPC-SP 1 Solvent cleaning
2. SSPC-SP 6 Commercial blast cleaning
3. SSPC-SP 10 Near white cleaning
4. SSPC-SP 2 Hand tool cleaning
5. SSPC-SP 11 Power tool cleaning to bare metal
6. SSPC- SP 15 Commercial grade power tool cleaning
7. SSPC-SP 16 Brush off Blast Cleaning of Non Ferrous Metals

B. ASTM - American Society for Testing Materials

1. ASTM D3359 - Measuring Adhesion by Tape Test
2. ASTM D4541 – Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
3. ASTM D16- Terminology Relating to Paint, Varnish, Lacquer, and related Products

C. AWWA - American Water Works Association

1. AWWA D102 – Coating Steel Water-Storage Tanks.

1.05 DESCRIPTION

1. Not Used

1.06 QUALITY ASSURANCE

A. Coating Quality Assurance Records

1. The following information shall be recorded for every coating project and submitted:
    a. Date
    b. Shift
    c. Part Temperature
    d. Dew Point
    e. Paint Batch Number/s
    f. Mixing Time for Each Part and the Combined Parts of a Paint System
    g. Pot Life
    h. Curing Time of Primer and Finish Layers
    i. Paint thickness measurements (DFT)

j. Holiday Test Results and Repair Data

k. Peel Test Results and Repair Data

l. Foreman or Supervisor's Signature

B. Test Surfaces

1. The Contractor shall coat certain areas of concrete and other surfaces, where directed, using approved coatings for use by the Engineer for comparisons with coating systems applied during the progress of the Work.

2. Such coated areas shall not be subsequently painted during the entire period of construction.

3. The Contractor shall supply all material and labor and shall perform any remedial Work on all such deteriorated surfaces using the coating system represented by the test surface at no additional cost to the City.

C. Painting Requirements

1. General: The Contract does specify the surface treatment for every individual part of the Work.

2. Coated Items: The following items shall be coated as specified herein:

a. Interior containment area as identified herein and on contract documents including sump pits.

b. All surfaces of concrete pads within containment area.

c. All surfaces of concrete pedestals within containment area up to 16-inches above containment elevation.

d. All perimeter walls of containment area include 8-inches above containment elevations at walls extending above containment area.

e. All undersides of overhangs within containment areas.

f. All ceilings within containment elevation.

D. Performance Criteria:

1. General:

a. Standards: Comply with applicable standards, recommendations and stated product material properties, except to the extent more stringent requirements are specified or required by governing authorities having jurisdiction at the Site.

b. VOC Content: Provide concrete topping systems that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1) Epoxy matrix: 0.0 g/L

2) Vinyl ester matrix: 100 g/L

2. The finished concrete topping system shall provide abrasion resistance and splash and spill protection from the chemicals listed below.
   a. Sodium Hypochlorite, 20% concentration.
   b. Sodium Bisulfite, 50% concentration.
3. The exposure to sunlight shall have no effect on coating's chemical resistance.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings for approval by the Engineer. Submittals shall include, but not be limited to:
   1. Catalog cuts and reference materials.
   2. Coating System Surface Samples:
      a. Upon request, duplicate samples of the results obtained by painting and finishing various materials on the Work shall be submitted. Such samples, and the approved paint applied thereto, shall be applied in strict conformance with these Sections.
      b. Finished areas shall be considered adequate for the purpose of determining the quality of the Work. All painting work shall be performed in a quality equal to the approved samples.
      c. Where equipment is customarily shipped with a standard finish, samples of the proposed color and finish shall be submitted for approval prior to shipping.
   3. Certification:
      a. Affidavits from the manufacturer certifying that materials furnished conform to the requirements specified.
      b. And that paint products have been checked for compatibility.
   4. Immersion Certification:
      a. Affidavits from the manufacturer certifying that coatings in immersion service contain no water soluble solvents or corrosion inhibitive (active) pigments with slight water solubility.
   5. List of Coating System:
      a. A list of coating products with mil thickness and solids by volume, including all paint applied in the shop and in the field. The list shall be in accordance with the requirements of this Section and the recommendations of the paint manufacturer.
   6. Applicator's Quality Assurance:
      a. Submit list of a minimum of 5 completed projects of similar size and complexity to this work. Include for each project:

1) Project name and location
2) Name of owner
3) Name of contractor
4) Name of engineer
5) Name of coating manufacturer
6) Approximate area of coatings applied.
7) Date of completion.

7. Site Quality Control Report:

a. Submit preliminary report indicating the surface moisture testing results and site preparation for installation and any remedial actions taken.

b. Submit final report indicating the surface adhesion testing and testing procedures and results.

1.08 DELIVERY, STORAGE, AND HANDLING

A. General: All products and materials shall be delivered, stored, and handled as specified in Contract Documents and as follows:

1. Safety Requirements

a. All coating materials specified herein, and ingredients of coatings containing substances that are potentially toxic or hazardous shall be shipped with warning labels. These products shall be applied in strict conformance with the safety requirements of the following:

1) Manufacturer
2) National Paint and Coatings Association (NPCA)
3) Society of the Plastics Industry (SPI)
4) Manufacturing Chemist Association (MCA)
5) Society of Protective Coatings (SSPC)
6) United States Government Occupational Safety and Health Administration (OSHA)
7) Health and Safety Requirements of the State of New York (PESH- Public Employees Safety and Health)
8) Health and Safety Requirements of the City of New York (COSH- Citywide Office of Safety and Health)

B. Delivery and Storage: All coating materials delivered and stored at the site shall be from the approved manufacturer only.

C. Packaging and Labeling: Paints, coatings or ingredients of coating to be used on the job shall be properly prepared, packed, and labeled. All materials shall be

delivered to the Site in original, unbroken containers bearing the manufacturer's printed labels, which shall specify the following:

1. Project and Contract No.
2. Name of manufacturer
3. Address of manufacturer
4. Generic name of paint or ingredients
5. Brand and trademark
6. Schedule letter as listed herein
7. Percent solids by volume
8. Net quantity
9. Date of manufacturer
10. Date packed

D. Storage: Coating materials shall be stored at the Site in manner and place which shall be in accordance with applicable codes and regulations, and in accordance with manufacturer's instructions. The storage space shall be kept clean at all times. Every precaution shall be exercised to eliminate fire hazards.

E. Safety Requirements

1. All coating materials specified herein, and ingredients of coatings containing substances that are potentially toxic or hazardous shall be shipped with warning labels. These products shall be applied in strict conformance with the safety requirements of the following:
    a. Manufacturer
    b. National Paint and Coatings Association (NPCA)
    c. Society of the Plastics Industry (SPI)
    d. Manufacturing Chemist Association (MCA)
    e. Society of Protective Coatings (SSPC)
    f. United States Government Occupational Safety and Health Administration (OSHA)
    g. Health and Safety Requirements of the State of New York (PESH-Public Employees Safety and Health)
    h. Health and Safety Requirements of the City of New York (COSH-Citywide Office of Safety and Health).

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

B. Additionally as part of the post-Substantial Completion Guaranty Period, the Contractor shall touch up and restore any finish damaged. Coating or other finishes spilled, splashed or splattered shall be removed from all surfaces using care so as not to mar any surface or item being cleaned. The Contractor shall rectify any failures or breakdowns, loosening of the paint or coatings within a year after Substantial Completion, regardless of the paint systems used. This will require removal of the entire coating where failure occurs and repainting with the coating system previously specified. Patching will not be allowed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Chemical Resistant Concrete Coating Products and Manufacturers:

1. Stonchem 856HD by Stonhard, Incorporated, Part of the StonCor Group, Maple Shade, NJ.

2. Key Vinyl Ester STD by Key Resins Incorporated.

3. Or approved equal.

B. Latest Products: Unless specified otherwise, the protective coatings of the manufacturer's latest products in regular production on the date of receipt of order shall be provided.

C. Equivalents: Equivalent products shall be of a standard, regularly produced product of a manufacturer. Equivalent products shall be submitted on their applicable published printed literature that states the generic type, instructions for use, solids by volume, application rates, and chemical components of vehicles and solids. Equivalent products shall be accompanied by a list of projects where each of the coatings has been used on new construction and has rendered satisfactory service for at least three years. Should the manufacturer's literature of the product being offered call for higher film thickness, the greater film thickness shall be applied, and the submitted schedule shall so state.

2.02 MATERIALS / EQUIPMENT

A. Chemical Resistant Concrete Floor Topping Physical Properties: Provide the following trowel-applied vinyl ester composition flooring system capable of, and recommended by the manufacturer for, resisting strong concentrations of chemicals, heavy-duty trucking and heavy traffic.

1. Acid Etch: Provide manufacturer's recommended ten percent muriatic acid etching compound in addition to shot blast scarification, grinding and other required surface preparations.

2. Primer: Two-component, highly cross-linked, penetrating vinyl ester, as recommended by the manufacturer.

3. Woven Fiberglass Roving Reinforcement: Provide a ten-ounce glass cloth reinforced system using materials recommended for the system and chemical resistance specified.

4. Mortar: Two layers of trowel-applied vinyl ester mortar consisting of a three-component, highly cross-linked combination of organic peroxides and catalyst, vinyl ester resin and styrene monomers and selected, graded aggregates blended with inorganic pigments.

5. Saturant: Two-component, as recommended by the manufacturer.

6. Topcoats: Provide optional mineral composite topcoat for increased impermeability and a chemical resistant textured topcoat for slip-resistance.

7. Termination Strips: White metal, tapered bar type as recommended by the manufacturer.

8. Colors: To be selected by Engineer from manufacturer's full selection of standard grey colors.

9. Textures: Nonslip surface.

   a. Tensile Strength, ASTM D 307: 2,700 pounds per square inch, minimum.

   b. Indentation, MILD3134: 0.062-inches, maximum.

   c. Bond Strength, ASTM C 321: 400 pounds per square inch, minimum.

   d. Flame Spread, ASTM D 635: Self-extinguishing.

   e. Thermal Coefficient of Linear Expansion, ASTM C 531: 2 x 10-5-inches per inch per degree C, maximum.

   f. Abrasive Resistance, ASTM D 4060: 0.10 gram maximum weight loss.

   g. Flexural Strength, ASTM C 580: 8,000 pounds per square inch, minimum.

   h. Compressive Strength, ASTM C 579: 11,000 pounds per square inch, minimum.

   i. Surface Hardness - Shore D Durometer, ASTM D 2240: 85 to 90.

   j. Water Absorption, MILD3134: 0.12.

   k. Chemical Resistance, ASTM C 267: Reagent Film Integrity

      1) 20 percent Sodium Hypochlorite Unaffected.

      2) 50 percent Sodium Hydroxide Unaffected.

B. Auxiliary System Components:

1. Underlayment Grout: Heavy-duty, three-component, fast-setting, high temperature resistant, 100 percent solids epoxy grout for filling and leveling deep holes, erosions, modifying pitch in trench drains and similar uses in the Work, and recommended by the concrete toppings manufacturer for compatibility with concrete toppings specified.
2. Epoxy Grout Primer: Compatible primer as recommended by the concrete toppings manufacturer.
3. Epoxy Sealants: Two-component, self-leveling and non-sag, chemical resistant, flexible epoxy/polyamide sealants.
4. Waterproof Membrane: 100 percent solids, liquid-applied membrane providing a positive barrier against water penetration.
5. Protective Joint Sealer: Two-component, traffic bearing, fluoro-elastomeric joint sealer, recommended by the concrete toppings manufacturer for sealing and protecting floor sealant joints.
6. Heavy-Duty Industrial Detergent: Concentrated, biodegradable, industrial cleaner and degreaser.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Surface Preparation: Prior to coating, surface preparation prior to coating shall be in accordance with this section and as recommended by the coating material manufacturer.

B. Concrete and masonry shall be dried for a minimum of 28 days and then the dry concrete and masonry shall be brushed and washed to remove all loose dirt, dust, free lime and other deleterious substances by approved methods. Protruding fins and other adhering matter shall be removed or ground until a smooth, even finish is obtained. Concrete surfaces to be painted shall be acid etched or otherwise roughened as recommended by the manufacturer of the coating to be applied, to produce a slightly granular surface required for adherence of coating to the concrete, unless otherwise indicated.

C. Do not proceed with coating installation until manufacturer's technical representative approves condition of subfloor. Correct all unsatisfactory conditions, as required by manufacturer's technical representative, at no additional cost. Record all such requirements and remedial actions as part of the final Site Quality Control Report.

D. Environmental Requirements

1. Weather:
    a. Air and surface Temperatures: Prepare surfaces and apply and cure coatings within air and surface temperature range in accordance with manufacturer's instructions.
    b. Surface Temperature: Minimum of 5 degrees F (3 degrees C) above dew point.
    c. Relative Humidity: Prepare surfaces and apply and cure coatings within relative humidity range in accordance with manufacturer's instructions.
    d. Precipitation: Do not prepare surfaces or apply coatings in rain, snow, fog or mist.
    e. Wind: Do not spray coatings if wind velocity is above manufacturer's limit.
2. Ventilation
    a. Provide ventilation during coating evaporation stage in confined or enclosed areas in accordance with AWWA D102.
3. Dust and Contaminants:
    a. Schedule coating Work to avoid excessive dust and airborne contaminants.
4. Protect Work areas from excessive dust and airborne contaminants during coating application and curing.

3.02 APPLICATION

A. General: Apply each component of coating system in compliance with manufacturer's directions to produce a uniform monolithic wearing surface of thickness indicated, uninterrupted except at divider strips, saw joints or other types of joints, indicated or required.
    1. Total Chemical Resistant Concrete Coating System thickness: 1/4-inch, minimum.

B. Primer: Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates.

C. Basecoat: Mix basecoat material according to manufacturer's recommended procedures. Uniformly spread material over substrate using a notched squeegee as specified by manufacturer.

D. Engineering Fabric: Embed fiberglass fabric into basecoat material with strict adherence to manufacturer's installation procedures.

E. Saturant: Uniformly roll the saturant into the fiberglass fabric as recommended in manufacturer's application procedures.

F. Mortar coat: Mix mortar coat according to manufacturer's recommended procedures. Apply mixed material over surface with strict adherence to manufacturer's installation procedures.

1. Apply mortar coat as specifically recommended by the manufacturer to achieve the physical properties and dimensional tolerances specified.

G. Topcoat: Remove any surface irregularities. Mix and apply mineral composite topcoat with strict adherence to manufacturer's installation procedures.

1. Apply vinyl ester floor topcoat to 15 mil inch dry cured minimum thickness, or greater if specifically recommended to achieve the physical properties, chemical resistances and dimensional tolerances specified.

H. Terminations:

1. Edges shall be chased to “lock” the lining into the concrete.

2. Tank pedestals and pads:

a. Coating shall be installed prior to placement of tanks within containment area at or below 16-inches above the elevation of containment.

b. Coating shall terminate at tank perimeter without sealing perimeter edge, to allow detection of leaks that may occur under the tank.

3. Equipment supports and legs:

a. Coating shall be installed prior to placement of tanks within containment area at or below 16-inches above the elevation of containment.

b. Supports and legs shall be coated with compatible chemical resistant coating.

4. Pipe drains shall be treated by chasing the coating to “lock” in place at point of termination. Pipe drain must be anchored to prevent movement between concrete and trench.

5. Pipe chases shall be treated by having the coating lap and seal onto the perimeter of the pipe chase.

I. Joints and Cracks:

1. Control joints shall be treated by coating manufacturer to assure bridging of potential cracks and to maintain monolithic protection.

2. Cold joints or construction joints shall be treated by coating manufacturer to assure bridging potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.

3. Vertical and horizontal expansion/contraction joints shall be honored by installing backer rod and compatible chemical resistant sealant after coating is installed. Sealant shall be sufficient to handle traffic conditions and chemical exposures in area.

4. Cracks in vertical or horizontal concrete substrates shall be treated by coating manufacturer to assure bridging of cracks and to maintain monolithic protection.

3.03 FIELD TESTING / QUALITY CONTROL

A. General: Before start of installation of chemical resistant concrete coating, perform the following field quality control tests and include procedures and results in final Site Quality Control Report. Incorporate installation or system improvements, as may be recommended based on test results, into the remainder of the Work.

B. Moisture Testing

1. Test the low carbon cast-in-place concrete for moisture, in compliance with ASTM D 4263, in order to determine that the maximum safe moisture-emission level, recommended by the concrete topping system manufacturer's written installation limitations, will not be exceeded, before installation of the concrete topping system.

a. Perform minimum of one test for every 1,000 square feet of substrate area to receive the concrete topping system. Perform tests on areas scheduled to be coated the following day.

b. If moisture tests indicate unacceptable levels of moisture remaining in the substrate, do not install the concrete topping system. Report existing conditions, along with manufacturer's recommendations, to Engineer. Allow additional time for the low carbon cast-in-place concrete to dry and retest.

c. Contractor may, at its option and expense, enclose, dehumidify or provide additional heat, in order to speed the drying process. If, after remediation measures are implemented, retesting the low carbon cast-in-place concrete continues to indicate unacceptable levels of moisture, perform calcium chloride tests in accordance with ASTM F 1869. If readings are below five pounds per 1,000 square feet for 24 hours install the primer. If readings are between five and eight pounds per 1,000 square feet for 24 hours install the moisture barrier coating, if readings are over eight pounds per 1,000 square feet for 24 hours submit the concrete topping system manufacturer's recommended remedial action for Engineer's acceptance.

C. Adhesion Testing:

1. Before application of the coating system, an adhesion test shall be conducted on a properly prepared concrete surface that is acceptable to the material manufacturer and Engineer. The test area shall be at least two square feet or larger to allow a minimum of three tests to be conducted. The test area shall be coated with the specified system and cured as recommended by the material manufacturer. Pull-off strength adhesion tests of coating system shall be conducted by the material manufacturer in

accordance with ASTM D 4541, using an Elcometer tensile adhesion tester. At least three adhesion tests shall be conducted and the results averaged. Adhesion strength shall equal or exceed the minimum adhesion strength recommended by the material manufacturer and shall exceed the tensile strength of the concrete. If the concrete topping system fails the adhesion test, the cause of the failure shall be determined and corrected before re-conducting the test.

D. Allowable Installation Tolerances:

1. Do not install the Work until substrate preparation and tolerances have been accepted by Engineer, concrete topping manufacturer's technical representative and the coating installer and Contractor has verified the substrates are within tolerances and profiles specified and acceptable to produce acceptable Work. Work advanced, for any reason, without such verification shall be stopped, and coating removed and replaced with new material if substrates are determined to be unacceptable for the Work.

2. Substrate Tolerances:

a. Out-of-Plane: 1/8-inch maximum in ten feet and 1/16-inch maximum in any 12-inches measured along the plane.

b. Maximum Offset in Plane Alignment: 1/16-inch.

c. Variation From Slope: 1/8-inch maximum in ten feet.

3. Chemical Resistant Concrete Coating Tolerances:

a. Finished coating system level to 1/8-inch in ten feet with smooth continuous uniformly sloped-to-drain planes.

b. Provide smooth continuous color with no color streaks or inconsistencies with smoothly textured non-slip finish.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. The Contractor shall touch up and restore any finish damaged. Coating or other finishes spilled, splashed or splattered shall be removed from all surfaces using care so as not to mar any surface or item being cleaned.

1. The Contractor shall rectify any failures or breakdowns, loosening of the paint or coatings within a year after Substantial Completion, regardless of the paint systems used. This will require removal of the entire coating where failure occurs and repainting with the coating system previously specified. Patching will not be allowed.

B. Cure coating materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 24 hours.

C. Protect coating materials from damage and wear during construction. Provide temporary covering, comply with manufacturer's recommendations for protective materials and method of application. Contractor is responsible for protection and cleaning of surfaces after final coats.

END OF SECTION

SECTION 10 14 01 – IDENTIFYING DEVICES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Identifying devices as specified herein shall include standing signs, metal letters and numbers signs and appurtenances.

B. Identifying devices shall be provided as specified in the Contract, in accordance with the NYC Fire Code and NYC Building Code, and as required for a complete installation of the equipment or structure.

C. The Contractor shall implement practices and procedures to meet the project's sustainability goals as identified in the Contract Documents. The Contractor shall ensure that the sustainability requirements of this Section are implemented to the fullest extent.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the

applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 03 21 00 - Reinforcing Steel

B. Section 03 30 00 - Cast-in-Place Concrete

C. Section 05 05 23.01 - Welding

D. Section 05 05 23.02 - Miscellaneous Metal Fastening

E. Section 05 12 00 - Structural Steel Framing

1.04 REFERENCES

A. OSHA - 1910.145 – Specifications for Accident Prevention Signs and Tags

B. NYCBC - New York City Building Code

C. ANSI/ICC A117.1 - Accessible and Usable Buildings and Facilities

D. AWS A5.12 - Tungsten and Oxide Dispersed Tungsten Electrodes for Arc Welding and Cutting

E. AWS D1.1 - Structural Welding Code - Steel

1.05 DESCRIPTION

A. Sustainable Design Requirements

1. Adhesives: As recommended by sign manufacturer and with a VOC content of 70 g/L or less for adhesives used inside the weatherproofing system and applied on-site when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Adhesives: Do not use adhesives that contain added urea formaldehyde.

3. Composite Wood and Agrifiber Products: Do not use composite wood and agrifiber products that contain added urea formaldehyde.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Engage a single fabricator, with undivided responsibility for detailing and performance of the signage structure and wall mounted metal lettering.

2. Engage a firm which can show five years previous successful experience in detailing and fabrication of signage paneling, signage structures, and metal lettering, of scope and type similar to the required work.

3. Materials and fabrication procedures shall be subject to inspection and tests in the mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests shall not relieve the Contractor of responsibility

for providing materials and fabrication procedures in compliance with specified requirements.

B. Installer Qualifications:

1. Engage a single installer skilled, trained and with documented successful experience in the installation of signage structures and wall mounted metal lettering, and with specific skill and successful experience in the erection of the types of materials required; and who agrees to employ only tradesmen with specific skill and successful experience in this type of Work. Submit names and qualification to Engineer along with the following information on a minimum of three successful projects:

a. Names and telephone numbers of owner, architects or engineers responsible for projects.

b. Approximate contract cost of the ornamental fences and gates.

c. Amount of area installed.

C. Source Quality Control:

1. Obtain all signage structure components and accessories from the same manufacturer.

2. Provide qualified welding processes and welding operators in accordance with AWS D1.1, Section 6 “Qualification”.

3. Provide certification that all welders employed on, or to be employed for, the fabrication of the signage structures and wall mounted metal lettering, have satisfactorily passed AWS qualification tests within the previous twelve months. Contractor shall ensure that all certifications are kept current.

1.07 SUBMITTALS

A. The Contractor shall submit for approval, catalog cuts, shop drawings, and reference materials.

B. Shop Drawings

1. The Contractor shall submit copies of specifications, installation instructions and general recommendations from the identifying device manufacturers, for each type of identifying device product. Manufacturer's data substantiating that the materials comply with the requirements of the Contract Documents shall be included.

2. Drawings showing extent of the Work and all details required for the Work referencing system components provided as samples, and shall include:

a. Complete details for all signs giving sizes and styles of lettering and colors.

b. Complete schedules for all signs, and building name letters giving location, message, letter, size, color, and method of attachment.

c. Details of fabrication and attachment of all items.

d. Complete location plan for all sign types.

C. Samples

1. Submit for approval color and finish samples of each identifying device product, including each accessory and miscellaneous material to be used in the Work.

D. Mockups

1. Mockups of each type of Identifying Device including wall mounded letters, shall be done in shop and await approval before installation.

E. Sustainable Design Submittals

1. Environmental Materials Reporting Form (EMRF) Recycled Content Materials. Provide the following information:

a. Name of Product and Manufacturer.

b. Material cost breakdowns. Cost breakdowns must include total material-only cost (excluding installation, labor and equipment).

c. The percentage (by weight) of post-consumer and pre-consumer recycled content in the submitted product(s), if applicable.

2. Environmental Materials Reporting Form (EMRF) - Composite Wood Products. Include the following information:

a. Confirmation that composite wood and Agri Fiber products contain no added urea formaldehyde.

b. For each laminate adhesive used on site and in the shop, documentation indicating that the adhesive contains no added urea formaldehyde.

3. VOC Reporting Form. Provide the following information:

a. For all adhesives used on site, provide the VOC content in grams/Liter (g/L) less water and other exempt compounds.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Materials shall not be delivered to the project site before the time of installation.

2. Materials shall be delivered in sufficient quantities to allow continuity of the Work.

3. All welding and fastening shall be done in shop prior to delivery to the site to minimize installation time.

B. Storage of Materials:

1. Materials shall be stored in original, undamaged containers with manufacturer's labels and seals intact.
2. All materials shall be stored in a dry, enclosed area, off the ground and away from all possible contact with water, ice or snow.
3. Damage to materials during storage shall be prevented by minimizing the amount of time they are stored at the site before being incorporated into the Work.

C. Handling of Materials:

1. Materials shall be handled in such a manner to avoid damage or breakage.
2. Materials shall not be exposed to detrimental conditions or physical damage. Materials which are so exposed shall be removed from the site and shall not be incorporated into the Work.
3. Packages or containers shall not be opened until all necessary preparatory Work is complete and installation is to begin immediately. Materials shall not be allowed to become wet or soiled or covered with ice or snow.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval by the Engineer.

1. Standard Signs and Handicap Signs: (exterior)
   a. Nelson-Harking Industries
   b. Or approved equal
2. Standard Signs and Handicap Signs: (interior)
   a. ASI Signage Innovations
   b. Best Signs
   c. Or approved equal
3. Metal Letters and Numbers: (exterior)
   a. Nelson-Harking Industries
   b. American Sign Letters

c. Or approved equal

2.02 MATERIALS / EQUIPMENT

A. General:

1. Accessibility Standard: Comply with applicable provisions in ICC A117.1 for signs.

2. Signs shall be in accordance with the NYC Fire Code, the NYCBC and as directed by the Engineer.

B. Standard Signs and Handicap Signs:

1. All standard signs information shall be as per the Contract Drawings and the In-design File that is to be provided by the Engineer. For signs font, font size, color, logo and graphic refer to the In-Design File.

a. Font: Helvetica Medium.

b. Minimum Font Height: 1-inch, refer to the Contract Drawings.

2. Room name and informational signage:

a. Product Description: Provide unframed signs, surface-etched, 1/32-inch raised tactile lettering and pictograms, sandblasted on an opaque sheet.

b. Materials:

1) Interior Signs: Three-ply, self-extinguishing melamine plastic.

2) Exterior Signs: One-piece fiberglass.

c. Size and Thickness: 0.125-inch thick; eight inches by eight inches with 1/2-inch radiused corners.

3. All wayfinding, directional, identifying signage and handicap signs, shall be a standalone structure. No signage shall be secured to the new fence, gates, or other structures.

4. All sign support structures shall be made of White Powder Coated Steel and bolted to concrete footings.

5. All mounting hardware shall be as provided as shown on the Contract Drawings.

C. Metal Letters and Numbers (Exterior)

1. All metal letters, numbers, and symbols shall be as per contract drawings and made of:

a. Metal: 316 stainless steel

b. Thickness: 1/2 inch, unless otherwise noted in Contract Drawings.

c. Finish: No. 4 Satin

d. Size: 10 inches and 5 inches - refer to the Contract Drawings

e. Font: Shall be as per the design file that will be provided by the Engineer.

2. NYC Logo and Agency Name:

a. Follow NYC Logo Guidelines: nyc_logoguidelines.pdf

1) Logo: Match NYC logo font and style in proportion.

2) Agency Name – Font: Helvetica Neue 55 Roman.

3) Agency Name – Height: 7-1/2 inches.

b. Building Name:

1) Font: Helvetica Neue 85 heavy with -20 track.

2) Height: 12-1/2 inches.

3. All letters shall be manufactured to have Projected Mounting Hardware with ½ inch.

D. Attachments: All attachments and anchors necessary for concealed installments of identifying devices shall be furnished.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Wall Mounted Metal Letters

1. All surfaces shall be cleaned and prepared to receive the metal lettering as per the Contract Documents.

2. All pegs/bolts/nuts/clips, etc., fastening the metal lettering to the wall surface shall be of like materials or separated by neoprene washers.

3. The Contractor shall follow requirements for metal fastening as per Section 05 05 23.02 - Miscellaneous Metal Fastening.

B. Post Mounted Signs

1. All steel posts are to be welded to their baseplates or any other items in shop unless otherwise indicated on the Contract Documents.

2. All welding is to be done in accordance with Section 05 05 23.01 – Welding.

3. All structural steel fabrication shall be done in accordance with Section 05 12 00 -Structural Steel Framing.

4. All concrete and concrete re-enforcement to be used for footings shall be done in accordance with Section 03 21 00 - Reinforcing Steel and Section 03 30 00 - Cast-in-Place Concrete.

C. Welding

1. For all welding in shop or in field the Contractor shall adhere to AWS A5.12, AWS D1.1 and any other applicable reference.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. The Contractor shall verify that areas to receive identifying devices are properly prepared and completed.

3.02 INSTALLATION

1. All materials specified herein shall be installed in compliance with the NYCBC, ANSI A117, OSHA regulations, and the approved manufacturer's printed specifications. Mounting devices, bolts, screws, nuts, and the like shall be in accordance with the Contract Drawings, and all related section listed herein.

B. Identifying devices shall be installed where shown on the Contract Drawings.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjustment: System components which are dislodged, damaged, expanded, broken, penetrated or crushed by subsequent installation operations or damaged by detrimental weather shall be immediately replaced with undamaged material in compliance with the Specifications and properly protected as specified.

B. Protection: Identifying devices shall be protected from all damage and abuse from all other Contractors and installers involved in the Work until Final Acceptance by the City.

C. Cleaning: Upon completion of the project, all protection devices shall be removed and identifying devices shall be touched up as necessary. All exposed surfaces shall be cleaned using a mild solution of detergent and warm water. All surfaces shall be left in a neat and clean condition.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish and install fire extinguishers, complete and operational, with cabinets and all anchor bolts, fasteners, and accessories.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Abbreviations and Acronyms:

1. DC Dry Chemical

2. CO_2 Carbon Dioxide

B. Reference Standards:

1. NFPA 10 Portable Fire Extinguishers.

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to, the following:

1. Action Submittals:

a. Shop Drawings:

1) Complete detail and installation drawings for fire extinguisher s and cabinets.

2) Wall mount hardware.

2. Information Submittals:

a. Manufacturer's specification data sheets and verification of UL ratings.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver equipment provided under this Section in accordance with the requirements of the Contract Documents.

B. The Contractor shall store and handle equipment provided under this Section in accordance with the requirements of the Contract Documents.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. DC fire extinguishers:

1. Ansul Inc., Marinette, WI.

2. Kidde as manufactured by United Technologies Corp., Mebane, NC.

3. Or approved equal.

B. Cabinets:

1. 'Duo-vertical' panel w/ tempered safety glass style, as manufactured by Potter-Roemer Inc., Union, NJ.

2. 'Duo-vertical' panel w/ tempered safety glass style, as manufactured by Larson's Manufacturing Company, Minneapolis, MN.

3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. DC fire extinguishers shall be 10 lb. capacity, cartridge operated, hand portable, with wall mount, tri-class dry chemical type, with Underwriters' Laboratories rating of 4A:60B:C.

B. CO2 fire extinguishers shall be 10 lb. capacity, portable carbon dioxide type with wall mounts, having Underwriters' Laboratories rating of at a minimum 1A:10B:1C.

C. Provide the manufacturer's standard wall-mounting bracket for each fire extinguisher.

D. Cabinets: Surfaced mounted as indicated on the Contract Drawings. All cabinets shall be #4 finish type 316 stainless steel and ⅛-in. thick, double strength sheet ('DSA') glass. Size cabinets for extinguishers.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Install fire extinguishers in complete accordance with the manufacturer's printed instructions and the approved shop drawings.

B. Fire extinguishers shall be installed where shown on the Contract Drawings, as indicated below and as directed by the Engineer.

1. Provide exterior fire extinguishers with weather cover.

C. Wall mounts for extinguishers shall be securely mounted to masonry with Type 316 stainless steel lag bolts and shields.

D. Fire extinguishers shall be mounted with carrying handle no more than 42-inches above finish floor and fire extinguisher bottom 4-inches or more above finish floor.

E. Fire extinguisher locations, refer to the Contract Drawings and as follows:

1. Provide CO2 fire extinguishers in electrical rooms.
2. Provide dry chemical fire extinguishers at each building exits.
3. Provide dry chemical fire extinguishers in surface mounted cabinet at each exterior chemical fill stations.
4. Provide minimum one dry chemical fire extinguisher at entrance to sodium bisulfite room.
5. Provide minimum one dry chemical fire extinguisher at entrance to sodium bisulfite room.
6. Provide minimum one dry chemical fire extinguisher at entrance to sodium hypochlorite room. Do not install any CO2 fire extinguishers in this room.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 21 13 13 – WET PIPE SPRINKLER SYSTEM
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish and install automatic wet-pipe sprinkler system complete and operational with accessories.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 50 00 – Metal Fabrications.

B. Section 09 91 00 - Painting.

C. Section 40 05 97 – Identification for Process Equipment.

1.04 REFERENCES

A. Standards referenced in this Section are listed below:

1. American National Standards Institute, (ANSI).

a. ANSI A13.1, Scheme for Identification of Piping Systems.

b. ANSI A21.4, Cement-Mortar Lining for Cast-Iron and Ductile Cast-Iron Piping for Water and Other Liquids (AWWA C105).

c. ANSI A21.10, Cast-Iron and Ductile Iron Fittings, 2 thru 48-inch, Water.

d. ANSI A21.11, Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings.

e. ANSI A21.51, Ductile Iron Pipe Centrifugally Cast, in Metal Molds.

f. ANSI B2.1, USAS-Pipe Threads (Except Dryseal).

g. ANSI B16.1, Cast Iron Pipe Flanges and Flanged Fittings.

h. ANSI B16.3, Malleable Iron Threaded Fittings, 150 and 300 lb.

i. ANSI B16.5, Pipe Flanges and Flanged Fittings.

2. American Society for Testing and Materials, (ASTM).

a. ASTM A 47/A 47M, Specification for Ferritic Malleable Iron Castings, Grade 32510.

b. ASTM A 48/A 48M, Specification for Gray Iron Castings.

c. ASTM A 53/A 53M, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

d. ASTM A 126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

e. ASTM A 183, Specification for Carbon Steel Track Bolts and Nuts.

f. ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

g. ASTM A 449, Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 KSI Minimum Tensile Strength, General Use.

h. ASTM A 795/A 795M, Specification for Black and Hot-Dipped Zinc- Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.

i. ASTM B 5, Specification for Electrolytic Tough-Pitch Copper Refinery Shapes.

j. ASTM B 19, Specification for Cartridge Brass Sheet, Strip, Plate, Bar and Disks.

k. ASTM B 584, Specification for Copper Alloys Sand Castings for General Applications.

l. ASTM D 1330, Specification for Rubber Sheet Gaskets.

m. ASTM D 2000, Classification System for Rubber Products in Automotive Applications.

3. American Welding Society, (AWS).

a. AWS D1.1/D1.1M, Structural Welding Code-Steel.

4. Factory Mutual Association, (FM).

5. National Fire Protection Association, (NFPA).

a. NFPA 13, Standard for Installation of Sprinkler Systems.

b. NFPA 24, Installation of Private Fire Service Mains and Their Appurtenances.

c. NFPA 25, Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.

1.05 DESCRIPTION

A. This Section includes requirements for providing wet-pipe sprinklers, piping, valves and accessories for fire service, in accordance with applicable standards and regulations.

1.06 QUALITY ASSURANCE

A. Installer's Qualifications:

1. Engage a single installer regularly engaged in sprinkler piping installation and with experience in the installation of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to Engineer.

2. Engage a single installer for the entire sprinkler piping system with undivided responsibility for performance and other requirements.

3. The installer shall be a licensed fire suppression contractor for fire sprinkler and fire alarm systems.

B. Component Supply and Compatibility:

1. Obtain all equipment included in this Section regardless of the component manufacturer from a single wet-pipe sprinkler system manufacturer.

2. The wet-pipe sprinkler system equipment manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.

3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the wet-pipe sprinkler system equipment manufacturer.

C. Regulatory Requirements: Comply with applicable provisions and recommendations of the following except as otherwise shown or specified.

1. Local and State Building Codes and Ordinances.

2. Permits: Contractor shall obtain and pay for all required permits, fees and inspections.

D. Qualifications for Welding Work:

1. Qualify welding processes and welding operators in accordance with AWS "Structural Welding Code-Steel" D1.1/D1.1M, Section 5, Qualification and NFPA 13. Use only welding fitting for shop welding.

2. Provide certification that all welders employed on, or to be employed for the Work, have satisfactorily passed AWS qualification test within the previous 12 months. Contractor shall ensure that all certifications are kept current.

E. Field Measurements: Take field measurements, where required, prior to preparation of Shop Drawings and fabrication, to ensure proper fitting of the Work.

F. Manufacturers' Qualifications: Firms whose equipment, specialties and accessories are listed by product name and manufacturer in UL Fire Protection Equipment Directory and FM Approval Guide and that conform to other requirements indicated.

G. Listing/Approval Stamp, Label or Other Marking: On equipment, specialties and accessories made to specified standards.

H. Listing and Labeling: Equipment, specialties and accessories that are listed and labeled.

1. The Terms "Listed and Labeled": As defined in "National Electrical Code", Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL), as defined in OSHA Regulation 1910.7.

I. Comply with requirements of applicable authority having jurisdiction for submittals, approvals, materials, hose threads, installation, inspections and testing.

J. Licensed Engineer: Submit design calculations and installation inspection reports. Include seal and signature of Registered Engineer licensed in the State of New York, certifying compliance with these Specifications.

1.07 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:

a. Contractor shall submit for review a reflected ceiling plan or layout of all areas with automatic sprinkler protection showing proposed location of sprinkler heads with respect to lights, diffusers, framing members, etc. After review of the reflected ceiling plan, Contractor

shall prepare 1/4-inch scale working drawings of the installation. Data on these working drawings shall include, but not be limited to, the following:

1) Size of all piping

2) Method of anchoring or hanging pipe-lines

3) Location and type of valves

4) Position, type and temperature ratings of sprinkler heads, zone valves, nozzles and detectors

5) Material and equipment list indicating manufacturers' names and types

6) Structural, mechanical, heating and ventilating, electrical and architectural coordinating information

7) Hydraulic calculations and various other items pertinent to the complete installation of the systems.

8) Working drawings, hydraulic calculations, specifications, etc., shall be submitted to the local authorities having jurisdiction at the Site for checking and approval. Contractor shall submit final approved working drawings, hydraulic calculations, etc, for record purposes prior to starting any Work.

2. Product Data:

a. Manufacturer' literature, specifications, illustrations and Engineering data, including dimensions, size, weights and materials for the following:

1) Pipe and fittings.

2) Unions.

3) Flexible couplings.

4) Valves.

5) Strainers.

6) Fire department connections.

7) Sleeves and escutcheons.

8) Waterflow alarm indicator.

9) Gages.

10) Tamper switches.

11) Sprinkler heads.

12) Sprinkler cabinet.

13) Reduced pressure zone backflow preventer assembly.

14) Hangers and supports.

15) Escutcheons.

16) Pipe and valve labels.

17) Other materials and equipment requested by Engineer.

B. Informational Submittals: Submit the following:

1. Qualification Statements:

a. Installer's qualifications.

C. Closeout Submittals: Submit the following:

1. Operation and Maintenance Manuals:

a. Submit complete installation, operation and maintenance manuals, including test reports, maintenance data and schedules, description of operations and spare parts information, including:

b. Fire Department approved drawings.

c. Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01 78 25 – Operations and Maintenance Manuals.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling and Unloading:

1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.

B. Storage and Protection:

1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.

C. Acceptance at Site:

1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bronze Body Gate Valves:

1. Milwaukee Valve Company, Inc., Fig. No. 118-FP
2. Nibco Inc., Fig. No. T-104-O
3. Or approved equal.

B. Iron Body Gate Valves:

1. Kennedy Valve Division of McWane Corp., Fig. No. C509
2. Nibco, Inc., Fig. No. F-607-OTS
3. Or approved equal.

C. Iron Body Check Valves:

1. Kennedy Valve Division of McWane Corp., Fig. No. 1126
2. Nibco, Inc., Fig. No. F-908-W
3. Or approved equal.

D. Strainers:

1. Grinnell Products Division of JCI
2. The Viking Corporation.
3. Or approved equal.

E. Automatic Ball Drip:

1. Potter-Roemer Incorporated, Fig. No. 5983
2. The Viking Corporation, Model B-1
3. Or approved equal.

F. Wet Pipe Alarm Valves:

1. Grinnell Products Division of JCI
2. Reliable Automatic Sprinkler Co.
3. The Viking Corporation.
4. Or approved equal.

G. Riser Check Valves:
   1. Grinnell Products Division of JCI
   2. Reliable Automatic Sprinkler Co.
   3. The Viking Corporation.
   4. Or approved equal.

H. Gages:
   1. States Gauge Division Ametek, Incorporated.
   2. Weksler Instruments Division of Ashcroft, Inc.
   3. Or approved equal.

I. Fire Department Connection:
   1. Croker Division, Fire End & Croker Corporation NYC Approved**.**
   2. Potter-Roemer Incorporated, No. 5020 NYC Series.
   3. Or approved equal.

J. Automatic Sprinklers, Standard:
   1. Reliable Automatic Sprinkler Co., Inc.
   2. Tyco Fire Products - JCI
   3. The Viking Corporation.
   4. Or approved equal.

K. Automatic Sprinklers, Quick Response:
   1. Reliable Automatic Sprinkler Co., Inc.
   2. Tyco Fire Products - JCI
   3. The Viking Corporation.
   4. Or approved equal.

L. Sprinkler Cabinets:
   1. Tyco Fire Products - JCI
   2. The Viking Corporation.
   3. Or approved equal.

M. Tamper Switch:
   1. Notifier Division of Honeywell, Int., Model OSY2A
   2. Potter Electric Signal Company, Model OSYSU-2.
   3. Or approved equal.

N. Hangers and Supports:
   1. Anvil International, Inc.
   2. Tolco Division of Nibco, Inc.
   3. Or approved equal.

O. Escutcheons:
   1. Tyco Fire Products - JCI
   2. Or approved equal.

P. Electric Alarm Bell:
   1. Reliable Automatic Sprinkler Company.
   2. The Viking Corporation.
   3. Or approved equal.

Q. Waterflow Alarm Indicators:
   1. Notifier Division of Honeywell, Int., series WFDE
   2. Potter Electric Signal Company, Model VSR-F.
   3. Or approved equal.

R. Threaded Fittings ANSI B2.1:
   1. Anvil International, LLC
   2. Mueller Industries, Inc
   3. Ward Manufacturing, LLC
   4. Or approved equal

S. Grooved:
   1. Anvil International, LLC
   2. Grinnell Products Division of JCI
   3. Victaulic Company of America.
   4. Or approved equal

2.02 MATERIALS / EQUIPMENT

A. Steel Pipe: Interior:
   1. Pipe:
      a. Reference: ASTM A 795/A 795M or ASTM A 53/A 53M.
      b. Weight: Schedule 40.
         1) Cut or roll grooved, threaded or welded pipe - Schedule 40.

2) Grooved Pipe 2-Inch and Larger:

a) Cut or roll grooved - Schedule 40.

b) Roll grooved - Schedule 10.

c. Finish: Black or galvanized.

d. End Connections: Compatible with fittings and accessories.

e. Labeling: Manufacturer shall provide industrial inkjet printed, or other industry standard, labeling with all information required by the NFPA 13 for piping used in automatic sprinkler service.

2. Fittings:

a. Threaded: ANSI B2.1

1) Reference: ANSI B16.3, Class 150 and 300, Factory Mutual approved, Underwriters' Laboratory listed for specific use.

2) Material: Malleable iron.

3) Finish: Black or galvanized.

b. Grooved:

1) Reference: FM approved, UL listed.

2) Material: Malleable iron.

3) Finish: Black or galvanized.

4) Couplings:

a) Type: Grooved mechanical.

b) Material: Malleable iron, ASTM A 47/A 47M.

c) Finish: Black or galvanized.

d) Nuts and Bolts: Carbon steel, ASTM A 449 and ASTM A 183.

e) Gasket: EPDM, ASTM D 2000.

3. Unions: Threaded, malleable iron, FS WWU531, Class 1, Type B. 1-1/2-inch pipe size and smaller only.

4. Flanges:

a. Type: Screwed, 125 lb. or 150 lb., ANSI A21.10 drilling.

b. Material: Steel, ANSI B16.5.

c. Gaskets: Red rubber, ASTM D 1330, Grade 1, 1/8-inch thick.

d. Bolts and Nuts: ASTM A 307, Grade B.

5. Joint Compound: Underwriters' Laboratory listed or Factory Mutual approved.

6. Thread Tape:
   a. Material: Teflon.
   b. Underwriters' Laboratory listed or Factory Mutual approved.
7. Flexible Coupling Assembly:
   a. Manufacturers: Provide products of one of the following:
      1) Anvil International, LLC
      2) Grinnell Products Division of JCI
      3) Victaulic Company of America.
      4) Or approved equal
   b. Reference: Underwriters' Laboratory listed or Factory Mutual approved.
   c. Material: Malleable iron, ASTM A 47/A 47M.
   d. Finish: Red.
   e. Nuts and Bolts: Carbon steel, ASTM A 449 and ASTM A 183.
   f. Gasket: EPDM, ASTM D 2000.
   g. Pipe:
      1) Reference: ASTM A 795/A 795M.
      2) Weight: Schedule 40.
      3) Finish: Black or galvanized.
      4) End Connection: Cut or roll groove.

B. Ductile Iron Pipe: Underground Water Service:
   1. Pipe: Ductile Iron, ANSI A21.51.
   2. Fittings: Ductile Iron, ANSI A21.11.
   3. Joints:
      a. Mechanical Joint:
         1) Glands, Bolts and Nuts: ANSI A21.11.
      b. Push-on Joint:
         1) Gaskets Rubber: ANSI A21.11.
         2) Lubricant: ANSI A21.11.
   4. Lining: Cement Lined, ANSI A21.4.

C. Bronze Body Gate Valves:
   1. Type: Outside screw and yoke, rising stem solid wedge disc.
   2. Materials: Brass and Bronze.

3. Rating: 175 lb. WOG.
4. End Connections: Threaded.
5. Markings: Underwriters' Laboratory listed, Factory Mutual approved, rating and manufacturers markings cast on body.
6. Size: 3/4-inch to 2-inch pipe size.

D. Iron Body Gate Valves:

1. Type: Outside screw and yoke, rising stem, solid wedge.
2. Materials: Iron body with bronze trim.
3. Rating: 175 lb. WOG.
4. End Connections: Flanged, ANSI B16.1, ANSI A21.10 drilling.
5. Markings: Underwriters' Laboratory listed, Factory Mutual approved, rating and manufacturer's markings cast on body.
6. Size: 2-1/2-inch to 8-inch.

E. Iron Body Check Valves:

1. Type: Swing, regrind-renew disc and seat ring, bolted cover.
2. Materials: Iron body, renewable or bronze trim, bronze disc and seat ring.
3. Rating: 175 lb. WOG.
4. End Connections: Flanged, ANSI B16.1, ANSI A21.10 drilling.
5. Markings: Underwriters' Laboratory listed, Factory Mutual approved, rating and manufacturer's markings cast on body.

F. Strainers:

1. Type: Self-cleaning "Y" body with blow-off cock.
2. Materials:
   a. Body: Cast-iron, galvanized.
   b. Screen: Stainless steel with 3/16-inch diameter holes.
   c. Retainer: Steel.
   d. Pipe Plug: Steel.
   e. Rating: 175 lb. WOG.
   f. End Connections: Threaded.

G. Automatic Ball Drip:

1. Type: In-line automatic ball drip.
2. Materials: Rough cast brass.
3. Rating: 175 lb. WOG.

4. End Connections: Threaded.

H. Riser Check Valves:

1. Type: Vertical.
2. Materials:
   a. Gray Iron Castings: ASTM A 48/A 48M, Class 30A.
   b. Cast Bronze: ASTM B 584, Alloy 5A.
   c. Clapper Facing: EPDM rubber, ASTM D 2000.
   d. Clapper Retainer: Stainless steel.
   e. Stainless Steel: AISI 302.
3. Rating: 175 lbs. WOG.
4. End Connections: Flanged ANSI B16.1, ANSI A21.10 drilling.
5. Markings: Underwriters' Laboratory listed, Factory Mutual approved markings, rating, year and manufacturer's markings cast on body.
6. Accessories:
   a. Trim packages shall consist of angle valves, ball valves, orifice restriction, pipe nipples and fittings.
   b. Water pressure gages.
   c. Plugs.

I. Gages:

1. Type: Bourdon type having an enclosed phosphor-bronze tube.
2. Materials:
   a. Moving Parts: Brass or stainless steel.
   b. Case: Brass or stainless steel.
   c. Ring: Brass or stainless steel, threaded.
   d. Hair Spring: Phosphor-bronze.
3. Dial Markings: Subdivisions one percent of maximum scale reading.
   a. Pressure Gage: 0 to 300 psi.
4. Accuracy: One percent of manufacturer's specified pressure over the working range.
5. Face Diameter: 4-1/2-inch.

J. Fire Department Connection:

1. Type: Wall mounted fire department connection, double clapper two-way inlets with plate and plugs.

2. End Connection: As required by local Fire Department.
3. Caps: Cast brass complete with gasket and chain with "S" hooks.
4. Threads: Verify thread types and sizes with local fire department.
5. Material: Cast brass with satin finish chrome plating.
6. Wall Plate: Cast brass round with satin finish chrome plating.
7. Rating: 175 lb. WOG.
8. Markings: Manufacturer's label and **"AUTO-SPKR"** cast on top.
9. Reference: UL listed, FM approved.

K. Automatic Sprinklers, Quick Response:

1. Type:
   a. Upright Spray: Deflector cupped downward at edges.
   b. Pendent Spray: Flat deflector.
2. Materials:
   a. Natural bronze, corrosion resistant upright or pendent as required shall be used in the areas designated corrosive atmosphere and shall be additionally Teflon coated for corrosion resistance.
   b. Natural bronze, upright or pendent as required shall be used in the areas designated non-corrosive.
   c. Frame: Bronze casting ASTM B 584; threads, Teflon taped.
   d. Levers: Bronze casting ASTM B 584, Alloy 5A.
   e. Link: Leaf and ball CDA-411.
   f. Waterway Washer: Copper ASTM B 5.
   g. Deflector: Brass ASTM B 19.
3. Finishes: Chrome plated, natural bronze or Teflon coated.
4. Rating: 175 lb. WOG.
5. Markings:
   a. Upright Use: "SSU" stamped on deflector plate.
   b. Pendent Use: "SSP" stamped on deflector plate.
   c. All sprinklers shall be permanently marked with the manufacturer, the model, year, deflector characteristic, thermal sensitivity and temperature rating.
6. End Connections: Threaded.

L. Sprinkler Cabinets:

1. Type: Sprinkler head cabinet for sprinkler head, sprinkler wrench storage.

2. Material: Enameled steel.

3. Markings: Manufacturer's name and words "AUTOMATIC SPRINKLERS, RESERVE SUPPLY" stenciled on face of cabinet.

4. Contents:

   a. Two sprinkler wrenches.

   b. Spare sprinkler heads of each type and spare heads of each temperature rating used in the building in accordance with NFPA 13.

M. Tamper Switch:

1. Type: Monitor open position of OS & Y sprinkler system control valves.

2. Reference: Underwriters' Laboratory listed and Factory Mutual approved.

3. Tamper proof, NEMA 4X switch case.

4. Two single pole, double throw switches.

5. Operation: The entire assembly shall be tamper proof, adjusted to operate within two revolutions of the valve control, or when stem has moved no more than 1/5 of the distance from its normal position.

N. Hangers and Supports:

1. Type: Clamps, hooks, rods, and hangers used to support a sprinkler piping system from the structure.

2. Materials: Comply with the requirements of, NFPA 13, Underwriters' Laboratory listed and Factory Mutual approved.

O. Escutcheons:

1. Type: Split ring with set screw.

2. Material: Chrome plated cast brass.

P. Pipe Labels: Provide in accordance with Section 40 05 97 – Identification for Process Equipment.

Q. Electric Alarm Bell:

1. Type: Electric alarm bell, weatherproof.

2. Materials:

   a. Gong Shell: Alloy steel, painted.

   b. Plunger: Cadmium finish iron with stainless steel striking tip.

   c. Mounting Plate: Plated steel and drilled to fit standard back boxes.

   d. Back-Box Housing: Weatherproof die-cast aluminum with rubber gasket.

   e. Bell Guard: Cast aluminum, fasten to gong shell.

3. Diameter: Ten-inch.
4. Voltage/Phase/Hertz: 120/1/60.
5. Decibel Rating: 97 decibels at ten feet.

R. Waterflow Alarm Indicators:

1. Type: Flexible vane projecting into the waterway with pneumatic retard.
2. References: Underwriters' Laboratory listed and Factory Mutual approved.
3. Tamper proof, NEMA 4X switch case.
4. Two single pole, double throw switches rated at ten amps, 120/240 VAC.
5. Flow sensitivity adjustment from 0 to 90 seconds.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Contractor shall examine the conditions under which the Work is to be installed and notify the Engineer, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Piping Schedule

1. Use types of pipe and fittings as specified below, unless otherwise specified or shown.
   a. All sprinkler piping shall be galvanized steel or copper for corrosive environment.
   b. All sprinkler piping, 2-inches and larger, Schedule 40 shall be threaded, welded or cut or roll grooved mechanical fittings.
   c. All sprinkler piping, 2-inches and larger, Schedule 10 shall be threaded, welded or roll grooved mechanical fittings.
   d. All sprinkler piping, 1-1/2-inch and smaller, shall be Schedule 40 with threaded or welded fittings.
   e. Potable water supply mains to sprinkler system, aboveground and underground, 3-inches and larger upstream of the backflow preventers shall be ductile iron.

B. General:

1. The installation of the sprinkler system shall conform to the requirements of NFPA 13, Factory Mutual 2-0 and the supplemental Specifications, below.
2. Provide all necessary supports, angle iron stands, miscellaneous steel, inserts, anchor bolts and hangers required for all equipment furnished under this Section. Supports, angle iron stands, etc., shall be in accordance with Section 05 50 00 – Metal Fabrications.
    a. Space supports so that there is at least one hanger for each length of pipe, with one hanger within 30-inches of the end sprinkler head.
    b. Do not hang piping from ductwork or other piping.
3. Install all items as shown, specified, and recommended by the manufacturer.
4. Request instructions from Engineer, in writing, when there is a conflict between the manufacturer's recommendations and the Contract Documents.
5. Present conflicts between piping systems and equipment or structures to the Engineer, in writing, who will determine corrective measures to be taken.
6. Do not modify structures to facilitate installation of piping, unless specifically approved by Engineer.
7. Installation to conform to requirements of all local and state codes.
8. Defective Materials: Examine piping, fittings, valves, sprinkler heads and accessories to be installed and reject those which are defective or in poor condition.

C. Piping:

1. Install straight runs true to line and elevation.
2. Install vertical pipe truly plumb in all directions.
3. Install piping parallel or perpendicular to building walls. Piping at odd angles and 45° runs across corners will not be accepted.
4. Install small diameter piping (1-inch minimum) generally as required to avoid ducts, equipment, beams, etc.
5. Provide drains at low points of all lines and wherever sprinkler piping is trapped.
6. Install underground piping in accordance with NFPA 24, Chapter 10.
7. Install sprinkler heads at centerline of corridors.

D. Joints:

1. General:

a. Make joints in accordance with the pipe manufacturer's recommendations and the supplemental Specifications, below.

b. Cut piping accurately and squarely and install without forcing or springing.

c. Ream out all pipes and tubing to full inside diameter after cutting.

d. Remove all cuttings and foreign matter from the inside of pipes and tubing before installation.

2. Threaded Joints: Use standard, right hand tapered full depth threads on steel piping and apply an approved joint compound to the male threads only, before installation. Leave not more than three pipe threads exposed at each connection.

3. Flanged Joints: Assemble flanged joints with approved full face gaskets and gasket compounds and draw up flange bolts evenly.

4. Welded Joints: ANSI Z49.1 latest revision and requirements of the American Welding Society for pipe welding.

5. Grooved Joints: Grooves for couplings shall be fabricated in accordance with manufacturer's recommendations.

E. Unions:

1. Provide a union downstream of each valve with screwed connections.

2. Provide screwed or flanged unions where shown or where necessary to install piping, so that piping may be readily dismantled in small sections.

F. Valves and Accessories:

1. Provide supports for large valves and other heavy items as shown.

2. Install floor stands as shown and as recommended by the manufacturer.

3. Position valve operators as shown and where required. When the position is not shown, install the valve so that it can be conveniently operated and as approved by the Owner. Avoid placing operators at odd angles to the floors or walls.

4. Any valve placed so that its operating mechanism is more than seven-foot above a floor or stair landing, a 12-inch wide wrought iron, steel or equivalent ladder securely fastened shall be provided for access to the valve.

G. Head Quantity:

1. Actual quantity and locations shall be as required by the local fire protection agency (Fire Marshal's Office). Contractor shall design, furnish and install complete, all piping and sprinkler heads as required to conform to all local, state and federal laws, codes and ordinances having jurisdiction over this Project.

H. Sprinkler Head Guards:

1. Sprinkler heads which are less than 84-inches above finished floor or are so located as to be subject to injury, shall be protected with approved guards.

I. Gages:

1. An approved 3-1/2-inch diameter spring pressure gage shall be installed at each test pipe location.

J. Control Valves:

1. All section control valves shall be installed where required and in accessible locations as required by the local Fire Marshall or Factory Mutual Systems.
2. Each sprinkler zone shall have a control valve.
3. All valves controlling the water supply to the sprinkler system shall be provided with tamper switches. Coordinate wiring and connection to the fire alarm control panel with Division 26, Electrical.

K. Test Pipes:

1. Test pipes shall be provided in accordance with NFPA 13 and same shall discharge into the nearest open Site floor drain or outside of building.

L. Signs:

1. Enameled signs with appropriate nomenclature as approved by the local Fire Marshall shall be installed at each control valve, drain, inspector's test station, alarm bell, etc.

M. Shields:

1. Furnish and install hoods or shields to protect electrical equipment from water. Hoods or shields shall be fabricated from non-combustible materials.

N. Flexible Couplings:

1. Provide flexible couplings comprised of several grooved joints and grooved couplings adjacent to the previous as required on each sprinkler line crossing a building expansion joint. Grooved joint and coupling assembly shall be UL listed or FM approved, for use with Schedule 40 steel pipe with cut groove joint.

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Tests:

1. Fill all systems and fully test all equipment, piping, valves, etc. in operation.
2. Installed systems and components will not be released to Owner, unless all systems have been tested and approved by the Engineer.
3. Flush out all piping systems according to the applicable building codes.
4. Test the systems before any paint is applied.

B. Inspection of Welded Connections:

1. All welds will be subject to visual inspection. Where visually deficient welds are observed, the welds will be tested using non-destructive methods by a certified testing laboratory. If welds are found to be satisfactory, Owner will pay for testing. Where welds are found unacceptable or deficient, Contractor will pay for testing. Contractor will correct improper workmanship, remove and replace, or correct as instructed, all welds found unacceptable or deficient. Contractor will pay for all corrections and subsequent tests required to confirm the integrity of the weld.

C. Acceptance Tests: Testing shall be in conformance with the requirements of the applicable authority having jurisdiction and NFPA 13 Standard, Chapter 16.

1. Piping system shall be hydrostatically tested at 200 psi. Apply the test for a minimum of two consecutive hours with no loss of pressure.

D. Inspection:

1. Examine areas to receive piping, valves and accessories for:

a. Defects that adversely affect execution and quality of the Work.

b. Deviations beyond allowable tolerances piping, valves and accessories.

c. Start the Work only when conditions are satisfactory.

2. The Engineer reserves the right to reject or authorize replacement of piping, valves and accessories found to defective.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting:

1. Adjust all controls for proper settings.

2. While system is operable, balance all equipment, valves, etc., to achieve design conditions.

B. Cleaning:

1. Thoroughly clean all piping, fittings, valves, and accessories prior to installation.

2. Remove all dirt, rust, dust, etc. from piping in preparation for painting.

3. Remove and dispose of all debris and waste from the Site resulting from installation.

END OF SECTION

SECTION 22 05 27 – PIPE SLEEVES FOR PLUMBING PIPING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install pipe sleeves, other wall pieces, and escutcheons complete with accessories.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

1. Section 03 30 10, Low Carbon Cast-In-Place Concrete.
2. Section 07 90 00, Joint Protection.
3. Section 21 13 13, Wet-Pipe Sprinkler System.
4. Section 22 11 16, Domestic Water Piping.

5. Section 22 13 16, Sanitary Waste and Vent Piping.

1.04 REFERENCES

A. Reference Standards:

1. American National Standards Institute, (ANSI).
   a. ANSI A21.4, Cement-Mortar Lining for Cast-Iron and Ductile Iron Pipe and Fittings.
   b. ANSI A21.6, Cast-Iron Pipe Centrifugally Cast in Metal Molds.
   c. ANSI A21.10, Cast-Iron and Ductile Iron Fittings, 2 thru 48-inches in Water.
   d. ANSI A21.15, Flanged Cast-Iron and Ductile Iron.
   e. ANSI A21.51, Ductile Iron Pipe Centrifugally Cast in Metal Molds.
   f. ANSI B16.1, Cast Iron Pipe Flanges and Flanged Fittings.
2. American Society for Testing and Materials, (ASTM).
   a. ASTM A36, Specification for Carbon Structural Steel.
   b. ASTM A47, Specification for Ferritic Malleable Iron Castings.
   c. ASTM A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   d. ASTM A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   e. ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
   f. ASTM A575, Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
   g. ASTM A668, Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.
3. American Water Works Association, (AWWA).
   a. AWWA C104, Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water.
   b. AWWA C106, Cast Iron Pipe Centrifugally Cast in Metal Molds.
   c. AWWA C110, Ductile Iron and Gray Iron Fittings for Water.
   d. AWWA C115, Flanged Ductile Iron Pipe or Gray-Iron Threaded Flanges.
   e. AWWA C151, Ductile Iron Pipe, Centrifugally Cast for Water.

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Installers' Qualifications:

1. Engage a single installer regularly engaged in pipe sleeves and mechanical seals installation and with experience in the installation of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit names and qualifications to Engineer.

2. Engage a single installer for the entire pipe sleeves and mechanical seals system with undivided responsibility for performance and other requirements.

B. Component Supply and Compatibility:

1. Obtain all products included in this Section regardless of the component manufacturer from a single pipe sleeves and mechanical seal manufacturers.

2. The pipe sleeves and mechanical seal manufacturers to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.

3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the pipe sleeves and mechanical seal manufacturers.

C. Regulatory Requirements: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. Local and State Building Codes and Ordinances.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals: Submit the following

a. Manufacturer's literature, illustrations, specifications, and engineering data.

b. Details of installation.

c. Detailed drawings showing all pipe sleeves and mechanical seals for each piping system. Drawings shall show location, installation and material of all pipe sleeves and mechanical seals.

d. Other technical data related to the specified material and equipment as requested by Engineer.

e. Installer's Qualifications.

f. Deviations from Contract Documents.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling and Unloading:

1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast in place concrete, in ample time to prevent delay of the Work.

B. Storage and Protection:

1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

C. Acceptance at Site:

1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mechanical Seals: Provide products of one of the following:

1. Advance Products & Systems, Inc., Innerlynx.
2. GPT Division of Enpro Industries, Link-Seal.
3. The Metraflex Company, Metraseal.
4. Or equal.

B. Wall, Floor and Ceiling Escutcheon Plates: Provide products of one of the following:

1. McGuire Manufacturing, Inc.
2. Pegasus Manufacturing, Incorporated.
3. Or equal.

C. Exterior Wall or Floor Sleeves (Below-Grade): Provide products of one of the following:

1. GPT Division of Enpro Industries, Century-Line.
2. SIGMA Corporation, Omni-Sleeve.
3. Or equal.

2.02 MATERIALS / EQUIPMENT

A. Pipe Sleeves:

1. Ferrous and Plastic Pipe: Use standard weight galvanized steel pipe, unless otherwise shown on the Contract Drawings.
2. Copper Pipe: Use standard weight galvanized steel pipe with mechanical link seals as spacers, unless otherwise shown on the Contract Drawings.

B. Cast Wall Sleeves:

1. Material: Cast-iron furnished with integral wall collar in accordance with AWWA C110.
2. Dimensions: As required for mechanical joint or calked joint pipe to pass through sleeve. Length as required.

C. Mechanical Seals: Provide link type mechanical seals with adjusting bolts suitable for 20 psi working pressure where shown on the Contract Drawings or required.

1. Materials:
   a. Mechanical seals through non-fire rated walls or floors:
      1) Pressure Plate: Glass reinforced nylon plastic.
      2) Bolt and Nut: 18-8 stainless steel.
      3) Sealing Element: EPDM rubber.
   b. Mechanical seals through fire rated walls or floors; two independent mechanical seal assemblies required for each penetration:
      1) Pressure Plate: Low carbon steel, zinc galvanized plated or stainless steel.
      2) Bolt and Nut: Low carbon steel zinc galvanized.
      3) Sealing Element: Silicone rubber.
      4) Fire rating: Three hour.

D. Wall, Floor and Ceiling Escutcheon Plates:

1. Bare Pipes Passing Through Walls, Floors and Ceilings in any Room: Provide escutcheon plates of cast brass or stamped steel, chrome plated, hinged with setscrews.

2. Insulated Pipes Passing Through Walls, Floors and Ceilings in Finished Rooms: Provide plated escutcheon plates of stamped steel or cast brass, chrome plated, hinged with setscrews.

E. Exterior Walls or Floors Sleeves: Below grade:

1. Type: Thermoplastic sleeve for use in new construction where sleeves are exposed to liquid or on exterior walls or floors exposed to backfill only.

2. Integral reinforcing ribs, anchor and waterstop collar textured surface for adhesion to concrete.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. General:

1. Install all items as shown, specified, and as recommended by the manufacturer.

2. Request instructions from Engineer, in writing, when there is a conflict between the manufacturer's recommendations and the Contract Documents.

3. Present conflicts to Engineer, in writing, who will determine corrective measures to be taken.

4. Do not modify structures to facilitate installation of pipe sleeves, mechanical seals, and accessories, unless specifically approved by Engineer.

5. Installation to conform to requirements of New York City and state codes.

6. Protection: Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.

B. Pipe Sleeves:

1. Use sleeves wherever pipes pass through walls, partitions, floors and roofs, unless otherwise shown.

2. All sleeves through floor slabs in finished areas shall extend a maximum of 1/4 inch above finished floor.

3. Anchor sleeves to concrete and masonry walls as shown or otherwise accepted.

4. Sleeves through walls shall be flush with wall face.
5. Calk and seal annular space between pipe and sleeve.
6. All pipe joints and annular spaces in exterior walls or walls subjected to hydrostatic pressure shall be completely watertight.
7. All vertical pipes through sleeves shall be installed with a modular seal system capable of maintaining a 2-hour fire rating between the two fire areas.
8. Size Sleeves to provide annular space as recommended by the mechanical seal manufacturer and as follows:

Pipe Size	Sleeve ID Minus Pipe or Insulation OD
Less than 2 in.	1/2 in. to 3/4 in.
2 in. to 4 in.	3/4 in. to 1 1/4 in
6-in. to 12-in.	1-1/4-in. to 2-in.

9. For mechanical link seals, size sleeves to provide space required to suit link type seals provided.
10. Do not install sleeves and pipes through structural members unless specifically required due to coordination or obstructions, each sleeve condition shall be submitted for approval.

3.03 FIELD TESTING / QUALITY CONTROL

A. Inspection:

1. Examine areas to receive pipe sleeves, mechanical seals, escutcheons and accessories for:
   a. Defects that adversely affect execution and quality of the Work.
   b. Deviations beyond allowable tolerances for pipe sleeves, mechanical seals, escutcheons and accessories.
   c. Start the Work only when conditions are satisfactory.
2. The Engineer reserves the right to reject or authorize replacement of pipe sleeves, mechanical seals, escutcheons and accessories found to be defective.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting:

1. Adjust all materials for proper settings.

B. Cleaning:

1. Thoroughly clean all pipe sleeves, mechanical seals, escutcheons and accessories prior to installation.
2. Remove all dirt, rust, dust, etc. from all pipe sleeves, mechanical seals and escutcheons in preparation for required painting.
3. Remove and dispose of all debris and waste from the Site resulting from installation.

END OF SECTION

SECTION 22 05 29 – HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified, and required to furnish, install, and test all hangers and supports complete with accessories for plumbing piping and equipment.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 05 23.02 – Miscellaneous Metal Fastenings.

B. Section 05 12 00 – Structural Steel Framing

C. Section 05 50 00 – Metal Fabrications.

D. Section 09 91 00 – Painting.

1.04 REFERENCES

A. Standards referenced in this Section are listed below:

1. American National Standards Institute, (ANSI).
    a. ANSI B1.1, Unified Inch Screw Threads. (ASME B1.1).
2. American Society for Testing and Materials, (ASTM).
    a. ASTM A36/A 36M, Specification for Carbon Structural Steel.
    b. ASTM A47/A 47M, Specification for Ferritic Malleable Iron Castings.
    c. ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
    d. ASTM A575, Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
    e. ASTM A668/A668M, Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.
3. Federal Specifications, (FS).
    a. FS WW-H-171E, Hangers and Supports, Pipe.
4. Manufacturer's Standardization Society, (MSS).
    a. MSS SP-58, Pipe Hangers and Supports - Materials, Design and Manufacture.
    b. MSS SP-59, Short Radius Welding Fittings.
    c. MSS SP-69, Pipe Hangers and Supports - Selection and Application.
    d. MSS SP-89, Pipe Hangers and Supports - Fabrication and Installation Practices.
    e. MSS SP-90, Guidelines on Terminology for Pipe Hangers and Supports.

1.05 DESCRIPTION

A. This Section includes requirements for providing hangers and supports for plumbing piping in accordance with applicable standards and regulations.

1.06 QUALITY ASSURANCE

A. Qualifications of Manufacturer and Pipe Support Designer:

1. Pipe hangers, supports, and appurtenances shall be standard products of the manufacturer specified herein.
2. Each type of hanger and support shall be the product of a single manufacturer.

3. The pipe support designer, if retained by the Contractor, shall have a minimum of five (5) years of experience in the design of pipe supports and shall show evidence of having completed at least five (5) substantially similar, successful pipe support projects of equal complexity as the systems specified.

   a. The pipe support designer shall be a New York State Registered Professional Engineer.

B. Installer's Qualifications:

1. Engage a single installer regularly engaged in hangers and supports installation and with experience in the installation of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to Engineer.

2. Engage a single installer for the entire plumbing pipe and equipment hangers and supports system with undivided responsibility for performance and other requirements.

C. Regulatory Requirements: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. All hangers and supports shall conform to the applicable requirements of ASME B31.1, MSS SP-58, SP-59, SP-69, SP-89, and SP-90, except as modified herein, and be of standard manufacture wherever possible, and best suited for the service required.

2. Unless otherwise approved, all hangers, supports and concrete inserts shall be listed with Underwriters' Laboratory, Inc.

3. Local and State Building Codes and Ordinances.

4. Permits: Contractor shall obtain and pay for all required permits, fees and inspections.

D. Supply and Compatibility:

1. Obtain all products included in this Section regardless of the component manufacturer from a single plumbing pipe and equipment hangers and supports manufacturer.

2. The plumbing piping and equipment hangers and supports manufacturer shall review and approve all Shop Drawings and other submittals for all components furnished under this Section.

3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the plumbing piping and equipment hangers and supports manufacturer.

4. The pipe and fittings shall be designed, fabricated, and installed in accordance with standards referenced herein.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals: Submit the following:

a. Shop Drawings:

1) Details of installation.

2) Detailed drawings showing all hangers and supports for each piping system. Drawings shall show:

a) Location, installation, material, loads, forces, stresses and deflections of all hangers and supports.

b) Reaction forces imparted to structures to which hangers and supports are attached shall be shown.

c) Contractor shall provide detailed drawings of each pipe support. Each drawing shall contain enough information to verify the pipe support design and to allow the manufacture of the device. At a minimum, the Contractor shall submit:

(1) Scaled details of the device with dimensions.

(2) A table of applied forces and moments.

(3) A complete bill of materials.

(4) An isometric showing the applied forces and moments.

(5) Detailed connections to existing structure.

(6) Shop and field welds.

3) Manufacturer's catalogs and engineering data on all hangers and supports.

4) Load ratings.

5) Materials.

6) Installation details.

b. Submit the name and qualifications of the support and hanger engineer.

c. All drawings and design calculations included in the shop drawings shall be signed and sealed by a New York State Registered Professional Engineer.

d. Pipe support design shall include detailed load and movement calculations:

1) In the design of hangers, supports and anchors, unless otherwise shown or specified, pipe pressures shall be the maximum test pressures specified for pipelines carrying gases and twice the maximum test pressures specified for pipelines carrying liquids.

2) The following loads shall be included in pipe support design and pipe stress analysis:

3) The gravity force, including the weight of the pipeline plus the weight of any appurtenances, contents, insulation, etc.

4) The thermal expansion force developed by the restraint of free end displacement of the piping.

5) Hydrostatic forces developed by internal pressure during operation of the piping system.

6) Loading due to expansion joint reaction forces.

7) Seismic forces, as required by the latest edition of the New York City Building Code.

8) Occasional load calculations and pipe stress analysis shall be provided where required by the Contract Documents, Building Codes, or Standards referenced herein. Occasional loads include:

a) Seismic forces.

b) Pressure waves produced by sudden changes in fluid momentum, commonly referred to as water hammer.

c) Wind, snow or ice loads.

d) Safety valve thrust loads.

e. Calculated forces shall be included in the pertinent shop drawings as called for by the submittal requirements specified herein.

2. Informational Submittals: Submit the following:

a. Qualifications Statements:

1) Installer's Qualifications.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling and Unloading:

1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast in place concrete, in ample time to prevent delay of the Work.

B. Storage and Protection:

1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.

C. Acceptance at Site:

1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Standard pipe supports and components shall conform to the requirements of MSS SP-69 and MSS SP-58, as manufactured by:

1. B-Line

2. Carpenter & Patterson

3. Grinnell

4. Or approved equal.

B. Expansion Joints: Provide products of one of the following:

1. Flex-Hose Co., Inc.

2. The Metraflex Company

3. Or approved equal.

C. Alignment Guides: Provide products of one of the following:

1. Flex-Hose Co., Inc.

2. The Metraflex Company
3. Or approved equal.

D. Toggle Bolts: Provide products by one of the following:
1. Cooper B-Line Division of Eaton Corp.
2. Powers Fasteners
3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Components of hangers and supports shall conform to the following:
1. Materials:
a. Bolts: ASTM A307, Grade A, unless otherwise specified below.
b. Forgings: ASTM A668/A 668M.
c. Malleable Iron: ASTM A47/A47M.
d. Rods and Bars: ASTM A575.
e. Threads: Unified Screw Threads, Class 2A and 2B, ANSI B1.1.
f. Structural Steel: ASTM A36/A36M.
2. Finish:
a. Steel or Malleable Iron Items: Hot-dipped galvanized, unless otherwise specified or as shown.
b. Steel or Malleable Iron Materials Used for the Support of Uninsulated Copper Piping: Copper plated.
c. Framing Members and Fittings: Dip painted with corrosion resistive primer as specified in Section 09 91 00 – Painting.
d. All hangers, rods, bolts, nuts, inserts, washers located in the corrosive areas shall be Type 316 stainless steel.

B. Pipe Attachments: The following types of pipe attachments shall be considered acceptable:
1. Adjustable Steel Clevis: FS WW H 171E, Type 1.
2. Steel Double Bolt Pipe Clamp: FS WW H 171E, Type 3.
3. Steel Pipe Clamp: FS WW H 171E, Type 4.
4. Adjustable Swivel Pipe Ring: FS WW H 171E, Type 6.
5. Adjustable Steel Band Hanger: FS WW H 171E, Type 7.
6. Riser Clamp: FS WW H 171E, Type 8.
7. Light-Duty Cleves Hanger: FS WW H 171E, Type 12.

8. Long Clips: FS WW H 171E, Type 26.
9. Offset J Hooks: FS WW H 171E, Type 27.
10. Steel Pipe Covering Protection Saddle: FS WW H 171E, Type 40A.
11. Insulation Protection Shield: FS WW H 171E, Type 41.
12. Pipe Saddle Support: FS WW H 171E, Type 37.
13. Pipe Stanchion Saddle: FS WW H 171E, Type 38.
14. Pipe Saddle Support with Base: FS WW H 171E, Type 36.
15. Adjustable Roller Hanger: FS WW-H-171E, Type 42.

C. Structural Attachments: The following types of structural attachments shall be considered acceptable:

1. Side Beam Clamp: FS WW H 171E, Type 20.
2. Center I Beam Clamp: FS WW H 171E, Type 21.
3. Welded Steel Bracket: FS WW H 171E, Types 32 and 33.
4. Side Beam Bracket: FS WW H 171E, Type 35.
5. Malleable Iron with Galvanized Finish Concrete Insert: FS WW H 171E, Type 18. The use of steel concrete inserts is prohibited and NOT acceptable.

D. Hanger Rod Attachments: Use as required to complete assembly:

1. Forged Steel Clevis: FS WW H 171E, Type 14.
2. Adjustable Turnbuckle: FS WW H 171E, Type 15.
3. Forged Steel Welders Eye Nut: FS WW H 171E, Type 17.

E. Expansion Joints:

1. 2 1/2 inch and Smaller Copper Tubing:
    a. Construction: Free flexing expansion joints with stainless steel corrugated members, NSF 372 certified lead-free for use in domestic water systems.
    b. End Connections: Male and female solder end fittings or screwed ends with adaptors for screwed to sweat ends.
2. 3 inch and Larger:
    a. Construction: Free flexing expansion joints with stainless steel corrugated members, NSF 372 certified lead-free for use in domestic water systems.
    b. End Connections: Welded ends with flanges.

F. Alignment Guides:

1. Type: Semi steel spider with four guiding fingers and guilding cylinder with base.

G. Connection Bolts: Materials shall be as specified in other Sections of these Specifications or as shown. Where materials are not specified or shown, they shall be of Type 304 stainless steel with Monel nuts.

H. Toggle Bolts:

1. Provide zinc plated spring wing toggle bolts of the size required for secure anchorage of individual items, but not less than 1/4-inch diameter, of length required.

I. Contractor shall furnish and install all necessary supports, angle iron stands, miscellaneous steel, inserts, anchor bolts and hangers required for all equipment furnished under this Contract, unless otherwise noted. All supports shall meet the requirements of the applicable Sections of Division 05, Metals.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. All pipe hangers, supports and restraints shall be painted as required in accordance with the requirements of Section 09 91 00 – Painting.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. The Contractor shall coordinate the Work such that all plumbing piping hangers, supports, and restraining systems shall be installed and secured prior to the testing or activation of the process pipeline.

3.02 INSTALLATION

A. General:

1. Install all items as shown, specified, and as recommended by the manufacturer.

2. Request instructions from Engineer, in writing, when there is a conflict between the manufacturer's recommendations and the Contract Documents.

3. Present conflicts to Engineer, in writing, who will determine corrective measures to be taken.

4. Do not modify structures to facilitate installation of pipe hangers, supports and restraints, unless specifically approved by Engineer.

5. Installation to conform to requirements of all local and state codes.

6. Protection: Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.

B. Hangers, Supports and Restraints for Horizontal Piping:

1. Space supports and hangers for all piping no farther apart than shown below, unless otherwise shown:

a. Copper Tube:

1) All Pipes: 6 feet 0 inch on center.

b. Steel Pipe:

1) Pipes up to 1 inch: 6 feet 0 inch on center.

2) Pipes 1 1/4 inch to 6 inch: 8 feet 0 inch on center.

c. Cast Iron Pipe:

1) Two supports per length, maximum 5 feet-0 inches on center.

d. Plastic Pipe:

1) 3 feet 0 inch on center for all sizes, unless otherwise recommended by manufacturer for 100°F ambient temperature.

2. Additional supports are to be provided at all changes of direction, at all no-hub fittings and couplings for cast iron pipe, and at all valves or other in-line devices installed in piping.

3. Rigid support sway bracing shall be provided at all changes of direction for piping 4" diameter and larger.

4. Mechanical restraints shall be installed at all fittings for changes of direction in drainage piping 4" and larger in accordance with the CISPI installation guidelines.

C. Hanger Rods: Size hanger rods according to the schedule below, unless noted otherwise.

Nominal Pipe Diameter	Rod Diameter
1/2-in. through 2 in.	3/8 in.
2-1/2 in. through 3-1/2 in.	1/2 in.
4-in. through 5-in.	5/8-in.
6-in.	3/4-in.

D. Supports for Vertical Piping:

1. Provide riser clamp placed under hub, fitting or coupling with approved solid bearing on steel sleeve at each floor level.
2. Where riser clamps are used with plastic piping they shall be modified so as not to exert any compressive forces on the pipe.
3. Support spacing shall not exceed code requirements.
4. Piping support intervals shall not exceed those listed in Paragraph 3.4.A., above.
5. Additional supports shall be placed immediately adjacent to any change in piping direction, and on both sides of valves and couplings.
6. Accurately locate inserts for hanger rods in forms before concrete is placed.
7. Use Type 304 stainless steel expansion anchor assemblies of the capsule polyester resin adhesive type and only to support rods, hangers and brackets for piping 1 inch and smaller no other type will be considered and only if the expansion anchors are designed to carry 100 percent of the full load, hanger, and/or bracket and pipe load.

E. Supports for water meters and backflow preventers: Provide pipe saddle supports with base anchored to floor.

F. Structural members shall conform to Section 05 12 00 – Structural Steel Framing.

G. Anchor bolts, expansion anchors and concrete inserts shall conform to Section 05 05 23.02 – Miscellaneous Metal Fastenings. Miscellaneous metal fabrications shall conform to Section 05 50 00 – Metal Fabrications.

H. Allow clearances for expansion and contraction of piping.

I. Anchors shall be designed to prevent any pipe movement at pipe anchorage points. Anchors shall be securely fastened to the construction directly or indirectly through structural framing:

1. Piping 2-1/2-inches and Smaller: Anchor horizontal runs over 50 feet to midpoint to allow expansion toward expansion compensators (anchor intervals shall not exceed 30 feet) or elbows.
2. Piping 3-inches and Larger: Anchor horizontal runs over 100 feet at mid-points to force expansion toward expansion compensators.
3. Provide alignment guides in accordance with expansion compensator manufacturer recommendations.

J. Provide expansion compensators where necessary to absorb expansion and contraction in heating lines and as follows:

1. Thirty feet on center of copper piping.
2. Fifty feet on center of steel piping section spec

K. Locate first set of alignment guides within four pipe diameters of the anchor or expansion compensator, the second set of pipe alignment guides shall be located within fourteen pipe diameters of the first guides.

3.03 FIELD TESTING / QUALITY CONTROL

A. Inspection:

1. Examine areas to receive plumbing piping and equipment hangers and supports and accessories for:

a. Defects that adversely affect execution and quality of the Work.

b. Deviations beyond allowable tolerances for pipe hangers, supports and restraints and accessories.

c. Start the Work only when conditions are satisfactory.

2. The Engineer reserves the right to reject or authorize replacement of pipe hangers, supports and restraints and accessories found to be defective.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting:

1. Adjust all materials for proper settings.

B. Cleaning:

1. Thoroughly clean all pipe hangers, supports and restraints and accessories prior to installation.

2. Remove all dirt, rust, dust, etc. from all pipe hangers, supports and restraints in preparation for required painting.

3. Remove and dispose of all debris and waste from the Site resulting from installation.

END OF SECTION

SECTION 22 05 33 – HEAT TRACING FOR PLUMBING PIPES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install heat tracing for plumbing pipes, complete with accessories.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. The Institute of Electrical and Electronic Engineers (IEEE):

1. Testing, Design, Installation, and Maintenance of Electrical Resistance Trace Heating for Commercial Applications.
2. National Electrical Manufacturer's Association (NEMA).
3. NFPA 70 - National Electric Code.
4. Underwriter's Laboratories.
5. Factory Mutual (FM).

1.05 DESCRIPTION

A. Not Used.

1.06 QUALITY ASSURANCE

1. Installer:
   a. Qualifications to include ten years' experience in design, engineering, manufacture and support of specified system and components.
   b. System installer shall have complete understanding of product and product literature from manufacturer or authorized representative prior to installation.
   c. Electrical Connections shall be performed by a licensed electrician.

B. Product Requirements:

1. The equipment covered by these specifications is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Contract Drawings.

C. Regulatory Requirements and Approvals:

1. The heat tracing system shall be UL Listed/CSA Certified.
2. Electrical Components, Devices, and Accessories: Listed and labelled as defined in NFPA 70 and marked for intended use.

1.07 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:
   a. Bill of Materials
   b. Wiring Schematic of Monitor Panel
   c. Power and End Termination points in relation to the piping layout.
   d. Location of Monitor Panels
   e. Location and placement of RTD sensors

2. Product Data:

a. Manufacturers' catalog literature, specifications, and illustrations with the following information:

1) Thermal Properties.

2) Physical Properties.

b. Data Sheet for each electric heating circuit with the following information:

1) Heater catalog number

2) Heater length.

3) Voltage required.

4) Ampere load.

5) Total output in watts.

6) Output in watts per lineal foot.

B. Informational Submittals: Submit the following:

1. Qualifications Statements:

a. Installer’s qualifications.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping Handling and Unloading:

1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast in place concrete, in ample time to prevent delay of the Work.

B. Storage and Protection:

1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer’s recommendations for long-term storage.

C. Acceptance at Site:

1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer’s instructions.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Heat Trace Cable:

1. Thermon, Inc.
2. nVent Thermal Management, LLC.
3. Chromalox, Inc.
4. Or approved equal

2.02 MATERIALS / EQUIPMENT

A. General:

1. All thermally insulated piping, valves, and related fluid transfer systems supplying tepid water to eyewashes or safety showers, as shown on the Drawings, shall be electrically traced with self-limiting heater cable. The maintenance temperature for these systems shall be 80 degrees Fahrenheit.
    a. The system shall be controlled from a Control/Monitoring panel as specified.
    b. Heat tracing cable shall be installed before insulation is installed and as per manufacturers' instructions.
    c. Furnish and install a complete heat tracing system with all components including temperature sensor, cable, junction box, etc., being the product of one manufacturer or supplier.
    d. All outdoor remote connections and equipment shall be corrosion resistant weatherproof, NEMA 4X.
    e. Submit suppliers' information related to design parameters and heat loss values related to specified maintenance of temperature.
2. The heater cable shall be suitable for cutting to desired length to suit conditions at installation. The cable shall form a continuous heating circuit. Heat trace cable shall not be used as jumper conduit from one piping system to another. Contractor shall use heat trace cable, wire, conduit and junction boxes to achieve the complete circuit.
3. Upon receipt, the contractor shall record an insulation resistance of 20 megohms minimum bus to braid using the procedure outlined in "C" above.

B. Self-Regulating Cable:

1. The heater cable shall be capable of maintaining maximum recommended pipe temperatures, and withstand continuous exposure temperatures as outlined below, without permanent damage to the matrix core.

   a. The maximum maintenance temperature rating of the cable shall be +150 F.

   b. The maximum continuous exposure rating of the cable shall be +185 F.

   c. At a minimum the heat trace cable shall be designed to maintain the solution in the pipe at a temperature at 80 F, unless otherwise specified. The assumed outdoor ambient temperature is -10 F with a 25-mph wind with a 20 percent safety factor. Indoors, assume 50 degrees F with no wind.

2. The heater cable assembly shall consist of two parallel copper bus wires, minimum size 16 AWG, connected through a semi-conductive heating matrix. This heating element shall be covered with a cross-linked polyolefin insulation jacket. This insulation shall be covered by a tinned copper braid and then covered again with a fluoropolymer insulating jacket. The cable heat output capacity shall be designed by the manufacturer's heat loss software and submitted to the engineer.

C. Accessories

1. Splicing connectors, end termination, caution labels, tee connectors, thermostats, control panel (as required) and power termination kits shall be provided to ensure a complete heat trace system in accordance with the manufacturer's recommendations.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Provide insulation on all heat traced pipe in accordance with Section 22 07 19 – Plumbing Piping Insulation.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

1. Heat tracing cables to be Megger tested prior to shipment. Before shipment, cable shall indicate an insulation resistance of 20 megohms minimum bus to braid using a 2500 volt DC megger and withstand for one minute a voltage equal to twice rated plus 1,000 volts applied bus to braid.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. The heating cable system shall be inspected before the system is covered over with insulation to look for damaged heating cable and to ensure the manufacturer's recommended installation instructions have been observed.

3.02 INSTALLATION

A. Cable shall be carefully located so as to preclude subsequent damage coincident with normal operations and maintenance.

B. Fasten cable with manufacturer-supplied tape so as to uniformly position the cable on the pipeline.

C. Accordion cable around valves, etc. to avoid overlaying cable over cable.

D. Special care is required to permit turning, or inserting, spec blinds, re-packing or replacing valves, and adjusting and calibrating process control instruments.

E. The installed heating cable should be covered with thermal insulation and waterproof jacketing as rapidly as possible. Install thermal insulation in accordance with insulation requirements specified herein.

F. The following decal type sign shall be prominently fixed to the exterior of the thermal insulation every 20 feet and readily visible from ground level: ELECTRIC HEAT TRACING: CAUTION.

3.03 FIELD TESTING / QUALITY CONTROL

A. Heat tracing cables to be Megger tested after shipment, after attachment to the pipe, and again after insulation has been properly installed. Testing shall be performed at 2,500 VDC.

1. Testing for dielectric strength shall be performed as follows: power wire is separated from the heater cable and the leads of a 2500 VDC megger is placed on one copper cable conductor of the heat tracing while the other is placed on the electrical ground wire, pipe, or tinned copper braid. A minimum of 20 megohms should be measured. This test indicates that splices are properly made and insulated and that the heater cable insulation is intact and undamaged. This test may be performed at the monitor panel by taking the load side leads off the terminal blocks and measuring between the conductor wires and the ground wire or other electrical ground in the panel.

B. Visual Inspection: All electrical connections should be intact including conduit, junction boxes, temperature sensors and wiring. All pipe insulation and weather proof barriers should be sound and not penetrated by water.

C. Pre-start up Tests**:** The following actions should have been performed prior to start up:

1. Check all electrical connections are made from monitor panel to the heat tracing junction boxes.

2. Check that, at the heat tracing power start point junction boxes, the cable has the proper insulating boot installed. The power wire should be connected to the heater cable.

3. Check that all splices have the proper insulating boots installed.

4. Check that the remote temperature sensor is wired to the heat trace monitor panel properly with twisted shielded 3 conductor wire.
5. Check that the test for dielectric strength with a 2500 VDC megger is completed and recorded.
6. Secure a trained technician to program the unit for operation as part of this contract.
7. Each setting and reading should be recorded and submitted to the Engineer or Owners Representative.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 22 07 19 – PLUMBING PIPING INSULATION
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install plumbing piping insulation complete with accessories.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 22 05 29 – Hangers and Supports for Plumbing Piping.

B. Section 22 05 33 – Heat Tracing for Plumbing Pipes.

C. Section 22 10 53 – Installation of Plumbing Piping.

D. Section 22 11 16 – Domestic Water Piping.

1.04 REFERENCES

A. Standards referenced in this Section are:

1. ANSI A117.1, Guidelines for Accessible and Usable Buildings and Facilities.

2. ASTM C449/C449M, Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finish Cement.

3. ASTM D1784, Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

4. Federal Specification (FS) SS-C-160, Cement, Insulation, Thermal.

1.05 DESCRIPTION

A. Not Used.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. Installer:

a. Engage installer regularly engaged in plumbing piping insulation installation and with experience installing the types of materials required; and employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to Engineer.

b. Engage a single plumbing piping insulation installer for entire piping insulation system, with undivided responsibility for performance and other requirements.

B. Component Supply and Compatibility:

1. Obtain all products included in this Section regardless of component manufacturer, from a single piping insulation Supplier.

2. Plumbing piping insulation Supplier shall review and approve or prepare all Shop Drawings and other submittals for components furnished under this Section.

3. Components shall be suitable for specified service conditions and shall be integrated into overall assembly by plumbing piping insulation Supplier.

C. Regulatory Requirements: Comply with the following.

1. Local and State Building Codes and Ordinances.

2. Americans with Disabilities Act (ADA)

1.07 SUBMITTALS

A. Action Submittals: Submit the following:

1. Product Data:

a. Manufacturer's literature, illustrations, specifications, and engineering data.

b. Other technical data related to specified materials as requested by Engineer.

B. Informational Submittals: Submit the following:

1. Manufacturer's Instructions:

a. Manufacturer's recommended installation instructions.

2. Qualifications Statements:

a. Installer's Qualifications.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading:

1. Deliver products to Site to ensure uninterrupted progress of the Work.

2. Inspect all boxes, crates, and packages upon delivery to Site and notify Engineer in writing of loss or damage to products. Promptly remedy loss and damage to new condition per manufacturer's instructions.

3. Conform to Section 01 65 00 – Product Delivery Requirements.

B. Storage and Protection:

1. Keep all products off ground using pallets, platforms, or other supports, in covered storage. Protect materials from damage and deterioration.

2. Prevent condensation in materials and packaging in accordance with manufacturer's recommendations for long-term storage

3. Conform to Section 01 66 00 – Protection of Materials and Equipment.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiberglass Insulation:

1. Owens Corning Fiberglass Corporation, Fiberglass SSL II with ASJ Max Fiberglass.

2. Johns Manville Division of Berkshire Hathaway, Micro-Lok HP

3. Or approved equal.

B. Calcium Silicate Insulation at Insulation Protection Shields:

1. Industrial Insulation Group, LLC, IIG.b.
2. Thermo 12 Gold, by Johns-Manville.
3. Or approved equal.

C. PVC Pipe Jacketing and Valve and Fitting Covers:

1. Proto Corporation
2. Speedline Corporation.
3. Zeston by Johns Manville.
4. Or approved equal.

D. Weatherproof SS Jacketing and Valve & Fittings Covers:

1. Great Lakes Textiles Products
2. Insultherm
3. Shur-Fit Products
4. Or approved equal

2.02 MATERIALS / EQUIPMENT

A. Fiberglass Insulation:

1. Type: Heavy-density pre-formed fiberglass sectional pipe insulation with factory-applied indoor foil or polymer jacketing with self sealing lap.
2. Thermal Conductivity: 0.25-0.29 Btu inch per hour per square foot per degree F at 125 degrees F mean temperature. Insulation thicknesses shall be as indicated in manufacturer's installation guidelines, except that in no case shall insulation thicknesses be less than required by ASHRAE 90.1.
3. Fire Hazard Classification:
   a. Flame Spread: 25.
   b. Fuel Contributed: 50.
   c. Smoke Developed: 50.
4. Density: Three pounds per cubic foot (pcf) minimum.
5. Fittings: Molded fiberglass.
6. Jointing Materials: Manufacturer's recommended adhesives and tape.
7. Valve Insulation: Miter cut nesting size covering segments of same thickness as pipeline, for insulation of valves.

B. Calcium Silicate Insulation at Insulation Protection Shields:

1. Type: Asbestos-free calcium silicate pipe insulation.
2. Thermal Conductivity: 0.40 Btu inch per hour per square foot per degree F at 200 degrees F mean temperature.
3. Fire Hazard Classification:
    a. Flame Spread: Zero.
    b. Smoke Developed: Zero.
4. Density: 14 pounds per cubic foot (pcf).
5. Compressive Strength: 140 psi.
6. Cut insulation 0.5-inch longer than insulation shield upon which it rests.

C. PVC Pipe Jacketing and Valve and Fitting Covers:

1. Type: PVC Jacketing (for insulated piping and appurtenances located indoors, unless otherwise shown or indicated):
    a. 25/50 PVC, conforming to ASTM D1784, Class 16354-C and C-585
    b. Thickness: 20 mils.
    c. Color: White.
    d. Finish: Glossy.
    e. Temperature: Suitable for 150 degrees F, minimum.
    f. Provide insulation adhesive of other means of sealing jacketing per manufacturer insulation instructions.

D. Weatherproof Jacket (for insulated piping and appurtenances located outdoors, and where shown or indicated):

1. Type: Smooth-embossed, Type 316 stainless steel jacket.
    a. Thickness: 0.016 inches.
    b. Moisture Barrier: Polycraft.
    c. Fastening: Pre-formed "Z"-lock seam with two-inch butt strap with waterproof sealant.
    d. Bands: 1/2-inch Type 316 stainless steel bands with wing seals.
    e. Fittings: Pre-fabricated Type 316 stainless steel fittings, 0.016-inch thickness.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examine conditions under which materials are to be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Piping systems to be insulated and associated insulation thicknesses are specified in the schedule at the end of this Section.

B. Thoroughly clean all piping, insulation, and accessories prior to installation.

C. Remove from piping all dirt, rust, dust, and other materials detrimental to proper installation of insulation.

D. Install items as shown, specified, and as recommended by manufacturer.

E. Request interpretation from Engineer if there is conflict between manufacturer's recommendations and the Contract Documents.

F. Do not modify structures to facilitate installation of piping insulation unless approved by Engineer.

G. Installation of plumbing piping insulation shall conform to Laws and Regulations.

H. Surfaces of piping, valves, and fittings shall be clean and dry before applying insulation.

I. Install piping insulation after associated piping system has been successfully tested.

J. Provide high-density insulation pipe support inserts at each hanger and shield extending halfway up the pipe insulation cover and extending along pipe at least six inches on each side of hanger. Securely fasten shield with pipe straps at each end. Insulate pipe anchors adequately to prevent moisture condensation problems.

K. Protection: Piping insulation materials applied each day shall have vapor barrier applied the same day and exposed ends shall be temporarily protected with moisture barrier and sealed to pipe.

3.03 FIELD TESTING / QUALITY CONTROL

A. Piping Insulation Schedule: Insulate plumbing piping as specified below, unless otherwise specified or shown:

1. All hot, cold, tepid and tempered piping 2.5-inch diameter and smaller: Insulation thickness shall be one-inch minimum.

2. All hot, cold, tepid and tempered piping three-inch diameter and larger: Insulation thickness shall be 1.5-inch minimum.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting:

1. Adjust or replace, as required, poorly fitted joints.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 22 10 53 – INSTALLATION OF PLUMBING PIPING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish and install plumbing piping systems complete with accessories.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 09 91 00 – Painting.

B. Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment.

C. Section 22 10 53 – Insulation of Plumbing Piping

D. Section 22 11 16 – Domestic Water Piping.

E. Section 22 13 16 – Sanitary Waste and Vent Piping.

F. Section 33 01 10.60 – Disinfection of Piping, Tanks, Structures

G. Section 40 05 97 – Identification for Process Equipment.

1.04 REFERENCES

A. Standards referenced in this Section are listed below:

1. American National Standards Institute, (ANSI).
   a. ANSI B13.1, Code for Pressure Piping.
   b. ANSI B31.1, Power Piping.
2. American Society for Testing and Materials, (ASTM).
3. American Welding Society, (AWS).
   a. AWS D10.9, Welding Procedures and Welders for Piping and Tubing.
4. Institute of Electrical and Electronic Engineers, (IEEE).
5. National Electrical Code, (NEC).
6. National Electrical Manufacturers' Association, (NEMA).
7. National Fire Protection Association, (NFPA).
8. Underwriters' Laboratories, Incorporated, (UL).

1.05 DESCRIPTION

A. The Scope of this Section includes the requirements for the installation of plumbing piping systems, including domestic water piping and sanitary waste and vent piping, except where installation requirements for plumbing piping are shown or specified elsewhere in the Contract Documents.

1.06 QUALITY ASSURANCE

A. Installer's Qualifications:

1. Engage a single installer regularly engaged in plumbing piping installation and with experience in the installation of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to Engineer.
2. Engage a single installer for the entire plumbing piping system with undivided responsibility for performance and other requirements.

B. Regulatory Requirements: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. Local and State Building Codes and Ordinances.
2. Permits: Contractor shall obtain and pay for all required permits, fees and inspections.

1.07 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:

a. Layout and Installation Drawings:

1) Shall include plans, sections, and details showing location, elevations, and clearly marked dimensions.

2) Piece numbers which are coordinated with the tabulated pipe layout schedule shall be clearly marked.

3) The scale used shall be the greater of the following two (2):

a) The scale used on the Contract Drawings that depict the process pipe for which the submittal pertains, or

b) A minimum scale of ¼-in = 1-ft - 0-in.

4) When special designs or fittings are required, the work shall be shown in large detail and the special or fitting completely described and dimensioned.

5) Include a north arrow.

6) Information on pipe supports, including:

a) Pipe support location.

b) Pipe support type.

c) hanger rod size.

d) Insert type.

e) All loads on the support (in either lbs. or kips.)

7) Locations where pipe and valve identification signs will be placed.

8) Location of pipe couplings, specials, and adapters.

9) Location of expansion joints.

10) Locations of pipe hangers and supports.

11) Extent of pipe insulation and heat tracing.

12) Extent of lining, wrapping, and coatings.

b. A tabulated pipe layout schedule for each plumbing piping system. Submit a separate schedule for each pipe system and/or service. The pipe layout schedule shall include the following information for each pipe section, fitting, and appurtenance that comprises that system:

1) Service.

2) Pipe size.

3) Working pressure.

4) Vacuum pressure (if applicable).

5) Weight (in lbs.)

6) Joint type.

7) Wall thickness.

8) Piece number.

9) Laying length.

c. For each plumbing piping system that contains valves, submit a tabulated valve schedule. Submit a separate schedule for each pipe system and/or service. The valve schedule shall include the following information for each valve:

1) Valve tag number.

2) Valve size.

3) Whether the valve is manual or actuated. If actuated, the type of actuator.

B. Informational Submittals:

1. Qualifications Statements:

a. Installer's qualifications.

1.08 DELIVERY, STORAGE, AND HANDLING

1. Not Used.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Materials for piping system shall be specified under applicable Sections of Division 22, Plumbing.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. All equipment and accessories shall be painted in accordance with the requirements of Section 09 91 00 – Painting.

B. Identification:

1. Provide in accordance with Section 40 05 97 - Identification for Process Piping and Equipment.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examine areas to receive piping, valves and accessories for:

1. Defects that adversely affect execution and quality of the Work.

2. Deviations beyond allowable tolerances for piping, valves and accessories.

3. Start the Work only when conditions are satisfactory.

B. The Engineer reserves the right to reject or authorize replacement of piping and accessories found to be defective.

3.02 INSTALLATION

A. General:

1. Install all items as shown, specified, and as recommended by the manufacturer.

2. Wherever changes in sizes of piping occur, changes shall be made with reducing fittings. The use of bushings is not permitted unless otherwise shown.

3. All pipes passing through ceilings, floors and walls in finished rooms, and all supplies to fixtures shall have escutcheon plates.

4. Install straight runs true to line and elevation.

5. Install vertical piping tight to walls, columns and truly plumb leaving clearance for vertical supports only.

6. Install piping parallel or perpendicular to building walls. Piping at odd angles and 45 degrees runs across corners will not be accepted unless specifically shown.

7. Install small diameter piping generally as shown on the Drawings when specific locations and elevations are not indicated. Locate such piping as required to avoid ducts, equipment, beams, etc.

8. Remove all cuttings and foreign matter from the inside of pipes and tubing before installation.

9. Provide a union downstream of each valve with screwed connections.

10. Use eccentric reducers where shown and where air or water pockets would otherwise occur in mains because of a reduction in pipe size.

11. Valves and Accessories:

    a. All valves and equipment are to be installed perfectly plumb and level, in horizontal runs of piping (except where specifically indicated for vertical piping installation).

    b. Provide supports for large valves, flow meters and other heavy items as shown or otherwise required.

    c. All required access shall be provided for valves and equipment. Where valves or equipment are installed behind walls, above ceilings, or in otherwise inaccessible locations, 18”x18” access panels are to be provided by the Contractor at locations to be coordinated.

    d. Install floor stands as shown on the Contract Drawings and as recommended by the manufacturer.

    e. Provide lateral restraints for extension bonnets and extension stems as shown and as recommended by the manufacturer.

12. Do not modify structures to facilitate installation of piping, unless specifically approved by Engineer.

13. Installation to conform to requirements of all local and state codes.

14. Unless otherwise required by the tubing manufacturer or AHJ, copper tubing, fittings, couplings, and soldered joints shall be installed according to methods and procedures described in “The Copper Tube Handbook” reference publication by the Copper Development Association.

15. Unless otherwise required by the piping manufacturer or AHJ, Cement-Lined Ductile Iron Pipe, fittings, couplings, joints and appurtenances are to be installed according to methods and procedures described in ANSI/AWWA 600, “Installation of Ductile Iron Mains and Their Appurtenances”, and the AWWA “Manual M41 on Ductile Iron Pipe and Fittings”.

16. All connections between ferrous and non ferrous piping materials shall be made with dielectric couplings.

17. Properly plug or cap the open ends of all piping at the end of each day’s Work or other stopping point through construction. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.

18. Provide shutoff valve, located for easy access, to each piece of equipment furnished.

19. Material Schedule shall be as specified under applicable Sections of Division 22, Plumbing.

B. Insulation:

1. Provide insulation, where required, in accordance with Section 22 07 19 – Plumbing Piping Insulation.

a. Insulation shall be installed after the installation and testing of plumbing piping.

2. Hangers and Supports:

a. Install pipelines with supporting devices in accordance with requirements of Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.

b. No piping shall be supported by metal stairs, ladders or walkways.

3.03 FIELD TESTING / QUALITY CONTROL

A. General:

1. Fill all systems and fully test all equipment, valves, piping, etc. in operation.

2. Check for excessive vibration while all systems are operating.

3. Installed systems and components will not be released to DEP unless all systems have been tested and approved by the Engineer.

B. Sanitary Waste and Vent Piping:

1. Water Tests:

a. Perform tests either on the entire system or on successive sections of the system.

b. Tightly close all openings, except the highest opening of the system or section to be tested.

c. Fill the system or section with water to the point of overflow.

d. Test with a head of at least ten feet of water, except for the uppermost ten feet of the system.

e. Allow water to stand in the system for at least 15 minutes before inspecting.

f. Inspect the system or section for leaks, and repair any leaks found.

2. Air Tests:

a. Attach air compressor testing apparatus to any suitable opening after closing all other inlets and outlets. Force dehydrated oil less compressed air, pressure dew point -40ºF, into system until there is a uniform gage pressure without the introduction of additional air. Below is a list of required gage pressures:

1) Drainage and Vent Piping (substitute for water test): Five psi for 15 minutes.

3. Smoke Tests:

a. Finished Plumbing: Final test for gas and water tightness of the completed drainage and vent system:

1) Fill all traps with water.

2) Introduce a pungent thick smoke, produced by one or more smoke machines, into the system.

3) When the smoke appears at stack openings on the roof, close the system.

4) Maintain a pressure in the system equivalent to a 1-inch water column for the period of the inspection.

5) Inspect the system for leaks and repair any leaks found.

3.04 STARTUP / DEMONSTRATION

A. All domestic water piping shall be disinfected before they are placed into service, as specified in Section 33 01 10.60 - Disinfection of Piping, Tanks, Structures, and Equipment.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting:

1. While system is operable, balance all equipment, valves, etc. to achieve design conditions.

B. Cleaning:

1. Thoroughly clean all piping, fittings, valves, and accessories prior to installation.

2. Remove all dirt, rust, dust, etc. from piping in preparation for painting.

3. Remove and dispose of all debris and waste from the Site resulting from installation.

END OF SECTION

SECTION 22 11 16 – DOMESTIC WATER PIPING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install domestic water piping, complete with accessories.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 09 91 00 – Painting.

B. Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment.

C. Section 22 05 33 – Heat Tracing for Plumbing Pipes.

D. Section 22 07 19 – Plumbing Piping Insulation.

E. Section 22 10 53 – Installation of Plumbing Piping.

1.04 REFERENCES

A. Standards referenced in this Section are listed below:

1. ANSI A13.1, Scheme for Identification of Piping Systems.
2. ANSI A21.1, Practice Manual, Computation Strength, Thickness.
3. ANSI A21.4, Cement Mortar Lining/Cast and Ductile Iron Pipe and Fittings (AWWA C105).
4. ANSI A21.10, Cast-Iron and Ductile Iron Fittings, 2-inches through 48-inches, for Water (AWWA C110).
5. ANSI A21.11, Rubber Gasket Joints for Cast Iron and Ductile-Iron Pressure Pipe and Fittings (AWWA C111).
6. ANSI A21.51, Ductile Iron Pipe Centrifugally Cast, in Metal Molds (AWWA C151).
7. ANSI A112.1.2, Air Gaps in Plumbing System.
8. ANSI B16.1, Cast-Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 150 and 800.
9. ANSI B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
10. ANSI B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings (ASME B16.22).
11. ANSI B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings, 150 and 300 lbs (ASME B16.24).
12. ANSI B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
13. ANSI B16.39, Malleable Iron Threaded Pipe Unions.
14. ANSI B16.42, Ductile Iron Pipe Flanges and Flanged Fittings.
15. ANSI B40.1, Gages - Pressure Indicating Dial - Elastic Element.
16. ANSI H 23.1, Seamless Copper Water Tube, (ASTM B 88).
17. ANSI Z358.1, Emergency Eyewash and Shower Equipment.

B. American Society of Sanitary Engineers (ASSE)

1. ASSE 1001, Performance Requirements for Atmospheric Type Vacuum Breakers.
2. ASSE 1013, Performance Requirements for Reduced Pressure Principal Backflow Preventers and Reduced Pressure Fire Protection Principal Backflow Preventers.
3. ASSE 1018, Trap Seal Primer Valves – Water Supply Fed.
4. ASSE 1020, Performance Requirements for Pressure Vacuum Breaker Assembly.

C. American Society for Testing and Materials

1. ASTM A126, Specification for Gray Iron Casting for Valves, Flanges and Pipe Fittings.
2. ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
3. ASTM B32, Specification for Solder Metal.
4. ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.
5. ASTM B88, Specification for Seamless Copper Water Tube.
6. ASTM D1330, Specification for Rubber-Sheet Gaskets.

D. AWWA C511, Reduced-Pressure Principle Backflow Prevention Assembly.

E. FS O-F-506, Flux, Soldering: Paste and Liquid.

F. FS WW U 516, Unions, Brass or Bronze, Threaded Pipe Connections and Solder-Joint Tube Connections.

G. Plumbing and Drainage Institute (PDI), PDI WH 201, Water Hammer Arresters.

H. NSF 61: Drinking Water System Components – Health Effects

I. NSF 372: Drinking Water System Components – Lead Content

J. The United States Safe Drinking Water Act

1.05 DESCRIPTION

A. This Section includes requirements for providing domestic water pipe and accessories in accordance with applicable standards and regulations.

1.06 QUALITY ASSURANCE

A. Installer's Qualifications:

1. Engage a single installer regularly engaged in domestic water piping installation and with experience in the installation of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to Engineer.
2. Engage a single installer for the entire domestic water piping system with undivided responsibility for performance and other requirements.

B. Regulatory Requirements: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. Local and State Building Codes and Ordinances.

C. Component Supply and Compatibility:

1. Obtain all equipment included in this Section regardless of the component manufacturer from a single domestic water piping systems manufacturer.

2. The domestic water piping systems manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.

3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the domestic water piping systems manufacturer.

1.07 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:

a. Shop drawings for domestic water piping shall comply with the requirements of Section 22 10 53 – Installation of Plumbing Piping.

2. Product Data:

a. Manufacturer's literature, illustrations, specifications and engineering data.

b. Flexible connections.

c. Other technical data related to the specified material and equipment as requested by Engineer.

d. Gasket material.

B. Informational Submittals: Submit the following:

1. Qualifications Statements:

a. Installer’s qualifications.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping Handling and Unloading:

1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast in place concrete, in ample time to prevent delay of the Work.

B. Storage and Protection:

1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer’s recommendations for long-term storage.

C. Acceptance at Site:

1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss

or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Dielectric Couplings:

1. Hart Industrial Unions, LLC
2. SSP Corporation
3. Watts
4. Or approved equal.

B. Bronze Body Globe Valves:

1. Apollo Valves Division of Conbraco Industries, Inc., 120S-LF Series
2. Milwaukee Valve, Fig. No. UP1502
3. Or approved equal.

C. Strainers:

1. Watts
2. Zurn Industries
3. Or approved equal.

D. Iron Body Gate Valves:

1. Apollo Valves Division of Conbraco Industries, Inc., 611F-LFA Series
2. Watts, Series 408-OSYRW
3. Or approved equal.

E. Iron Body Check Valves:

1. Apollo Valves Division of Conbraco Industries, Inc., Fig. No. 910F-LFA
2. Nibco, Inc. Fig. No. F-910-LF
3. Or approved equal.

F. Tepid Water Mixing Valve

1. Haws Corporation, Model No. TWBS.H
2. Powers, Model No. LFMM431.
3. Leonard Water Temperature Controls, Model No. TM-5125-STSTL-EXP.
4. Or approved equal.

G. Point-of-Use Thermostatic Anti-Scalding Valve:
1. The Bradley Corporation, S59-4016 Series
2. Watts, Series LFMMV.
3. Or approved equal.

H. Hose Bibbs, Pipe Drains:
1. Zurn Industries LLC, Model Z1341XL
2. Acorn Engineering Company, Model 8121-LF
3. Or approved equal.

I. Exposed Wall Hydrant Connection, Non-Freeze Type:
1. Jay R. Smith, Fig 5609 SE.
2. Zurn Industries, Fig. No. Z1321XL
3. Or approved equal.

J. Water Hammer Arresters:
1. Products and Manufacturers: Provide one of the following:
2. Zurn-Wilkins Division of Zurn Industries, 1260XL Series
3. Watts, LF15 Series
4. Or approved equal.

K. Flexible Connections:
1. Flex Hose Co., Inc.
2. The Metraflex Company
3. Or approved equal.

L. Automatic Air Vents:
1. Armstrong Fluid Technologies.
2. Bell and Gossett.
3. Or approved equal.

M. Thermometers:
1. H.O. Trerice Company.
2. Weksler Instruments Division of Ashcroft, Inc.
3. Or approved equal.

N. Pressure Gages:
   1. H.O. Trerice Company.
   2. Weksler Instruments Division of Ashcroft, Inc.
   3. Or approved equal.

O. Backflow Preventers: 1/2-Inch to 2-Inches: (BFP-RPZ):
   1. Watts, Series LF919
   2. Zurn-Wilkins Division of Zurn Industries, Series 975XL2
   3. Or approved equal.

P. Backflow Preventers, Reduced Pressure Detector Assembly (BFP-RPDA):
   1. Zurn Industries, Series 350
   2. Watts, Series 709.
   3. Or approved equal.

Q. Backflow preventers test kit.
   1. Watts, Backflow Preventer Test Kit with carrying case.
   2. Zurn-Wilkins Division of Zurn Industries Test Kit and case.
   3. Or approved equal.

R. Water Meter:
   1. Sensus OMNI R2 Series.
   2. Neptune Water Meter Company, T10.
   3. Or approved equal.

S. Vacuum Breakers: Pressure Type: PVB
   1. Conbraco Industries, Incorporated, Series SVB 4ALF
   2. Watts, Series LF800
   3. Or approved equal.

T. Vacuum Breakers Atmospheric Type: AVB:
   1. Apollo Valves Division of Conbraco Industries, Inc, Series 38LF-100
   2. Watts, Series LF288A.
   3. Or approved equal.

U. Trap Primer Valve:
   1. MIFAB
   2. Watts.
   3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. General Materials Requirements:

1. All piping, couplings and fittings to be used in the potable domestic water distribution system shall be certified NSF 61 Annex G/NSF 372 lead-free.

2. All piping and fittings to be used for domestic water shall comply with the current requirements of the United States Safe Drinking Water Act.

B. Copper Water Tube:

1. Tube:

a. Reference: ANSI H23.1, ASTM B 88.

b. Type: K or L.

c. Temper: Hard drawn or soft annealed.

2. Fittings:

a. Reference: ANSI B16.22.

b. Reference: ANSI B16.26.

c. Reference: ANSI B16.18.

3. Joints:

a. Sweat:

1) Solder Metal: ASTM B 32, Type 95 5TA.

2) Flux: FS O F 506, Type 1.

b. Flanged:

1) Flanges: ANSI B16.24, 150 lb. class.

2) Gaskets: Red rubber, ASTM D 1330, Grade 1, 1/8 inch thick.

3) Nuts and Bolts: ASTM A 307.

4. Unions:

a. Reference: FS WW U 516.

b. Material: Bronze.

c. Rating: 250 lb. W.O.G.

C. Ductile Iron Pipe:

1. Pipe: Ductile iron, ANSI A21.51.

2. Fittings: Ductile iron, ANSI A21.1.

3. Joints:

a. Mechanical Joints:

1) Glands, Bolts and Nuts: ANSI A21.11.

b. Flanged Joints:

1) Reference: ANSI A21.10.

4. Lining: Mortar lined, ANSI A21.4.

D. Dielectric Couplings:

1. Type: Union or flange.

2. Ratings:

a. Unions: 250 psi, ANSI B16.39.

b. Flanges: 175 psi, ANSI B16.42 (Iron), ANSI B16.24 (Bronze).

E. Valves:

1. General Valves Requirements:

a. All valves, strainers and appurtenances to be used in the potable domestic water distribution system shall be certified NSF 61 Annex G/NSF 372 lead-free. Where specified products are third-party certified lead-free, uncertified products shall not be acceptable equals for substitution.

b. All valves, strainers and appurtenances to be used for domestic water shall comply with the current requirements of the United States Safe Drinking Water Act.

2. Bronze Body Globe Valves:

a. Products and Manufacturers: Provide one of the following:

1) Apollo Valves Division of Conbraco Industries, Inc., 120S-LF Series

2) Milwaukee Valve, Fig. No. UP1502

3) Or approved equal.

b. Type: Composition disc, screwed bonnet.

c. Materials: Lead-free Brass and bronze.

d. Rating: 150 lb. SWP.

e. End Connections: Solder joint.

3. Bronze Body Check Valves:

a. Products and Manufacturers: Provide one of the following:

1) Apollo Valves Division of Conbraco Industries, Inc., 161S-LF Series

2) Milwaukee Valve, Fig. No. UP1502

3) Or approved equal.

b. Type: Swing, bronze disc, screw in cap.

c. Materials: Lead-free Brass and bronze.

d. Rating: 200 PSI CWP

e. End Connections: Solder joint.

4. Bronze Body Ball Valves:

a. Type: Non blowout stem, two-piece, quarter turn, full port ball valve.

b. Materials:

1) Body: Lead-free bronze or brass.

2) Ball: Chrome plated brass.

3) Packing and Seats: Teflon.

4) Rating: 200 PSI CWP.

5) End Connections: Soldered End.

5. Strainers:

a. Type: Self-cleaning wye body with blow off cock.

b. Construction:

1) Basket: Perforated stainless steel basket.

2) Perforations: 0.045 inches diameter, minimum.

3) Free Area: Four times, cross sectional area of connecting pipe, minimum.

6. Strainers 2 1/2 inch and smaller:

a. Materials:

1) Body: Cast bronze, ASTM B 62.

b. Pressure Rating: 250 psi steam at 425□F temperature.

c. End Connections: Solder ends or screwed ends with adapters for screw to sweat ends.

d. Blowoff Connection: Unplugged, NPT blowoff connection.

F. Iron Body Gate Valves:

1. Type:

a. Solid wedge, OS&Y, full-port with bolted bonnet.

2. Materials:

a. Body: Cast Iron with epoxy finish

b. Wedge: Lead-free bronze or epoxied cast-iron

c. Bonnet: Cast Iron

3. Rating:200 PSI CWP

4. End Connections: Flanged end connections, ANSI B16.1 drilling.
5. Provide chain wheel operators for all valves above 5 foot-6 inches above finished floor.

G. Iron Body Check Valves:
1. Type: Swing, bolted cover.
2. Materials: Iron body, lead-free bronze trim and disc.
3. Rating: 200 PSI CWP.
4. End Connections: Flanged, ANSI B16.1 drilling.

H. Tepid Water Mixing Valve
1. Type: Thermostatically operated water-blending device.
2. Materials:
   a. Body: Brass.
   b. Vanes: Brass.
3. Thermostatic element to be located in main body of valve.
4. Low outlet temperature type valve shall be adjustable from 60 to 110°F.
5. Test Pressure: 300 psi.
6. Reference: NSF/ANSI 61-G.

I. Point-of-Use Thermostatic Anti-Scalding Valve:
1. Type:Thermostatically operated point-of-use anti-scalding with integral supply checks.
2. End Connection: Soldered-end.
3. Maximum Supply Pressure: 150 PSI
4. Maximum Supply Temperature: 180º F
5. Approvals:ASSE 1070, NSF 61/372

J. Hose Bibbs, Pipe Drains:
1. Valve:
   a. Type: Indoor chrome plated.
   b. Materials: Bronze body, screwed bonnet, renewable composition disc.
   c. End Connections: Hose thread outlet, NPT thread inlet.
   d. Rating: 125 lbs. WOG.
2. Vacuum Breaker:
   a. Type: Non removable, atmospheric.

b. Materials: Brass body, stainless steel trim, silicone rubber diaphragm and disc.

c. End Connections: Hose thread inlet and outlet.

3. Reference: NSF 61/NSF 372, ASSE 1011

K. Wall Hydrants, Exposed Non-Freeze Type:

1. Type: Anti-siphon, non-freeze wall hydrant.

2. Materials:

a. Casing: Bronze.

b. Vacuum Breaker: Integral.

c. Threads: Standard 3/4-inch hose thread outlet.

d. Wall Clamp: Adjustable with set screw.

e. Key: Removable tee handle type.

3. Connections: 3/4-inch sweat end inlet and 3/4-inch hose thread outlet, universal type.

4. Reference: NSF 61/NSF 372.

L. Water Hammer Arresters:

1. Materials:

a. Casing: Copper Tube

b. Piston: Polycarbonate

c. Tailpiece: Low-lead brass

2. Connection: Male NPT thread.

3. Maximum Working Pressure: 250 psig.

4. Sizing and Certification: PDI WH 201.

5. References: ASSE 1010, NSF 61 / NSF372

M. Flexible Connections:

1. Type: Flexible connections for piping 2 1/2 inches and smaller.

2. Construction:

a. Hose: 316 Stainless Steel

b. Braid: 316 Stainless Steel

3. Pressure Ratings: 190 psig working pressure at 250□F temperature.

4. End Connections: Threaded or flanged pipe connection.

5. References: NSF 61/NSF 372

N. Automatic Air Vents:

1. Type: Automatic vent air eliminator with built in air chamber.
2. Construction:
   a. Body: Bronze.
   b. Finish: Chrome plated exterior.
   c. Overflow Connector: Provide connection for 1/4 inch OD copper tubing.
3. Ratings: 75 psig working pressure.
4. References: NSF 61/NSF 372

O. Thermometers:

1. Range: 30°F to 240°F temperature range in maximum of 2°F increments.
2. Type: Adjustable Angle Column Type Thermometer.
   a. Construction:
      1) Scales and Lens: Nine inch high satin finish aluminum scales, black numerals, front reading tubes for non-mercury fluid.
      2) Wells: Insertion well with brass separable sockets.
      3) Neck: 2 1/2 inch extension neck.
      4) Case: Cast aluminum.
      5) Window: Glass or clear acrylic plastic.

P. Pressure Gages:

1. Reference ANSI B40.1 for Grade AA gages.
2. Type: Direct mounted, dial type pressure gage.
3. Construction:
   a. Case: Six inch diameter cast aluminum, flangeless with black finish and bottom 1/4 inch N.P.T.
   b. Ring: Chrome plated close type.
   c. Dial: White face, black numbers and graduations.
   d. Window: Glass or clear acrylic plastic.
   e. Pointer: Micrometer type, black finish, red tip.
   f. Movement: Stainless steel, rotary type, delrin sector and bushings.
   g. Bourdon Tube: Type 316 stainless steel
   h. Socket and Tip: Forged brass, alloy steel and Type 316 stainless steel.
4. Accuracy: One percent minimum.
5. Gage Cocks: Provide brass tee handle isolation cock before each gage.

6. All gauges are to be filled with non-mercury organic fluids.

Q. Backflow Preventers: 1/2-Inch to 2-Inches: (BFP-RPZ):

1. Type: Reduced pressure zone device with two independently acting check valves, together with an automatically operated pressure differential relief valve located between the two check valves.

2. Materials:

   a. Body: Low-lead Bronze.

   b. Valve Discs: BUNA-N rubber.

   c. Diaphragm: Silicone rubber or Buna N rubber.

   d. Springs: Stainless steel.

   e. Screws: Stainless steel.

3. Maximum Working Pressure: 175 PSI WWP

4. End Connections: Screwed.

5. Accessories:

   a. Air gap drain funnel with threaded outlet and vent elbow furnished by manufacturer.

   b. Strainer with blow-off on inlet.

   c. Ball valves on inlet and outlet.

   d. Reduced pressure principle backflow preventer test kit for each unit furnished, provided in molded plastic carrying case with foam inserts.

6. References: ASSE 1013, AWWA C511, NSF 61 and applicable authority having jurisdiction.

R. Backflow Preventers, Reduced Pressure Detector Assembly (BFP-RPDA):

1. Type: Assembly of two single independently acting check valves with tight closing shut off valves at each end and suitable connections for testing the water tightness of each check valve with bypass assembly. Gate valves shall be provided with tamper switches as specified herein.

2. Materials:

   a. Main Valve Body: Cast-iron.

   b. Trim: Bronze.

   c. Bypass Valve Body: Bronze.

   d. By-Pass Meter: Totalizing 1 to 20 gpm, 5/8-inch by 3/4-inch.

   e. Seats: Bronze.

   f. Fasteners: Stainless steel.

g. Main-Line Shut Off Valves: OS & Y with resilient seats and tamper switches, Underwriters' Laboratory listed and Factory Mutual approved.

h. Test cocks: Bronze body ball valves, four required.

3. Maximum Working Pressure: 200 psi.

4. End Connections: Flanged.

5. Accessories:

a. Gate valves on inlet and outlet with Underwriters' Laboratory listed, Factory Mutual approved tamper switches.

b. DCV backflow preventer test kit provided in molded plastic carrying case with foam inserts for each unit furnished to be turned over to DEP.

6. Reference: Underwriters' Laboratory listed and Factory Mutual approved.

7. Fire protection system backflow preventers shall be provided with a bypass assembly consisting of a water meter, approved double check valve backflow prevention assembly with shut-off valves and test cocks.

8. All backflow preventers shall meet with the approval of U.S.C. Cross Connection Control Lab, U.S. Army Corps of Engineers, U.S. Navy, AMPS, Southern Building Code Congress, AWWA, and ASSE.

S. Water Meter:

1. General: Water meter shall be as supplied by local water utility company. Otherwise, provide water meters as specified below.

2. Type: Turbine Type.

3. Materials:

a. Body: Lead-free alloy.

b. Register: Lead-free alloy.

c. Gear Train: Direct Coupled.

4. Size: 2-inch.

5. Maximum Working Pressure: 150 psi.

6. End Connections: Flanged.

7. Reference: NSF 61/NSF 372, Local Water Utility

T. Vacuum Breakers:

1. Pressure Type: PVB:

a. Type: An assembly containing an independently operating internally loaded check valve and an independently operating loaded air inlet valve located on the discharge side of the check valve. The assembly

shall also be equipped with test cocks and shut off valves on the inlet and outlet of the assembly.

b. Materials:

1) Springs: Stainless steel.

2) Bonnet: Glass filled PPO

3) Vent Disc: Silicone rubber.

4) Disc Holder Float: Polypropylene.

5) Check Valve Disc: Silicone rubber.

6) Check Valve Seat: NORYL

7) Body: Lead-free copper alloy

c. Accessories:

1) Ball valves on inlet and outlet on the assembly.

2) Ball valve test cocks on the assembly.

d. Reference: ASSE 1020, NSF 61/NSF 372.

e. Working Pressure: 150 psi.

f. Installation: Vertical, minimum 12 inches above fixture vacuum breaker serves.

2. Atmospheric Type: AVB:

a. Type: An assembly containing an air inlet valve, a check seat and an air inlet port to prevent reverse flow of water and allow air into the water line to break a siphon.

b. Materials:

1) Hood: Polished Chrome Finish

2) Body: Lead-Free Bronze.

3) Vent Disc: Silicone.

4) Disc Holder Float: Polyethylene.

5) Body: Lead-Free Bronze.

c. Reference: ASSE 1001.

d. Working Pressure: 210°F at 125°F.

e. Installation: Vertical, minimum 6 inches above fixture vacuum breaker serves.

U. Trap Primer Valve:

1. Construction:

a. Body: Brass.

b. Seals: O-ring 40°F to 450°F.

c. Inlet and Outlet Size: 1/2-inch.

d. Integral backflow preventer.

e. Provide multiple outlet distribution units, as required.

f. Reference: ASSE 1018, NSF 61/NSF 372

g. Accessories: Floor drain trap primer distribution unit.

V. Material Schedule:

1. Use types of pipe and fittings as specified below, unless otherwise specified or shown.

2. All potable water supply, hot, cold, tepid and tempered water piping 3-inches and smaller, run within the interior of a building, shall be hard drawn copper Type "L" with solder joints and connections.

3. All potable water piping 3-inches and smaller run underground shall be soft-annealed copper Type "K" copper tubing.

4. All underground water piping 4-inches and larger shall be cement-lined ductile iron pipe with mechanical joints.

5. All water piping 4-inches and larger run above ground within the interior of a building, shall be Type "L" hard-drawn copper tubing with soldered joints and fittings.

6. All exposed water piping and valves to plumbing fixtures shall be chrome-plated brass.

7. All valves for copper tubing shall be bronze bodied, unless otherwise specified.

8. All valves for ductile iron piping shall be iron bodied, unless otherwise specified.

9. Use "wrought copper" fittings for copper tubing.

10. Use "butt welded" fittings for welded steel pipe connections.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Piping and accessories shall be painted in accordance with Section 09 91 00 – Painting.

B. Provide insulation, where required, in accordance with Section 22 07 19 – Plumbing Piping Insulation.

C. Provide heat tracing on hot and tepid water piping as required in accordance with Section 22 05 33 – Heat Tracing for Plumbing Pipes.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Install domestic water piping in accordance with the requirements of Section 22 10 53 – Installation of Plumbing Piping.

B. Installation of hangers and supports shall be in accordance with Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment.

3.03 FIELD TESTING / QUALITY CONTROL

A. Perform field testing and quality control of domestic water piping in accordance with the requirements of Section 22 10 63 – Testing of Plumbing Piping Systems.

3.04 STARTUP / DEMONSTRATION

A. All domestic water piping shall be disinfected before they are placed into service, as specified in Section 33 01 10.6, Disinfection of Piping, Tanks, Structures, and Equipment .

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used.

END OF SECTION

SECTION 22 13 16 – SANITARY WASTE AND VENT PIPING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install sanitary waste and vent piping, and appurtenances complete with accessories.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 09 91 00 – Painting.

B. Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment.

C. Section 22 10 53 – Installation of Plumbing Piping.

1.04 REFERENCES

A. Standards referenced in this Section are listed below:

1. American Society of Sanitary Engineering, (ASSE).
2. The American Society of Mechanical Engineers (ASME).
   a. ASME A112.14.1, Backwater Valves
   b. ASME B16.29, Standard for Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings – DWV.
3. American Society for Testing and Materials, (ASTM).
   a. ASTM A74, Specification for Cast-Iron Soil Pipe and Fittings.
   b. ASTM A518/A 518M, Specification for Corrosion Resistant High Silicon Iron Castings.
   c. ASTM A861, Specification for High Silicon Iron Pipe and Fittings.
   d. ASTM A888, Specification for Hubless Cast-Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.
   e. ASTM C564, Specification for Rubber Gaskets for Cast-Iron Soil Pipe and Fittings.
   f. ASTM D1785, Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.
   g. ASTM D2665, Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings.
4. Cast-Iron Soil Pipe Institute, (CISPI).
   a. CISPI 310 Specification for Couplings for Use in Connection with Hubless Cast-Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.
   b. CISPI HSN, Specification for Neoprene Rubber Gaskets for Hub and Spigot Cast-Iron Soil Pipe and Fittings.
5. Federal Specifications, (FS).
   a. FS QQ-C-40, Calking Lead Wool and Lead Pig.
6. National Sanitation Foundation (NSF).
   a. NSF 14: Plastic Piping System Components and Related Materials

1.05 DESCRIPTION

A. Not Used.

1.06 QUALITY ASSURANCE

A. Installer's Qualifications:

1. Engage a single installer regularly engaged in sanitary piping installation and with experience in the installation of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to Engineer.
2. Engage a single installer for the entire sanitary waste and vent piping system with undivided responsibility for performance and other requirements.

B. Regulatory Requirements: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. Local and State Building Codes and Ordinances.
2. Permits: Contractor shall obtain and pay for all required permits, fees and inspections.

C. Component Supply and Compatibility:

1. Obtain all equipment included in this Section regardless of the component manufacturer from a single sanitary waste and vent piping systems manufacturer.
2. The waste and vent piping systems manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the sanitary waste and vent piping systems manufacturer.

1.07 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:
   a. 1/4 inch scale piping layouts, dimensioned to show length of piping runs, pipe sizes, support spacing and expansion provisions.
   b. Details of installation, including piping supports.
   c. Submit pipe schedule with laminate construction, sizes, thickness, vacuum pressure, weight per foot pressure, spans, joint type and flange data.
2. Product Data:
   a. Manufacturer's literature, illustrations, specifications and engineering data.
   b. Flexible connections.
   c. Other technical data related to the specified material and equipment as requested by the Engineer.
   d. Gasket material.

B. Informational Submittals: Submit the following:

1. Qualifications Statements:

a. Installer's Qualifications

1.08 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling and Unloading:

1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast in place concrete, in ample time to prevent delay of the Work.

B. Storage of Materials:

1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.

C. Acceptance at Site:

1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cast-Iron Pipe:

1. Charlotte Pipe & Foundry Company

2. Tyler Pipe Company.

3. Or approved equal.

B. Steel Pipe and Fittings:

1. Mueller Industries

2. Wheatland Tube Co.
3. Or approved equal.

C. Floor Drains (FD-1):
1. Jay R. Smith, Fig. 2010-U-NB with A.R.E Coating.
2. Zurn Industries, Fig. Z-415S-P-VP with A.R.E Coating.
3. Or approved equal.

D. Floor Drains (FD-2):
1. Jay R. Smith, Fig. 2340-B-M with A.R.E. coating.
2. Zurn Industries, Fig. Z-521-Y with A.R.E. coating.
3. Or approved equal.

E. Cleanout Deck Plate:
1. Jay R. Smith, Fig. No. 4258C.
2. Zurn Industries, Fig. No. Z-1474.
3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Piping:
1. Cast-Iron Pipe:
a. Hub & Spigot Cast-Iron Soil Pipe and Fittings:
1) Pipe and Fittings: ASTM A 74.
2) Weight: Service Weight.
3) Joints:
b. Compression:
1) Gasket: Neoprene Rubber, ASTM C 564, CISPI HSN.
2) Lubricant: As recommended by pipe manufacturer.
c. Calked:
1) Lead: FS QQ C 40, Type I, Grade AA.
2) Jute Packing: FS HH P 117, Type I.
2. Hubless Cast-Iron Soil Pipe and fittings:
a. Pipe and Fittings: ASTM A 888 & CISPI 301
b. Joints: CISPI 310 & ASTM C 1277
3. Heavy duty hubless couplings: ASTM C1540

a. Gaskets: ASTM C 564

4. Steel Pipe and Fittings:

a. Pipe:

1) ANSI B125.2

2) ASTM/ANSI 1.20.1 (Threads)

3) Weight: Schedule 40

4) Finish: Galvanized.

5) Fittings: ANSI B16.12 recessed drainage pattern galvanized cast-iron, threaded so as to allow 1/8 inch or 1/4 inch per foot grade, as required.

B. Floor Drain (FD-1).

1. Materials:

a. Body: Enameled cast iron.

b. Collar: Cast-iron, reversible, threaded for strainer heads, enamel coated.

c. Strainer Head: Square 8-inch by 8-inch nickel bronze grate with bronze body, heel proof grate, and vandal proof screws.

d. Grate: Ductile iron, 11-1/2-inch diameter.

2. Outlet Connection: Bottom outlet, calk or no-hub, as required

3. Trap primer connection on body with thread to solder adapter, as required.

C. Floor Drain (FD-2)

1. Materials:

a. Body: Enameled cast-iron.

b. Collar: Enameled cast-iron.

c. Top: Enameled cast-iron adjustable.

d. Grate: Ductile iron, 11-1/2-inch diameter.

e. Accessories: Sediment bucket.

f. Rating: Heavy-duty.

2. Outlet Connection: Bottom outlet, calk or no-hub, as required.

3. Trap primer connection on body with thread to solder adapter, as required.

D. Cleanouts:

1. Cleanout Deck Plate (FCO):

a. Materials: Cast-iron body, flanged housing, cast-iron cover with fitting device.

1) Outlet Connection: Calk outlet.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. All piping and accessories shall be painted in accordance with the requirements of Section 09 91 00– Painting.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Install domestic water piping in accordance with the requirements of Section 22 10 53 – Installation of Plumbing Piping.

B. Installation of hangers and supports shall be in accordance with Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment.

C. Material Schedule:

1. Use types of pipe and fittings as specified below, unless otherwise specified or shown.

2. All exposed gravity sanitary waste and vent piping 1-1/2-inches and larger run within the interior of a building shall be no-hub cast-iron.

3. All gravity sanitary waste and vent piping 1-1/2-inches and larger located in concrete slabs or underground to exterior limits as shown shall be service-weight cast-iron soil pipe with hub-and-spigot fittings.

3.03 FIELD TESTING / QUALITY CONTROL

A. Test sanitary waste and vent piping in accordance with Section 22 10 53 – Installation of Plumbing Piping.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used.

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install domestic water heaters complete with accessories.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 09 91 00 - Painting.

1.04 REFERENCES

A. Standards referenced in this Section are:

1. ASME Boiler and Pressure Vessel Code.

2. ASME/ANSI Z21.22, Relief Valves for Hot Water Supply Systems.
3. NSF/ANSI 61, Drinking Water System Components – Health Effects.
4. NSF/ANSI 372, Drinking Water System Components – Lead Content
5. UL 1453, Electric Booster and Commercial Storage Tank Water Heaters.

1.05 DESCRIPTION

A. Not Used.

1.06 QUALITY ASSURANCE

A. All products are to be certified NSF 61 and NSF 372 lead-free, all electrical components are to be UL Listed for specific use, and all systems are to be third-party certified to all applicable equipment standards.

B. Qualifications:

1. Manufacturer: Shall have minimum of five years experience producing equipment substantially similar to that required, and shall be able to document evidence of at least five installations in satisfactory operation for at least five years each.

C. Component Supply and Compatibility:

1. Obtain each type of domestic water heater equipment included in this Section, regardless of component manufacturer, from one domestic water heater equipment manufacturer.
2. Each domestic water heater manufacturer shall review and approve, or shall prepare, all Shop Drawings and other submittals for components furnished under this Section for the particular equipment type.
3. Materials and equipment shall be suitable for the required service conditions and shall be integrated into each assembly by the associated domestic water heater manufacturer.

D. Regulatory Requirements: Comply with Laws and Regulations, including the following.

1. Local and State Building Codes and Ordinances.

1.07 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:
   a. Schedule of domestic water heaters for the Project, indicating for each the installation location, model or type, and other distinguishing information.
   b. Drawings showing fabrication methods, assembly, accessories, and installation details.

c. Detailed drawings of each equipment item's and component's wiring diagrams.

d. Detailed installation drawing of each individual component showing:

1) Mounting requirements.

2) Item locations, such as in a panel, installed on floor, or elsewhere.

3) Piping and wiring connections labeled and coded.

4) Data sheets.

e. Detailed description of each component.

2. Product Data:

a. Manufacturer's literature, illustrations, specifications, weight, dimensions, required clearances, materials of construction, and performance data for all equipment.

B. Informational Submittals: Submit the following:

1. Manufacturer's Instructions:

a. Special shipping, storage and protection, and handling instructions.

b. Installation data for the equipment, including setting drawings, templates, and directions for installing anchorage devices.

2. Source Quality Control Submittals:

a. Submit results of required factory tests and inspections.

3. Qualifications Statements:

a. Manufacturer, when submittal of qualifications is required by Engineer.

C. Closeout Submittals: Submit the following:

1. Operations and Maintenance Data:

a. Submit in accordance with Section 01 78 23, Operations and Maintenance Data.

b. Include maintenance data and schedules, description of operation, wiring diagrams, and list of spare parts recommended for one year of operation with current price list.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading:

1. Deliver materials and equipment to Site to ensure uninterrupted progress of the Work. Deliver anchorage materials to be embedded in concrete in ample time to prevent delaying the Work.

2. Comply with Section 01 65 00 - Product Delivery Requirements.

B. Storage and Protection:

1. Store materials and equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.

2. Comply with Section 01 66 00 - Protection of Materials and Equipment.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Electric Water Heater (EHW-1)

1. A.O. Smith, Model DVE-120.

2. Lochinvar Corporation, Model No. HST 12-119.

3. Or approved equal.

B. Vacuum Breakers:

1. Watts LFN36, Vacuum Relief Valve.

2. Cash Acme, VR-801, Lead-Free

3. Or approved equal.

C. Pre-Pressurized Expansion Tank:

1. Amtrol, Incorporated, Therm-X-Trol, ST Series.

2. Watts Regulator, Model DET.

3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Electric Water Heater (EWH-1)

1. Heater Type: Electric with UL label.

2. Service Conditions:

a. Nominal Capacity: 119 gallons.

b. Minimum Recovery Rate:

1) TI-010 Chlorination Facility 98 gallons per hour at 100 degrees F water temperature rise.

2) TI-010 Dechlorination Facility: 50 gallons per hour at 100 degrees F water temperature rise.

3) TI-011 Disinfection Facility: 98 gallons per hour at 100 degrees F water temperature rise.

c. Working pressure: 150 psig.

3. Heater Style: Standard vertical.

4. Materials:

a. Tank: Welded steel.

b. Tank Lining: Glass-lining, fired to a minimum temperature of 1,400 degrees F.

c. Outer Shell: Steel with baked enamel finish.

d. Insulation: Polyurethane foam.

e. Cathodic Protection Anode: High-density magnesium.

f. Water Connections: Brass.

g. Base and Legs: Steel or cast-iron.

5. Heaters shall not have:

a. Sharp edges.

b. Scratches on enameled surfaces.

c. Loose fasteners.

d. Loose panels.

e. Dents on outer jacket.

6. Electric Heat Source:

a. Heating Element and Operation: Immersion type.

1) TI-010 Chlorination Facility: 24 KW element.

2) TI-010 Dechlorination Facility: 13.5 KW element.

3) TI-011 Disinfection Facility: 24 KW element.

b. Heating Elements: Heavy-duty with incoloy sheaths and ceramic terminal blocks.

c. Power Supply:

1) TI-010 Chlorination Facility: 480-volt, three-phase, 60 Hertz.

2) TI-010 Dechlorination Facility: 208-volt, three-phase, 60 Hertz.

3) TI-011 Disinfection Facility: 208-volt, three-phase, 60 Hertz.

7. Controls:

a. Fused transformer for 120-volt control circuit power.

b. Thermostat: Immersion type. 110 degrees F to 170 degrees F adjustable water temperature range, set at 140ºF.

c. Element operation shall be simultaneously switched through individual magnetic contactors.

d. Manual reset high temperature cut-off. High limit energy cut-off to interrupt electrical current in event water inside heater tank exceeds 200 degrees F.

e. Local power disconnect switch to be provided under Division 26, Electrical.

8. Water Connections: 1-1/4 inch diameter inlet and outlet pipe nipples for connections to water piping system.

9. Drain Valve: Manufacturer's standard drain valve on front at tank bottom or lower side to completely drain tank.

10. Source Quality Control: Perform hydrostatic test on tank at the factory at 300 psi. Duration of test shall be the manufacturer's standard. Criteria for acceptance: Zero leakage.

11. Standards: Comply with UL 1453, NSF 61, NSF 372, and ASHRAE 90.1.

B. Accessories:

1. Temperature and Pressure Relief Valve: Provide one of the following on each storage-type water heater unit furnished:

a. Valve: Temperature and pressure relief valve in accordance with ASME/ANSI Z21.22.

b. Capacity and size of valve to relieve heater capacity at specified temperatures and pressure setting of domestic water heater tank.

c. Settings:

1) Temperature Relief Setting: 210 degrees F.

2) Pressure Relief Setting: 150 psig.

2. Cathodic Protection for Water Heaters with Tanks: Provide rigidly-supported anode rods in heater tank.

3. Vacuum Breakers: Provide one for each storage-type water heater furnished.

4. Pre-Pressurized Expansion Tank: Provide where shown or indicated on the Drawings:
   a. Type: Diaphragm type pre-pressurized expansion tank designed for potable hot water systems.
   b. Service Conditions:
      1) Tank Volume: 4 gallons
      2) Maximum Working Pressure: 125 psig.
      3) Maximum Working Temperature: 200 degrees F.
   c. Construction:
      1) Shell: Welded carbon steel.
      2) Diaphragm: Heavy-duty butyl rubber or comparable material for intended service. Schrader valve tapping.
      3) Heads: Dished.
      4) Polypropylene-lined water reservoir.
   d. Factory Charge: Precharged to 40 psig.
   e. Finish: Factory-applied primer coat, to be compatible with required field painting specified in Section 09 91 00, Painting.
   f. Standards: Equipment shall be listed in NSF/ANSI 61.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Factory-paint ferrous surfaces in accordance with Section 09 91 00 – Painting. Do not paint enameled surfaces, stainless steel, brass, chrome-plated, and other finished surfaces.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. All equipment shall be completely manufactured and pre-assembled in accordance with applicable reference standards indicated in this Section. Perform the following tests and inspections at factory before shipment:
   1. For each assembled unit, test and inspect equipment in accordance with UL requirements.
   2. Test and inspect in accordance with ASME Boiler and Pressure Vessel Code.
   3. Perform hydrostatic testing tanks as required in this Section for individual equipment items.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examine conditions under which materials and equipment will be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General:

1. Thoroughly clean materials, equipment, and accessories prior to installation.

2. Install items as in accordance with the Contract Documents, Laws and Regulations, manufacturer's recommendations, and good practice. Obtain interpretation from Engineer if manufacturer's instructions or Laws or Regulations conflict with the Contract Documents.

3. Do not modify structures or facilities to facilitate installation of equipment without approval of Engineer.

4. Provide each domestic water heater with shut off valves for required water supplies.

3.03 FIELD TESTING / QUALITY CONTROL

A. Site Tests:

1. Engineer shall witness field tests.

2. Fill all systems and verify that equipment, valves, and appurtenances operate successfully and in accordance with the Contract Documents.

3. Check for excessive vibration while systems are operating.

4. For materials and equipment that do not successfully pass field tests, make repairs or modifications and retest until acceptable results are achieved.

B. Manufacturer's Services: Provide a qualified, factory trained serviceman to perform the following:

1. Supervise installation of equipment.

2. Instruct Contractor in installing equipment.

3. Inspect and adjust equipment after installation and ensure proper operation.

4. Instruct operations and maintenance personnel in operation and maintenance of the equipment.

5. Manufacturer's technician shall make visits to the Site as follows:

a. First visit shall be for instructing Contractor in proper equipment installation, and assisting in installing equipment. Minimum number of hours on-Site: 2 hours.

b. Second visit shall be for checking completed installation, start-up of system; and performing field quality control testing. Minimum number of hours on-Site: 2 hours.

c. Third visit shall be to instruct operations and maintenance personnel.

1) Furnish services of manufacturer's qualified, factory-trained specialists to instruct DEP's operations and maintenance personnel in recommended operation and maintenance of equipment.

2) Training requirements, duration of instruction, and qualifications shall be in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.

3) Number of hours on-Site shall be in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.

d. Technician shall revisit the Site as often as necessary until installation is acceptable.

6. All costs, including allowable expenses for travel, lodging, meals and incidentals, and cost of travel time, for visits to the Site shall be included in the Contract Price.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting:

1. Adjust controls for proper settings.

2. While system is operable, balance all equipment, including valves, appurtenances, and similar equipment, to achieve specified service conditions.

3. Adjust thermostats to desired water outlet temperature.

B. Cleaning:

1. Upon completion of the Work, remove all non-permanent labels, and remove dirt, grease, markings, and other objectionable matter from equipment.

2. In preparation for painting, remove dirt, rust, dust, and objectionable materials from materials and equipment.

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to furnish, install and test all plumbing fixtures, complete and operational.

B. The following index of this Section is presented for convenience:

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C. Plumbing fixtures shall be as indicated in the Plumbing Fixture Schedule as shown on the Contract Drawings.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 33 01 10.60 – Disinfection of Piping, Tanks, Structures, and Equipment

1.04 REFERENCES

A. Abbreviations and Acronyms:

1.	ARI	American Refrigerating and Air
2.	CABO	Council of American Building Officials
3.	GPF	Gallons per Flush
4.	USCS	U.S. Department of Commerce Commercial Standard

B. Reference Standards:

1.	ASME A112.6.1M	Supports for Off-the-Floor Plumbing Fixtures for Public Use.
2.	ASME A112.18.1M	Plumbing Fixture Fittings.
3.	ASME A112.19.1M	Enameled Cast Iron Plumbing Fixtures.
4.	ANSI Z358.1	Emergency Eyewash and Shower Equipment.
5.	ANSI/CABO A117.1	Accessible and Usable Buildings and Facilities.
6.	U.S. Department of Commerce Commercial Standard.	
7.	New York City Building Code.	

1.05 DESCRIPTION

A. This Section includes requirements for providing plumbing fixtures in accordance with applicable standards and regulations. In addition:

1. Plumbing fixtures shall be furnished complete with all accessories, attachments, fastenings, and other appurtenances as specified and/or as may be required for a satisfactory installation.

2. Plumbing fixtures shall be of the water conservation type and shall conform to the requirements of the New York City Building Code.

B. All plumbing fixtures are to be white vitreous china unless otherwise specifically noted. Where enameled iron fixtures are specified, they shall be furnished with acid resisting enamel.

1.06 QUALITY ASSURANCE

A. The Work shall be performed by a New York City licensed plumber.

B. All plumbing fixtures and fittings proposed shall be one of a single manufacturer and of similar character in any room or location; escutcheons, handles, etc., on the different fixtures shall be of the same design.

C. All plumbing fixtures shall be "First Quality" as defined and set forth in Commercial Standard CS77-28 as promulgated by the U.S. Department of Commerce.

D. Plumbing fixtures shall be as efficient as those fixtures that have been tested to perform satisfactorily for at least two (2) years.

E. All wall hung fixtures shall be adequately supported from the floor with fixture support carriers. Floor mounted fixtures shall be installed as per manufacturer instructions.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Provide catalogue cuts of all plumbing fixtures, showing: sizes, rough-in dimensions, utility sizes, faucets, drains, carriers, flush valves, trim and finishes, and any electrical requirements.

b. Complete assembly, layout required clearances, and installation drawings, all with clearly marked dimensions.

c. Provide a list of manufacturer's recommended special tools and spare parts to be supplied.

d. Operation and Maintenance Manuals: Submit operation and maintenance manuals for plumbing fixtures, faucets, drains, mixing valves, flush valves, carriers, assembly of parts list for flush valves, signage, emergency equipment and electric water coolers as required in accordance with the Contract Documents.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. The cleaning, preservation and packing of the plumbing fixture for shipment shall be in accordance with the manufacturer's commercial practice subject to the approval of the Engineer.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. Plumbing fixture shall be handled in such a manner that they may be transported and unloaded without being over-stressed, deformed or otherwise damaged.

2. Plumbing fixture shall be protected from corrosion and deterioration, and plumbing fixtures shall be stored in a dry area.

a. Plumbing fixtures stored outdoors shall be supported above ground surfaces on wood runners and protected with effective and durable waterproof covers approved by the Engineer.

3. Plumbing fixture interiors shall be kept free from dirt and foreign matter.

4. Plumbing fixtures shall be properly protected from damage during construction, and shall be cleaned in accordance with manufacturer's instructions prior to installation.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall provide spare parts and special tools necessary to service, disassemble, repair and adjust the products provided under this Section, and as per the requirements of the Contract Documents.

B. Tools: Provide standard and special tools as well as supplies necessary to service, disassemble, repair, and adjust the products.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Service Sinks (Item No. SS-1):

1. Model K-6716-0, as manufactured by Kohler Company, Kohler, WI;

2. Model 7695.008, as manufactured by., American Standard, Piscataway, NJ;

3. Or approved equal.

B. Emergency Eyewash and Showers:

1. Emergency Shower and Eyewash (Corrosion Resistant): EES-1:

a. Model No. 8336, as manufactured by Haws Drinking Co., Lane Sparks, NV,;

b. Model No. SE-690-PVC as manufactured by Speakman Co., New Castle, DE,;

c. Or approved equal.

2. Emergency Shower and Eyewash Station (Freezeproof): EES-2:

a. Model SE-7000 as manufactured by Speakman Co., New Castle, DE,

b. Model 8317 Top Connection as manufactured by Haws Drinking Faucet Co., Lane Sparks, NV;

c. Or approved equal.

3. Emergency Shower and Eyewash Station (Freezeproof): EES-3:

a. Model SE-7001 as manufactured by Speakman Co., New Castle, DE,

b. Model 8317-Bottom Connection as manufactured by Haws Drinking Faucet Co., Lane Sparks, NV;

c. Or approved equal.

4. Flow Switches, Audible and Visible Alarms:

a. Haws Drinking Co., Lane Sparks, NV;

b. Speakman Co., New Castle, DE;

c. Or approved equal.

5. Safety Valve Lockout with Padlock:

a. Akron, Safety Products, Inc., Akron, OH;

b. Brady USA, Inc., Milwaukee, WI;

c. Or approved equal.

6. Freeze Protection Valves:

a. Model SP158A as manufactured by Haws Drinking Faucet Co. Lane Sparks, NV;

b. Speakman Company, New Castle, DE;

c. Or approved equal.

7. Scald Protection Valves:

a. Model SP157A as manufactured by Haws Drinking Faucet Co., Lane Sparks, NV;

b. Speakman Company, New Castle, DE;

c. Or approved equal.

C. Emergency Shower and Eyewash Station Tempering Valves (TWMV-1):

1. Exposed:

a. Haws Corporation, Model No. TWBS.HF

b. Leonard Valve Co, Model TM-800

c. Or approved equal.

D. Hose Reels:

1. Croker-Standard, Fig. No. 7025.

2. Potter Roemer, Incorporated, Fig. No. 2838.

3. Or approved equal.

E. Hose Nozzles:

1. Croker-Standard, Fig. No. 3477.

2. Potter Roemer, Incorporated, Fig. No. 2959.

3. Or approved equal.

F. Hose:

1. Croker-Standard, Fig. No. 7037 with brass coupling for non-collapsible hose.

2. Potter Roemer, Fig. No. 2852 hose with Fig. No. 2862 coupling.

3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Fixtures shall be equipped with appurtenances such as traps, faucets, stop valves, and drain fittings.

1. Each fixture and piece of equipment requiring connections to the drainage system shall be equipped with a trap.

2. Faucets shall have chrome plated flexible tube risers with loose key operated shutoff valves.

3. All exposed traps shall be cast brass swivel chromium plated, grounded joint, and with cleanout.

4. Polished chromium-plated pipe, valves, and fittings shall be provided where exposed to view.

B. Brass expansion or toggle bolts capped with acorn nuts shall be provided for supports.

C. Service Sinks (SS-1):

1. Type: Wall mounted, enameled cast iron sink.

2. Accessories:

a. Faucet with vacuum breaker shall be equal to Kohler Co. brand spill resistant vacuum breaker shall be closed by ambient air pressure when water flow is off.

b. Wall carrier shall be equal to WATTS® brand, 3-bolt floor mounter service sink carrier with epoxy coated steel uprights, welded feet, and cast iron fitting.

c. P-Trap shall be equal to Kohler Co. brand polished chrome P-Trap with adjustable rotation and slit joint inlet with cleanout plug and strainer.

d. Rim guard shall be equal to Kohler Co. brand stainless steel coated wire.

e. Fitting shall be wall mounted, mixing faucet type with integral stop, vacuum breaker, pail hook, and adjustable top brace. Finish shall be polished chrome.

D. Emergency Eyewash and Showers:

1. Emergency Shower and Eyewash: EES-1:

a. Type: Wall Mounted corrosion resistant emergency shower and eyewash station.

b. Materials:

1) Shower:

a) 9-in. diameter cycolac plastic shower head.

b) 1½-in. stay-open stainless steel ball valve.

c) 24-in. rigid pull rod.

2) Eye/Face-Wash:

a) Cycolac bowl.

b) Twin Buna-N covered ABS heads.

c) Stainless steel ball valve, stay open type.

3) Pipe:

a) All PVC parts shall be Schedule 80.

b) Painted green with bright yellow marking.

4) Supply: 1¼-in. PVC.

c. Anchor water supply to construction.

d. Shower and eyewash must conform to ANSI Z358-1-1998 standards.

2. Emergency Shower and Eyewash Station-Freeze-proof–Top Inlet: EES-2:

a. Emergency Shower:

1) Type: Thru-wall freeze-proof emergency shower station with inlet on top.

2) Materials:

a) Shower: Rough chrome plated brass.

b) Valve: Instant-open ball valve with large push-type plate. Valve remains open until manually closed. Extension shaft for valve handle designed to operate through 15-in wall.

c) Supply: 1¼-in. IPS with inlet on top.

d) Stainless steel pipe clamp and wall support with stainless steel rod.

e) Finish: Corrosion resistant coating.

b. Eye Wash:

1) Type: Thru-wall freeze proof emergency eyewash station.

2) Materials:

a) Receptor: Corrosion resistant stainless steel.

b) Heads: Buna-N covered ABS plastic designed to direct steady flow of water to eyes and ocular area of face.

c) Valve: Instant-open ball valve with large push type plate. Extension shaft for valve handle to operate through wall.

d) Wall Mounting: Bracket to be included.

e) Supply: ¾-in. IPS.

f) Waste: 1½-in. IPS tailpiece, spill onto floor, chrome plated.

g) Finish: Corrosion resistant coating.

3. Emergency Shower and Eyewash Station-Freeze-proof-Bottom Outlet EES-3:

a. Emergency Shower:

1) Type: Thru-wall freeze-proof emergency shower station with inlet at bottom.

2) Materials:

a) Shower: Rough chrome plated brass.

b) Valve: Instant-open ball valve with large push-type plate. Valve remains open until manually closed. Extension shaft for valve handle designed to operate through 15-in wall.

c) Supply: 1¼-in. IPS with inlet on bottom.

d) Stainless steel pipe clamp and wall support with stainless steel rod.

e) Finish: Corrosion resistant coating.

b. Eye Wash:

1) Type: Thru-wall freeze proof emergency eyewash station.

2) Materials:

a) Receptor: Corrosion resistant stainless steel.

b) Heads: Buna-N covered ABS plastic designed to direct steady flow of water to eyes and ocular area of face.

c) Valve: Instant-open ball valve with large push type plate. Extension shaft for valve handle to operate through wall.

d) Wall Mounting: Bracket to be included.

e) Supply: ¾-in. IPS.

f) Waste: 1½-in. IPS tailpiece, spill onto floor, chrome plated.

g) Finish: Corrosion resistant coating.

4. Flow Switches, Audible and Visible Alarms:

a. Type:

1) Single pole double throw.

2) NEMA 4X.

3) UL listed paddle type flow switch.

4) Contacts to be rated for 5 amps at 120 vac.

b. Emergency flow switch equipment shall be nominal 120 vac, 1 phase, 60 Hz electrical service, in accordance with Section 26 29 13 - Enclosed Controllers.

c. Flow switches shall only be furnished by emergency shower and eyewash manufacturer for each shower and/or eyewash station to ensure compatibility of flow switch operating in conjunction with shower or eyewash operation or operation of both units. If flow switch is not furnished by shower and eyewash manufacturer the Contractor shall assume complete responsibility for the proper operation of the flow sensing of the eyewash and shower units which shall include all additional conduit, wire and appurtenances, operation of flow switches shall be as stated below.

d. Flow switches shall sense flow for either showers and eyewashes. Flow switches shall be full line size so as not restrict water flow in order to detect flow. Provide a separate flow switch for each shower and each eyewash, if required, at each shower and eyewash station.

e. Alarms shall be activated by flow switch when emergency equipment is in operation. Audible alarm shall be intermittent signal rated at 85 Db at 10 ft. Light shall be red flashing. Alarm voltage shall be 110 vac, 60 Hz.

5. Safety Valve Lockout with Padlock:

a. Heavy duty plastic, dielectric and chemical resistant valve lock.

b. Padlock with unique serial number, hardened steel shackle, two brass keys with matching serial numbers for each padlock.

6. Anti-Freeze and Anti-Scald Valves:

a. Type: Anti-freeze valve provides freeze protection and bleeds valve to flush water through line when internal temperature drops below 35°F and closes when the line temperature reaches 45°F. Anti-scald valve provides scald protection and bleeds valve whenever internal temperature rises above 100°F and closes when line temperature drops to 85°F.

E. Emergency Shower and Eyewash Station Tempering Valves:

1. The Emergency Shower Tempering Valve shall employ two fully independent control mechanisms which split the flow in half, blend each half to the design temperature and then integrate each stream at the outlet. The valve shall control outlet temperature over a wide range of flow and shall be suitable for deluge shower or eyewash applications. The valve shall include three thermometers to measure the temperature of each stream and the merged flow. Temperature adjustment shall be vandal resistant.

2. Each independent control mechanism shall employ a liquid filled thermostatic motor to drive the valve without additional power a stainless steel sliding piston control device with reverse seat closure and both fixed and variable cold water bypass.

3. In the event of interruption of the cold water supply, each control mechanism closes off the hot water port, stopping all flow.

4. In the event of interruption of the hot water supply, each control mechanism shall allow cold flow through both the fixed and variable by pass.

5. In the event that one liquid motor fails, the control mechanism closes off the hot water port with the reverse sat and fully opens the internal variable bypass to allow cold water flow. The other control mechanism will be unaffected by the failure and will maintain design temperature.

6. Maximum Inlet Pressure: 125 psig.

7. Maximum Inlet Temperature: 180ºF.

8. Recommended Inlet Temperature: 140ºF.

9. Connections: 1¼-in. NPT.

10. Capacity: 60 gpm at 30 psig.

11. Temperature Range: 70º to 100ºF.

12. Set Point: 80ºF.

F. Hose Reels:

1. Type: Continuous flow hose reel.

2. Materials:
   a. Rims: Tubular steel, welded.
   b. Spokes: 3/8-inch diameter steel rods.
   c. Frame: Heavy steel bar frame.
   d. Drum: Galvanized steel.
   e. Finish: Baked enamel.
   f. Connections: One-inch inlet and outlet.
   g. Threads: One-inch N.S.T.

G. Hose Nozzles:
1. Materials:
   a. Body: Lexan.
   b. Stem: Brass.
   c. Bumper: Rubber.
2. Threads: One-inch N.S.T.
3. Nozzle: Adjustable fog nozzle, capable of complete shut-off, solid straight stream, or any degree of solid conical fog.

H. Hose:
1. Type: Double braided synthetic hose for use with continuous flow reels to permit flow while hose is coiled on reel. Couplings shall connect to hose nozzle threads and male hose outlet threads on hose reel.
2. Threads: One-inch N.S.T.
3. Hose Size: One-inch.
4. Length: One continuous length as shown with no intermediate couplings.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Inspection:
1. All plumbing fixtures and other related materials shall be inspected for chips, cracks, dents and other flaws. Only items free from defects shall be installed in the work. All fixtures shall be furnished with all necessary

supports, hangers, brackets, etc., for the proper installation of the fixtures. Such supports, etc., shall be in accordance with the manufacturer's recommendations.

2. No fixture will be accepted that shows cracks, blisters, thin spots, or other flaws.

B. Contractor shall install all Work in complete accordance with the manufacturer's instructions and recommendations, and the approved Shop Drawings.

1. Contractor shall not install damaged items until repairs are made in accordance with manufacturer's written instructions and approval by Engineer. Only minor repair work will be permitted in the field. All damaged items requiring remedial work shall be returned to the manufacturer for repair or replacement.

C. Interface with Other Products:

1. Review millwork shop drawings.

2. Confirm the location and size of fixtures and openings before rough-in and installation.

3.02 INSTALLATION

A. Install plumbing fixtures as shown on the Contract Drawings. The Contract Drawings are generally diagrammatic and installation of the plumbing fixtures in the allotted spaces shall be verified.

B. General Installation Requirements:

1. Install fixtures in complete accordance with the manufacturer's printed instructions and the approved shop drawings.

2. Fixtures requiring hot and cold water shall have the cold water faucet on the right hand side of the fixture and the hot water faucet on the left hand side of the fixture. Each fixture shall have shut off valves or stops for hot and cold water.

3. Each fixture shall be separately trapped.

4. Pipe openings shall be closed with caps or plugs during installation. Fixtures shall be tightly covered and protected against dirt, water, chemicals and mechanical injury.

5. Plated or polished fittings, pipes and appliances shall be coated with protective material immediately after installation.

6. Confirm location, size of fixtures and openings before installation.

7. Layout fixtures as indicated on the drawings.

8. Carefully install fixtures in accordance with manufacturer's data with sufficient clearances to coordinate with accessories, specialties and equipment specified in other divisions of these specifications and/or as shown on the drawings.

9. Hangers and carriers shall be installed in accordance with manufacturer's recommendations and in accordance with good practice and workmanship.

10. Upon completion of the work, all labels shall be removed, fixtures and trim shall be cleaned of all dirt, grease and markings and all valves properly adjusted.

11. Clean all exposed metal surfaces from grease, dirt, paint or other foreign material.

12. Fixtures shall be properly protected from damage during construction and shall be cleaned in accordance with manufacturer's instructions.

13. Fixtures, chrome-plated piping, fittings and trim shall be polished before requesting acceptance of the system.

14. All exposed valves and trim shall be chrome plated.

15. The entire plumbing installation shall be in accordance with best standard practice and in conformance with the plumbing ordinances in the Building Code of the City of New York.

C. Fixture Heights:

1. The Contractor shall install fixtures to the heights above finished floor as specified, herein below. Installation of fixtures for use by the physically handicapped shall be in accordance with ANSI/CABO A117.1.

a. Emergency Shower and Eyewash:

1) Emergency shower 84 in. to bottom of shower head.

2) Emergency eyewash 38 in. to receptor rim.

D. Fixture Rough-In :

1. The following table, Table 22 40 00-1, Fixture Rough-In Schedule, indicates the minimum size of run out piping that shall be provided to the fixtures.

TABLE 22 40 00-1
FIXTURE ROUGH-IN SCHEDULE

Fixtures	Hot Water	Cold Water	Waste	Vent
Service Sink	½-in.	½-in.	3-in.	2-in.

3.03 FIELD TESTING / QUALITY CONTROL

A. Contractor shall verify that all work furnished and installed conforms to the requirements the Contract Documents.

3.04 STARTUP / DEMONSTRATION

A. Disinfection:

1. Prior to placing the potable water systems in service, they shall be disinfected in accordance with AWWA Standard C601, Section 33 01 10.60 – Disinfection of Piping, Tanks, Structures, and Equipment, and any additional requirements prescribed by the applicable public health authorities having jurisdiction.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting:

1. Upon completion of the installation, the Contractor shall adjust all fixtures for their intended use.

2. The Contractor shall operate each fixture to ensure their performance without splashing, noise or overflow.

B. Cleaning:

1. The Contractor shall thoroughly clean all surfaces of the installed fixtures and polish all chromed surfaces.

2. Clean Work as specified in the Contract Documents.

C. Protection of Finished Work:

1. Protect finished Work as specified in Contract Documents.

2. Fixture Use: Do not permit use of fixtures.

END OF SECTION

SECTION 23 05 93 – TESTING, ADJUSTING, AND BALANCING FOR HVAC
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified, and required to perform testing, adjusting and balancing of all Heating, Ventilation, and Air Conditioning Systems, as specified and/or required for proper operation.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 23 09 00 – Instrumentation and Control for HVAC.

B. Section 40 80 82 – PMCS Startup and Field Testing.

1.04 REFERENCES

A. Abbreviations and Acronyms:

1.	AABC	Associated Air Balance Council
2.	NEBB	National Environmental Balancing Bureau
3.	HVAC	Heating, Ventilating, Air Conditioning
4.	TAB	Testing, Adjusting, and Balancing

B. Reference Standards:

1.	ASHRAE	Handbook – Fundamentals.
2.	AABC-MN-1	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems (1989).
3.	NEBB-01	Procedural Standards for Testing Adjusting Balancing of Environmental Systems (1991).
4.	AABC 81266	National Standards for Field Measurements, Total System Balance, Air Distribution, Hydronics Systems, Volume One.

1.05 DESCRIPTION

A. This Section includes requirements for the testing, adjusting, and balancing for HVAC Systems. In addition:

1. HVAC equipment shall be completely installed and in continuous operation as required to accomplish the test, adjust, and balance work specified.
2. Reports shall be certified by the testing engineer that the methods used and the results achieved are as specified.
3. Should corrective measures caused by faulty installation require retesting, adjusting and balancing, such work shall be performed at no additional expense to the City.

1.06 QUALITY ASSURANCE

A. Balancers Qualifications:

1. Balancer shall have certification by NEBB, AABC, or SMACNA, or demonstrate that the standards and experience required for certification are possessed, all to the satisfaction of the Engineer.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited, to:

1. Action Submittals:

a. Contractor shall submit one (1) copy of the standard procedure manual, published by the TAB organization affiliated with the Contractor, to the Engineer for his records.

b. Prior to testing all systems, the Contractor shall submit a test procedure for each and every system to undergo TAB as part of the Work.

c. Report Forms:

1) Submit specimen copies of report forms for Engineer's approval.

2) Forms shall be 8½-in. × 11-in. paper for loose leaf binding, with blanks for listing of the required test ratings and for certification of report.

3) Reports shall be on the organization’s approved forms imprinted with the company's name.

4) Certified report outlining procedure used to balance the system and the types of measuring devices used.

d. Test results shall be submitted on approved forms in a typed format.

e. Submit certified copies of required test reports to the Engineer for approval.

B. Information Submittals:

1. Data Sheets:

a. Submit samples of data sheets on each item of equipment for approval.

b. Submit data sheets on each item of testing equipment required.

c. Include name of device, manufacturer's name, model number, latest date of calibration, and correction factors.

2. Balancer's Qualifications:

a. Submit work experience or resume of proposed biographical data on employee who will directly supervise the TAB Work.

b. Licenses held by the balancer.

c. Submit a record of at least five (5) years' experience in the testing and balancing contracting industry, engaged in HVAC work, including but not limited to:

1) Names of projects.

2) Approximate contract cost of the TAB Work.

3) Amount of area that was tested, adjusted, and balanced for each project.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Instruments:

1. General:

a. Contractor shall provide all necessary instrumentation, tools, ladders, etc. to complete all air and hydronic balancing tests and adjustments.

b. Instrumentation shall be in accordance with NEBB, AABC, or SMACNA requirements and shall be calibrated to the accuracy standards demanded by these organizations.

c. Flow-measuring hoods (manufactured, not fabricated) shall be acceptable for measurement of ceiling diffuser performance only.

d. Contractor shall assume full responsibility for safe keeping of all instrumentation during the course of work.

B. Air balance instruments:

1. Provide all velometers, anemometers, pitot tubes, differential air pressure gages, manometers, hook gages, static pressure probe units, etc. as may be required to perform all air balance tests of HVAC equipment, ducts, registers, grilles, etc.

C. System performance measuring instruments:

1. Provide insertion thermometers, sling psychrometers, tachometers, revolution counters, clamp-on volt-ammeter recorders, and other instruments as required to measure all facets of the complete HVAC system performance.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. General:

1. All TAB of air systems shall be performed in compliance with the standard procedure manual published by the TAB organization affiliated with the Contractor and submitted to the Engineer for approval as specified herein. Contractor shall be solely responsible for the protection and safeguarding of his work and shall provide every protection against accidents, injury, and damage to persons and property.
2. Contractor shall keep dust, dirt, and debris to an absolute minimum and reinstall all removed ceiling components to their original positions at the end of each day.
3. Contractor shall be fully responsible for removal and reinstallation of ceiling system and replacement of any component damaged.
4. Contractor shall install additional access panels at no extra cost to the City, as is required to gain access to equipment concealed above ceilings, behind walls, or any other concealed space.
5. Air systems shall be tested, adjusted, and balanced with clean filters.

B. Inspection:

1. The Contractor shall conform to the requirements of this Contract Equipment Check:
   a. Verify proper overload heater sizes.
   b. Verify function of safety and operating controls.
   c. Verify proper operation of equipment.
   d. Report on inspection, observation and checking procedures.

C. Testing of Piping, Equipment, and Duct:

1. General:
   a. The Contractor shall be bound by this Section to test and adjust all systems and accessories covered under this Contract.
   b. The Contractor shall also comply with the requirements of testing as outlined in the individual sections.
   c. Furthermore, the Contractor shall operate and maintain these systems as per the requirements of the Contract Documents, and shall leave them in good working order.

d. The Contractor shall provide all necessary equipment and labor for this work.

2. Refrigerant piping must be tested before any piping is insulated or concealed.

   a. The entire refrigerant circuit must be thoroughly tested to be sure that it is absolutely tight.

   b. The system shall be tested with oil pumped, dry nitrogen.

   c. The low side of the system shall be tested at 150 psig and the high side at 300 psig.

   d. All pipe joints shall be tapped sharply with a rubber mallet and tested for leaks with a soap solution.

   e. After all leaks have been repaired, the system shall be charged with a small quantity of refrigerant and the entire system shall be checked with a halide leak detector.

   f. Once the system is found tight, it shall be allowed to stand for six (6) hours with the pressure on.

   g. If any pressure drop occurs, except those due to changes in ambient temperature, the entire system shall be retested.

   h. The system shall be evacuated with a vacuum pump until vacuum of 2.5 mm Hg is achieved.

   i. Under no circumstances shall the compressor be used to evacuate the system.

   j. After evacuation, the system shall be allowed to stand for twelve (12) hours.

   k. If no noticeable rise in pressure occurs, the system shall be charged.

3. All ductwork systems including air outlets shall be tested, adjusted and balanced for within limits of the required airflows as indicated on the Contract Drawings.

4. Overall System Test:

   a. After all final tests have been performed on all equipment and on all sub-systems installed under this Contract, including the testing of all controls specified in other Sections, and after the results from all such testing have been accepted, the Contractor shall test the overall system by demonstrating its ability to respond properly to normal changes in controlled parameters, as well as to system upsets.

   b. To facilitate this, the Contractor shall make available a minimum of two (2) personnel, thoroughly familiar with the systems and equipment installed under this Contract, for a minimum of seven (7) days to test the system by changing controlled parameters and

generating system upsets as directed by the Engineer, and demonstrating that the sequential action appropriate to the particular change or upset occurs automatically.

c. Where actual change or upset is not feasible, the Contractor shall simulate the change or the upset.

d. Controlled parameter changes shall include, but not necessarily be limited to, any change in temperature, pressure, flow rate, fluid level, load, etc., which should result in an automatic change in the position of a control valve or control damper, in the output rate of a piece of equipment, in the normal start-up or shutdown of equipment, etc.

e. The change in the state of the controlled device or equipment shall be shown to result in a corrective action on the controlled parameter.

f. Upsets shall include, but not necessarily be limited to, any condition which should cause annunciation of an alarm, safety shutdown of equipment, startup of standby equipment, closing of fusible-link devices, lifting of relief valves, etc.

g. The Contractor shall immediately restore to its original state any safety device, the state of which has been changed by its having been tested.

5. Contractor shall immediately correct any system deficiency that should occur during testing.

6. After the overall system testing has been completed, and after all final adjustments have been made, the Contractor shall operate and maintain all new systems and equipment, site-wide, associated therewith, for a period of thirty consecutive days.

a. During this period all normal maintenance (filter replacements, strainer cleaning, periodic checks of safety devices, datalogging, etc.) shall be performed by the Contractor.

b. If, during this period, any work beyond routine maintenance of equipment and materials installed under this Contract, should be required to maintain proper operation of the overall system, the elapsed time shall be forfeited, and a new thirty-day period shall commence following the completion of the corrective action.

7. The Engineer shall determine which fuel shall be burned in the boilers during these periods. All fuel and utilities required for system operation shall be provided by the City.

D. Balancing and Adjusting:

1. In addition to any other reference to balancing and adjusting specified elsewhere in these Section, the Contractor shall be bound by this portion of

the Section to balance, adjust and leave in good working order all systems and accessories covered under this Contract.

2. The Contractor shall procure the services of an independent balancing and testing agency which specializes in the balancing and testing of heating, ventilating and air conditioning systems to balance, test and adjust all systems installed under this Section.

3. The Contractor shall advise the Engineer at least two weeks in advance of the date scheduled for balancing to commence; at the Engineer's discretion, the balancing shall be conducted in the Engineer's presence.

4. At least three (3) months prior to the commencement of balancing, the Contractor shall forward a detailed explanation of the balancing procedure to the Engineer for review. In general, the method shall conform to those specified by the AABC or SMACNA.

5. All piping systems shall be balanced under this Section to provide the flows indicted on the Contract Drawings.

6. Air systems shall be balanced before all refrigerant systems.

7. Before beginning to balance the air systems the Contractor shall check, in the presence of the Engineer, all filters and coils for cleanliness, dampers (automatic, volume and fire) for correct position, all fans for proper rotation, and temperature controls for minimum completeness to allow for proper balancing.

    a. If any of the above or other conditions are found which would not allow for proper balancing the Contractor shall take the necessary corrective actions, at his own expense, before balancing begins.

8. All heating, ventilating, and air conditioning systems shall be balanced by the Contractor by adjustment of dampers, fan sheaves, apparatus and air outlets to provide the air quantities indicated on the Contract Drawings. If necessary, adjustments of air outlets shall be made to eliminate drafts.

9. Balancing for all air systems shall be accomplished in a manner to first minimize throttling losses, then fan speed shall be adjusted to meet design conditions. All air outlets and fans shall be balanced within 5% of the design capacity.

10. Fan Belt Deflection: No less than ¼-in. or more than a ½-in.

11. Finned Coils: Plate type fins shall be combed out with a fin comb for appropriate fin spacing. Helical fins shall be straightened with blunt bladed instrument.

12. After the systems have been balanced, the Contractor shall submit and certify to the City, a list containing the following minimum information for air outlets and equipment:

    a. Room or facility served.

b. Size, quantity and model of air outlet or equipment.

c. Type of air outlet or equipment.

d. Air flow indicated on Contract Drawings.

e. Air flow measured.

f. Fan cfm indicated on the Contract Drawings.

g. Fan cfm measured.

h. Fan motor running amps.

13. The Contractor shall start heating and/or cooling equipment. Once system design temperature has been reached, and system is in equilibrium, again record the pressures listed above, as well as the temperatures at the inlets and outlets of the condensers, coils, and heat exchangers.

14. The Contractor shall submit all recorded data to Engineer for review.

15. The Contractor shall adjust any or all equipment which, in the City's opinion, is not set within acceptable limits of ±5%.

E. Automatic Control Systems:

1. In cooperation with the control manufacturer's representative and as per the requirements of Section 40 80 82 - PMCS Startup and Field Testing, set and adjust automatically operated devices to achieve required sequence of operations. Refer to Section 23 09 00 – Instrumentation and Control for HVAC for additional information for HVAC sequence of operations.

2. Testing organization shall verify all controls for proper calibration and list those controls requiring adjustment by control system installer.

F. Marking Of Setting:

1. Following approval of TAB Verification Report, the setting of all HVAC adjustment devices including valves, and manual dampers shall be permanently marked by the TAB Specialist so that adjustment can be restored if disturbed at any time.

G. Identification Of Test Ports:

1. The TAB Specialist shall permanently and legibly identify the location points of duct test ports. If the ductwork has exterior insulation, the identification shall be made on the exterior side of the insulation. All penetrations through ductwork and ductwork insulation shall be sealed to prevent air leakage or to maintain integrity of vapor barrier.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required to furnish, install, and test all duct insulation complete and operational.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 09 91 00 – Painting

B. Section 40 05 97 – Piping and Equipment Identification

1.04 REFERENCES

A. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers.

B. ASTM C449 - Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

C. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

D. ASTM C547 - Mineral Fiber Pipe Insulation.

E. ASTM C552 - Cellular Glass Thermal Insulation.

F. ASTM C553 - Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

G. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

H. ASTM C647 - Properties and Tests of Mastics and Coating Finishes for Thermal Insulation.

I. ASTM C916 - Adhesives for Duct Thermal Insulation.

J. ASTM C920 - Elastomeric Joint Sealants.

K. ASTM C1126 - Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.

L. ASTM E84 - Surface Burning Characteristics of Building Materials.

M. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

N. NFPA 255 - Surface Burning Characteristics of Building Materials.

1.05 DESCRIPTION

A. This Section includes requirements for providing duct insulation in accordance with applicable standards and regulations. In addition:

1. All fastenings, auxiliary equipment, accessories and appurtenances, necessary and/or required for a complete installation shall be included within the scope of Work.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Engage a single firm, with undivided responsibility for performance and other requirements and components of the duct insulation installation.

2. Engage a firm which can show successful experience in the manufacture of duct insulation systems of scope and type similar to the required Work.

B. Installer Qualifications:

1. Installer shall have at least five (5) years of experience in the installation of the Work specified. Only tradesmen with specific skills and experience in this type of Work shall be employed.

C. Requirements of Regulatory Agencies: Comply with applicable provisions of regulatory agencies below and others having jurisdiction.

1. Underwriters Laboratories, Incorporated (UL).

2. National Fire Protection Association (NFPA).

3. Local and State Building Codes and Ordinances:

a. New York City Building Code

b. New York State Uniform Fire Prevention and Building Code

c. New York State Energy Conservation Construction Code

D. General: Insulation systems including covering, mastics, adhesives, sealers and facings shall have the following Fire Hazard Classifications in accordance with ASTM E84:

1. Flame spread, 25 maximum.

2. Fuel contributed, 50 maximum.

3. Smoke developed, 50 maximum.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited, to:

1. Action Submittals:

a. Samples: Submit for approval samples of the following:

1) Thermal Insulation - Flexible.

2) Thermal Insulation - Rigid.

3) Acoustical Insulation.

b. Shop Drawings: Submit for approval manufacturer's catalog literature, specifications, and illustrations with the following information:

1) Thermal properties

2) Physical properties

3) Fire hazard ratings

4) Facing information

5) Installation instructions

6) Jointing recommendations for butt joints and longitudinal seams

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Contractor shall provide spare parts and special tools necessary to service and repair duct insulation provided under this Section.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Duct insulation:

1. Owens Corning, Toledo, OH.
2. CertainTeed Corp., Valley Forge, PA.
3. Schuller International, Inc. (Johns-Manville), Littleton, CO.
4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. General:

1. Supply and return air ducts and plenums shall be insulated with not less than R-6 insulation where located in unconditioned spaces and where located outside the building with not less than R-8 insulation. Where located within a building envelope assembly, the duct or plenum shall be separated from the building exterior or unconditioned or exempt spaces by not less than R-8 insulation.

B. Exposed Ductwork Insulation (Rigid):

1. The following ductwork exposed in room shall be insulated:

a. All outside air intake ducts and plenums from the outside air intake louver, outside air intake shaft, or roof mounted intake up to the point where the duct or plenum is connected to the heating and ventilating units, air conditioning units, or supply fans in heated and air-conditioned spaces.

b. All exhaust and return air ductwork from air-conditioned spaces.

c. All supply and return air ductwork associated with air conditioning units.

d. All heated and air-conditioned ductwork located in unheated spaces.

e. All heated and air-conditioned ductwork located outdoor shall be insulated and covered with weatherproof stainless steel jacket.

f. Where indicated on the Contract Drawings.

2. All exposed ductwork insulation shall be a minimum 1½-in. thick (except 2-in. thick for ducts located outdoor and outside air intake plenums) glass fiber board having a density of not less than 3.0 lbs./ft^3, and a thermal conductivity of not more than 0.23 BTU·in./(h·ft^2·°F) at 75° F mean temperature.

3. The exposed ductwork insulation shall be impaled over pins welded to the duct surface on 12-in. centers.

a. The pins shall be coated with vapor barrier adhesive, and the insulation shall then be secured with caps over the pins.

4. All joints and breaks in the vapor barrier shall be sealed with 3-in. wide strips of the vapor barrier facing.

5. All insulation shall be reinforced with corner bead.

6. The facing shall be finished with a 3-ply application of lagging adhesive, glass fabric reinforcing and a finish coat of mastic.

C. Concealed Ductwork Insulation (Flexible):

1. The following ductwork located above hung ceiling shall be insulated:

a. All supply, exhaust and return ductwork associated with air conditioning units.

b. All outside air intake ducts and plenums from the outside air intake louver, outside air intake shaft or roof mounted intake up to the point where the duct or plenum is connected to the heating and ventilating units and supply fans.

c. Where indicated on the Contract Drawings.

2. All concealed ductwork insulation shall be 1½ in. thick flexible fiberglass, having a thermal conductivity of not more than 0.28 BTU·in./(hr·ft^2·°F) at 75° F mean temperature.

3. The insulation shall have a reinforced foil vapor barrier facing.

4. Insulation shall be secured with 4-in. wide bands of adhesive on 12-in. centers.

5. All joints shall be sealed by adhering a 2-in. sealing lap or 3-in. strips of vapor barrier facing applied with vapor barrier adhesive.

6. On horizontal ducts over 24-in. wide, welded pins and clips shall be used on the underside on 18-in. centers.

D. Acoustical Insulation:

1. Ductwork shall be internally insulated where indicated on the Contract Drawings.

2. Internal Duct Liner - Acoustical Insulation:

a. Type: Fiberglass duct liner board with black surface.

b. Density: Minimum 1½ lbs. per cubic foot.

c. Thickness: 1½ in. minimum.

d. Thermal Conductivity: 0.23 Btu·in./(h·ft^{2}·°F) at 75°F mean temperature.

E. Adhesives and Accessories:

1. Acoustical Lining Insulation Adhesive:

a. Insulation shall be applied in cut-to-size pieces attached to the interior of the duct with a nonflammable, fire-resistant adhesive conforming to ASTM C916, Type I.

b. Exposed edges of the liner at the duct ends and at other joints where the lining will be subject to erosion shall be coated with a heavy brush coat of the nonflammable, fire-resistant adhesive to prevent delamination of glass fibers.

2. Mineral Fiber Insulation Cement:

a. Cement shall be in accordance with ASTM C195.

3. Lagging Adhesive:

a. Lagging adhesives shall be nonflammable and fire-resistant and shall have flame spread and smoke developed ratings of 25/50 when measured in accordance with ASTM E84.

4. Contact Adhesive:

a. Adhesive may be dispersed in a non-halogenated organic solvent with a low flash point (flash pint less than minus 25°F when tested in accordance with ASTM D3278) or, dispersed in a nonflammable organic solvent which shall not have a fire point below 200°F.

b. The adhesive shall be nonflammable and fire resistant.

5. Caulking:

a. Caulking shall be in accordance with ASTM C920.

6. Corner Angles:

a. Nominal 0.016 in. type 316 stainless steel 1-in. × 1-in. with factory applied kraft backing and adhesive.

7. Finishing Cement:

a. Mineral fiber hydraulic-setting thermal insulating cement ASTM C449.

8. Fibrous Glass Cloth and Glass Tape:

a. Fibrous glass cloth and glass tape shall have flame spread and smoke developed ratings of no greater than 25/50 when measured in accordance with ASTM E84.

9. Staples shall be outward clinching Type 316 stainless steel.

10. White Vapor Retarder All Service Jacket (ASJ):

a. Shall be used on hot/cold pipes, ducts, or equipment.

b. Vapor retarder jackets used on insulation exposed in finished areas shall have white finish suitable for painting.

11. Weatherproof Jackets:

a. Type 316 stainless steel jackets shall be smooth sheet, 0.016 in. nominal thickness.

b. Corrugated metal jacket shall not be used outdoors for insulated ducts.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Source Quality Control: Perform the following tests and inspections at factory.

1. Flame Spread

2. Smoke Developed

3. Fuel Contributed

B. Manufacturer's Markings:

1. Stamp or label with manufacturer's name and brand every package or standard container of covering, adhesive and coating delivered to the job site for use.

2. Exposed side of insulation shall be legibly labeled by the manufacturer to show thickness, type and manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Contractor shall install all Work in complete accordance with the manufacturer's instructions and recommendations, and the approved Shop Drawings.

B. All duct leaks shall be sealed prior to installation of external insulation to prevent billowing and damage to insulation.

C. Contractor shall ensure that all surfaces are clean and dry before applying insulation.

D. Field Measurements: Take field measurements where required prior to installation to ensure proper fitting of Work.

E. Contractor shall ensure that ductwork has been inspected and released for application of insulation.

F. Contractor shall not install damaged insulation until repairs are made in accordance with manufacturer's written instructions and approval by Engineer.

1. Only minor repair work will be permitted in the field.

2. All damaged insulation requiring remedial work shall be returned to the manufacturer for repair or replacement.

3.02 INSTALLATION

A. Install duct insulation in complete accordance with the manufacturer's instructions and the approved shop drawings.

B. Install insulation to make surfaces smooth, even and substantially flush with adjacent duct insulation.

C. Duct sizes indicated on the Contract Drawings are clear inside dimensions. Increase duct sizes to give designated inside dimensions when internal insulation is used.

D. Thickness of rigid insulation shall be greater than the seams or angles of ductwork to which it is applied.

E. Duct insulation shall be continuous through sleeves and prepared openings.

F. Insulation shall terminate at fire dampers and flexible connections.

G. Vapor barrier materials shall be applied to form a complete unbroken vapor seal over insulation.

H. Provide Type 316 stainless steel jacketing and waterproof sealants for insulated ducts exposed to outdoor.

I. Field Painting shall comply with the requirements of Section 09 91 00 - Painting.

J. Identification markers and labels shall be in conformance with the Contract Documents and Section 40 05 97 - Piping and Equipment Identification.

3.03 FIELD TESTING / QUALITY CONTROL

A. Furnish the services of a qualified manufacturer's representative to check and approve all insulation in accordance with the requirements of the Contract documents. In addition:

1. Contractor shall verify that all work furnished and installed conforms to the requirements the Contract Documents.

2. Reports: Submit a report from the manufacturer of each visit to the Site. Reports shall provide complete information on time, schedule, tasks performed, persons contacted, problems corrected, instruction and all other pertinent information.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Remove all debris, waste materials and loose foreign matter resulting from installation.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 23 09 00 – INSTRUMENTATION AND CONTROL FOR HVAC
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Contractor shall provide all labor, material, equipment, related services, supervision and incidentals required, including, but not limited to, manufacturing, fabrication, configuration and installation for a complete HVAC Monitoring and Control System (HMCS) including all necessary hardware and all operating and applications software as required for the complete performance of the Work as shown on the Drawings and as specified herein.

1. An overview of the HMCS is summarized below:

a. The TI-010D Dechlorination Facility HMCS shall include an HMCS panel (HMCS-1) located in the Electrical Room. The HMCS panel is provided for global monitoring and control of the HMCS associated with the TI-010D Dechlorination Facility HVAC system. Signaling and alarms shall be provided to the SCADA system for remote monitoring as described under the Sequence of Operations within this specification.

b. The TI-011 Disinfection Facility HMCS shall include an HMCS panel (HMCS-1) located in the Electrical Room. The HMCS panel is provided for global monitoring and control of the HMCS associated with the TI-011 Disinfection Facility HVAC system. Signaling and alarms shall be provided to the SCADA system for remote monitoring as described under the Sequence of Operations within this specification.

c. The HMCS panel shall include among other devices described, direct digital controllers (DDC), panel face mounted operator interface terminal (OIT), uninterruptible power supply (UPS) and panel face mounted alarm horn, indicating lights, and push to test buttons. The OIT shall provide global monitoring and control of the HVAC equipment controlled from the associated panel.

d. HMCS panels shall have provisions for connecting to the HMCS for service and maintenance.

e. Sensors and control devices shall be suitable for the environment they are installed in.

f. Contractor shall be responsible for providing control wiring, conduct, and appurtenances for interconnecting factory controls provided with HVAC equipment including but not limited to remote control devices, thermostats, temperature sensors, controllers, etc.

g. All interfacing with the HMCS shall be through the OIT's graphical interface. Panel face mounted switches, run indicating

pilot lights, and other similar panel face mounted manual controls are not required.

2. Contractor is required to load, configure, develop, test, document and place into satisfactory operation all software associated with the HMCS and all its ancillary devices as described herein, required by other Sections as shown and as necessary to provide a properly operating and integrated system.

3. The system configuration shall be as specified herein and as described in Sequence of Operation. Some variations in the configuration will be considered provided functional constraints as intended for the various components of the system are met. Hardware requirements are specified in this Section. Software requirements for the HMCS and for interfacing with PLC's and other microprocessor-based equipment are specified herein.

4. The Contract Documents illustrate and describe the overall functional and operational requirements. Contractor is responsible for tagging, integrating, and verifying the functionality of all system components.

5. Network level components of the system – workstations, servers, etc. shall communicate using the BACnet protocol, as defined by ASHRAE Standard 135, EIA standard 709.1. No gateways shall be used for communication to controllers furnished under this section.

6. At a minimum, provide controls for the following:
   a. Electric duct heaters.
   b. Ductless split systems.
   c. Exhaust fans.
   d. Supply fans.
   e. Control points for packaged equipment.

7. The Work also includes:
   a. HMCS panels.
   b. Direct digital controllers.
   c. Servers.
   d. Operator interface terminals.
   e. Motorized dampers including linkage kits and other accessories.
   f. Sensors, controllers, thermostats, mounting accessories, junction boxes, face plates, wall plates, covers, mounting hardware as required.
   g. Relays, selector switches, pushbuttons, indicating lights, "ON/OFF/AUTOMATIC" selector switches.
   h. Transformers.

i. Power disconnects switches.

j. Motor starters.

k. Control panels.

l. Other control devices and appurtenances, as required.

m. Power and control wiring and conduit: The conduit and wiring to be provided under this Section shall include the following:

1) All wiring and conduit from each HMCS panel to sensors, controllers, switches, dampers, valves, louvers, HVAC equipment panels, audio visual alarms, etc.

2) All wiring and conduit between HVAC equipment panels and associated field devices.

3) Any other HVAC device requiring control under this Work.

4) All power wiring and conduit to HMCS panels, except where specified to be provided under the Electrical Work.

5) Conduit layouts for these wiring requirements are not shown; Contractor shall determine the requirements based upon the arrangement of the components being furnished.

8. Work Furnished Under the Electrical Work:

a. All 3-phase power wiring and conduit.

b. 120-volt, single phase power wiring and conduit for the following:

1) Power to HMCS panels.

2) Power from HMCS panels to single phase fans and pumps controlled from the HMCS panels.

3) All wiring and conduit between 120V unit heaters and associated 120V thermostats.

c. Starters.

d. Disconnects, except where specified to be furnished under the HVAC Work.

e. “ON/OFF/AUTOMATIC” selector switches, lockout stops, pushbuttons, “START/STOP” switches, and indicating lights, except those located at HMCS panels, which shall be provided under the HVAC Work.

f. Control wiring and conduit and status wiring and conduit from motor control centers to HMCS panels.

g. Control wiring and conduit from gas/leak detection system to HMCS panels.

h. Control wiring and conduit and status wiring and conduit from VFD's to HMCS panels except where VFD's are provided within packaged HVAC equipment.

i. Control wiring and conduit and status wiring and conduit from the Fire Alarm System panels to the HMCS panels.

j. Smoke detectors.

k. Signal wiring and conduit where specified to be provided under the Electrical Work.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 05 20 – Low Voltage Wires, Cables and Accessories.

B. Section 26 05 29 – Hangers and Supports for Electrical Systems.

C. Section 26 05 33 – Raceways and Boxes for Electrical Systems.

D. Section 26 05 53 – Identification for Electrical Systems.

E. Section 40 05 97 – Identification for Process Equipment.

1.04 REFERENCES

A. American National Standards Institute, (ANSI).

B. Federal Communications Commission (FCC)

C. Factory Mutual, (FM).

D. Institute of Electrical and Electronic Engineers, (IEEE).

E. The Instrumentation, Systems and Automation Society, (ISA).

F. National Electrical Code, (NEC).

1. NFPA 79, Electrical Standard for Industries Machinery.

G. National Electrical Manufacturers Association, (NEMA).

H. National Fire Protection Association, (NFPA).

1. NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems

I. Occupational Safety and Health Administration, (OSHA).

J. Underwriters' Laboratories, Inc., (UL).

1. UL 873, Standard for Temperature-Indicating and -Regulating Equipment.

2. UL 916, Standard for Energy Management Equipment.

3. UL 555S, Standard for Smoke Dampers.

1.05 DESCRIPTION

A. Definitions:

1. Unless specifically defined within the Contract Documents, the words or acronyms contained within this specification shall be as defined within, or by the references listed within this specification, the Contract Documents, or, if not listed by either, by common industry practice.

2. Definitions:

a. Commercial Area: This is an area that has a clean environment. Examples include administration and office areas.

b. Industrial Non-Process Area: This is an area that generally has a clean environment but could be dusty. Examples include but are not limited to electric rooms, control rooms, and mechanical rooms.

c. Industrial Process Area: This is an area that could have a wet and or corrosive environment and could be electrically classified. Examples include but are not limited to process equipment spaces, chemical rooms, wet wells, drywells, and pump stations.

d. Supplier: The Supplier shall be Contractor and manufacturer jointly, that has undivided responsibility for the Engineering, design, installation and commissioning of a complete and fully functional HMCS with all required appurtenances. An approved representative of the manufacturer is an acceptable substitute to for the manufacture where independent control Contractors are authorized by the manufacturer to provide their products and services.

B. Acronyms:

1. General

a. ASHRAE: American Society Heating, Refrigeration, Air Conditioning Engineers

b. AHU: Air Handling Unit

c. ASC: Application Specific Controllers

d. BACnet: Building Automation Controls Network

e. BMS: Building Management System

f. DDC: Direct Digital Control

g. EIA: Electronic Industries Alliance

h. GUI: Graphical User Interface

i. HVAC: Heating, Ventilation, and Air Conditioning

j. IEEE: Institute Electrical Electronic Engineers

k. MBPS: Mega Bites Per Second

l. MER: Mechanical Equipment Room

m. PID: Proportional, Integral, Derivative

n. VAV: Variable Air Volume Box

2. Communications and protocols

a. ARP: Address Resolution Protocol

b. BACnet: Building Automation and Control Networks

c. CORBA: Common Object Request Broker Architecture

d. CSMA/CD: Carrier Sense Multiple Access/Collision Detect

e. DDE: Dynamic Data Exchange

f. FTP: File Transfer Protocol

g. FTT: Free Topology Transceivers

h. HTTP: Hyper Text Transfer Protocol

i. IIOP: Internet Inter-ORB Protocol

j. IP: Internet Protocol
k. LAN: Local Area Network
l. LON: Echelon Communication – Local Operating Network
m. MS/TP: Master Slave Token Passing
n. OBIX: Open Building Information Exchange
o. ODBC: Open Database Connectivity
p. ORB: Object Request Broker
q. SNVT: Standard Network Variables Types
r. SQL: Structured Query Language
s. UDP: User Datagram Protocol
t. XML: eXtensible Markup Language

3. Controllers
   a. ASD: Application Specific Device
   b. AAC: Advanced Application Controller
   c. ASC: Application Specific Controller.
   d. CAC: Custom Application Controller.
   e. DCU: Distributed Control Unit
   f. LCM: Local Control Module
   g. MC: MicroControllers
   h. MPC: Multi-purpose Controller
   i. NSC: Network Server Controller
   j. PEM: Package Equipment Module
   k. PPC: Programmable Process Controller
   l. RC: Room controller
   m. SDCU: Standalone Digital Control Units
   n. SLC: Supervisory Logic Controller
   o. UEC: Unitary Equipment Controller
   p. VAVDDC: Variable Air Volume Direct Digital Controller
4. Tools and Software
   a. AFDD: Automated Fault Detection and Diagnostic
   b. APEO: Automated Predictive Energy Optimization
   c. DR: Demand Response
   d. CCDT: Configuration, Commissioning and Diagnostic Tool

e. BPES: BACnet Portable Engineering Station

f. LPES: LON Portable Engineering Station

g. POT: Portable Operator's Terminal

h. PEMS: Power and Energy Management Software

i. MTBF: Mean Time Between Failure

C. System Description:

1. In accordance with the scope of work, the system shall provide a graphical, web-based, operator interface that allows for instant access to any system through a standard browser. The Contractor shall provide PC-based programming workstations, operator workstations and microcomputer controllers of modular design providing distributed processing capability and allowing future expansion of both input/output points and processing/control functions.

2. For this project, the system shall consist of the following components:

a. Administration and Programming Workstation(s): The Supplier shall include Operation software and architecture as described in Part 2 of the specification. These workstations shall be running the standard workstation software developed and tested by the manufacturer of the network server controllers and the standalone controllers. Workstations shall conform to the B-OWS BACnet device profile.

b. Web-Based Operator Workstations: The Supplier shall furnish licenses for web connection to the HMCS system. Web-based users shall have access to all system points and graphics, shall be able to receive and acknowledge alarms, and shall be able to control setpoints and other parameters. All Engineering work, such as trends, reports, graphics, etc. that are accomplished from the WorkStation shall be available for viewing through the web browser interface without additional changes. The web-based interface shall conform to the B-OWS BACnet device profile. There will be no need for any additional computer-based hardware to support the web-based user interface.

c. Ethernet-based Network Router and/or Network Server Controller(s): The Supplier shall furnish needed quantity of Ethernet-based Network Server Controllers as described in Part 2 of the specification. These controllers will connect directly to the Operator Workstation over Ethernet at a minimum of 100 mbps and provide communication to the Standalone Digital Control Units and/or other Input/Output Modules. Network Server Controllers shall conform to BACnet device profile B-BC. Network controllers that utilize RS232 serial communications or ARCNET to communicate with the workstations will not be

accepted. Network Controllers shall be tested and certified by the BACnet Testing Laboratory (BTL) as BACnet Building Controllers (B-BC).

d. Standalone Digital Control Units (SDCUs): Provide the necessary quantity and types of SDCUs to meet the requirements of the project for mechanical equipment control including air handlers, central plant control, and terminal unit control. Each SDCU will operate completely standalone, containing all of the I/O and programs to control its associated equipment. Each BACnet protocol SDCU shall conform to the BACnet device profile B-AAC. BACnet SDCUs shall be tested and certified by the BACnet Testing Laboratory (BTL) as BACnet Advanced Application Controllers (B-AAC).

3. The Local Area Network (LAN) shall be a 10/100 Mpbs Ethernet network supporting BACnet, Modbus, XML and HTTP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Network Server Controllers (NSCs), user workstations and a local host computer system.

4. The Enterprise Ethernet (IEEE 802.3) LAN shall utilize Carrier Sense Multiple/Access/Collision Detect (CSMA/CD), Address Resolution Protocol (ARP) and User Datagram Protocol (UDP) operating at 10 or 100 Mbps.

5. The system shall enable an open architecture that utilizes ANSI / ASHRAE Standard 135, BACnet functionality to assure interoperability between all system components. Native support for ANSI / ASHRAE Standard 135, BACnet protocol are required to assure that the project is fully supported by the HVAC open protocols to reduce future building maintenance, upgrade, and expansion costs.

6. The system shall enable an architecture that utilizes a BACnet IP or BACnet MS/TP selectable 9.6-76.8 KBaud protocol, as a common communication protocol between controllers and integral ANSI / ASHRAE™ Standard 135, BACnet functionality to assure interoperability between all system components. The AAC shall be capable of communicating as a MS/TP device or as a BACnet IP device communicating at 10/100 Mbps on a TCP/IP trunk. The ANSI / ASHRAE™ Standard 135, BACnet protocol is required to assure that the project is fully supported by the leading HVAC open protocol to reduce future building maintenance, upgrade, and expansion costs.

7. The software tools required for network management of ANSI / ASHRAE Standard 135, BACnet protocol shall be provided with the system. Drawings are diagrammatic only. Equipment and labor not specifically referred to herein or on the plans and are required to meet the functional intent, shall be provided without additional cost to the City. BACnet clients shall comply with the BACnet Operator Workstation (B-OWS) device

profile; with the ability to support data read and write functionality. Physical connection of BACnet devices shall support Ethernet IP or MS/TP. Physical connection of LonWorks devices shall support Ethernet IP or FTT-10A.

8. The system shall provide support for Modbus TCP and RTU protocols natively, and not require the use of gateways.

9. Complete temperature control system to be DDC with electronic sensors and electronic/electric actuation of valves and dampers as specified herein. The HMCS is intended to seamlessly connect devices throughout the building regardless of subsystem type.

   a. The supplied system shall incorporate the ability to access all data using HTML5 enabled browsers without requiring proprietary operator interface and configuration programs. The system shall not require JAVA to be enabled in the browser.

   b. Data shall reside on a Supplier-installed server for all database access.

   c. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network.

10. Provide the Commissioning, configuration and diagnostic tool (CCDT), color display personnel computer, software, and interfaces to provide uploading/downloading of High Point Count Controllers (AAC), Unitary Equipment Controllers (UEC) and VAV controllers (VAVDDC), monitoring all BACnet objects, monitoring overrides of all controllers physical input/output points, and editing of controller resident time schedules.

1.06 QUALITY ASSURANCE

A. General:

1. The HMCS shall be furnished by a single Supplier responsible for the adequacy, performance and configuration of all items.

2. All work described in this section shall be installed, wired, circuit tested and calibrated by factory certified technicians qualified for this work and in the regular employment of the approved manufacturer's local field office.

3. Supervision, hardware and software Engineering, calibration and checkout of the system shall be by the employees of the manufacturer or manufacturers approved technical representative.

4. Provide HMCS components and ancillary equipment, which are UL-916 listed and labeled.

5. All components used in conditioned air streams, spaces or return air plenums shall comply with NFPA 90A Flame/Smoke rating of 25/50.

6. All wiring shall conform to the National Electrical Code.

7. All smoke dampers shall be rated in accordance with UL 555S.
8. Comply with FCC rules, Part 15 regarding Class A radiation for computing devices and low power communication equipment operating in commercial environments.
9. Comply with FCC, Part 68 rules for telephone modems and data sets.

B. Supplier's Qualifications:

1. Shall have a minimum of 5 years of installation experience with the manufacturer and shall provide documentation in the bid and submittal package verifying longevity of the installing company's relationship with the manufacturer.
2. Shall have an in-place support facility within 100 miles of the site with factory certified technicians and Engineers, spare parts inventory and all necessary test and diagnostic equipment for the installed system.
3. Shall have the capability to provide on-site service within a 2-hour period.
4. Shall have 24 hours/day, 7 days/week emergency service available.
5. Shall be a financially sound firm having at least five years continuous experience in designing, implementing, supplying and supporting control systems at similar facilities which are comparable to the HMCS in terms of hardware, software, cost and complexity.
6. Shall have manufactured and supported standard lines of digital processing and control equipment and application software continuously for the last five years.
7. Shall have in existence an experienced Engineering and technical staff capable of designing, implementing, supplying and supporting the HMCS and handling the HMCS submittal and training requirements.
8. Shall provide system hardware components and software packages of fully developed, field proven standardized designs and therefore shall furnish a system which is not a highly unique, custom one-of-a-kind system.
9. Shall have a minimum of five years' experience in software configuration, hardware application, programming, and data highway systems.
10. Shall provide standard course offerings in general control applications and in operation, programming and maintenance of the control system and equipment at a facility specifically utilized for training purposes. The facility shall have been in operation continuously for the last two years.
11. Shall have a demonstrated record of prompt response to field failures.
12. Shall have a documented program of failure analysis.
13. Shall utilize a UL approved panel shop.

C. Component Supply and Compatibility:

1. Obtain all equipment included in this Section regardless of the component manufacturer from a single Supplier.
2. The Supplier shall review and approve or prepare all Shop Drawings and other submittals for all components furnished under this Section.
3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall equipment assembly by the Supplier.

1.07 SUBMITTALS

A. Action Submittals: Submit the following:

1. All shop drawings shall be prepared in Visio Professional or AutoCAD software. In addition to the drawings, the Contractor shall furnish a CD containing the identical information. Drawings shall be 11” x 17” size or larger.
2. Shop drawings shall include a riser diagram depicting locations of all controllers and workstations, with associated network wiring. Also included shall be individual schematics of each mechanical system showing all connected points with reference to their associated controller.
3. Submittal data shall contain manufacturer's data on all hardware and software products required by the specification. Valve, damper and air flow station schedules shall indicate size, CV where applicable, configuration, capacity and location of all equipment.
4. Software submittals shall contain narrative descriptions of sequences of operation, program listings, point lists, and a complete description of the graphics, reports, alarms and configuration to be furnished with the workstation software. If color has been used to differentiate information, the information shall be in color.
5. Information common to the entire system shall be provided. This shall include but not be limited to the following.
    a. Product manuals for the key software tasks.
    b. Operating the system.
    c. Administrating the system.
    d. Engineering the operator workstation.
    e. Application programming.
    f. Engineering the network.
    g. Setting up the web server.
    h. Report creation.
    i. Graphics creation.
    j. All other Engineering tasks.

k. System architecture diagram.

l. List of recommended maintenance tasks associated with the system servers, operator workstations, data servers, web servers and web clients.

m. Define the task.

n. Recommend a frequency for the task.

o. Reference the product manual that includes instructions on executing the task.

p. Licenses, guarantees, and warranty documents for equipment and systems.

q. Submit one copy for each building, plus two extra copies.

6. Information common to the systems in a single building shall be provided.

a. System architecture diagram for components within the building annotated with specific location information.

b. As-built drawing for each control panel.

c. As-built wiring design diagram for all components.

d. Installation design details for each I/O device.

e. As-built system flow diagram for each system.

f. Sequence of operations for each system.

g. Binding map for the building.

h. Product data sheet for each component.

i. Installation data sheet for each component.

j. Submit two copies for each building and two extra copies.

7. Software shall be provided:

a. Submit a copy of all software installed on the servers and workstations.

b. Submit all licensing information for all software installed on the servers and workstations.

c. Submit a copy of all software used to execute the project even if the software was not installed on the servers and workstations.

d. Submit all licensing information for all the software used to execute the project.

e. All software revisions shall be as installed at the time of the system acceptance.

f. Firmware Files

g. Submit a copy of all firmware files that were downloaded to or pre-installed on any devices installed as part of this project.

h. This does not apply to firmware that is permanently burned on a chip at the factory and can only be replaced by replacing the chip.

i. Submit a copy of all application files that were created during the execution of the project.

j. Submit a copy of all graphic page files created during the execution of the project.

8. Panel and Cabinet Information:

a. Layout Drawings, including the following:

1) Front views to scale.

2) Dimensional information.

3) Functional name of components mounted in and on panel.

4) Product information on all panel components.

5) Nameplate location and legend including text, letter size and colors to be used.

6) Location of anchoring connections and holes.

7) Location of external wiring connections.

8) Mounting, support and installation details.

b. Wiring diagrams, including the following:

1) Name of panel, console or cabinet.

2) Wiring sizes and types.

3) Terminal strip numbers.

4) Color coding.

5) Functional name and manufacturer's designation for components to which wiring is connected.

c. Electrical control schematics in accordance with NFPA 79 Standards.

9. Conduit Layout Information:

a. Conduit layout drawings showing proposed routing of exposed and concealed conduits.

b. Drawings shall show locations of pull boxes, junction boxes, and all building penetrations.

c. All conduits shall have proper identification as to size and quantity of wire.

B. Informational Submittals: Submit the following:

1. Source Quality Control Submittals:
   a. Submit factory test reports.
2. Site Quality Control Submittals:
   a. Submit field Test Reports.
3. Qualifications Statements:
   a. Supplier's Qualifications Data:
      1) Submit qualifications data as required in Paragraph 1.5.B, above.

C. Closeout Submittals: Submit the following

1. Operations and Maintenance Manuals:
   a. Operation and Maintenance Manuals shall conform to the requirements of this Contract.
   b. The Operation and Maintenance Manuals shall include the following:
      1) Name, address, e-mail address and telephone number of the Supplier's local service representative.
      2) Complete list of supplied system hardware parts with full model numbers referred to system part designations, including spares.
      3) Copy of all approved submittal information and system Shop Drawings.
      4) The following is a list of post construction submittals that shall be updated to reflect any changes during construction and re-submitted as "As-Built".
         a) System architecture drawing.
         b) Layout drawing for each control panel
         c) Wiring diagram for individual components
         d) System flow diagram for each controlled system
         e) Instrumentation list for each controlled system
         f) Sequence of operation
         g) Binding map
         h) A matrix sheet detailing all system addresses and communication settings for the following:

All IP network addresses & settings

All HMCS device addresses & communication settings

5) Safety considerations relating to operation and maintenance procedures.

2. Record Documentation:

a. Contractor and Supplier shall revise all system drawings, submittals and software documentation to reflect as built conditions in accordance with the requirements of the Contract Documents.

b. Half size black line prints of wiring diagrams and any program or configuration printouts applicable to each control panel shall be placed inside a clear plastic envelope and stored in a suitable print pocket or container inside each control panel.

D. Maintenance Material Submittals: Furnish the following:

1. Spare Parts:

a. Spare parts and testing equipment list with recommended quantities to be provided.

E. Software Ownership:

1. The City shall retain licenses to software.

2. The City shall sign a copy of the manufacturer's standard software and firmware licensing agreement as a condition of this Contractor. Such license shall grant use of all programs and application software to the City as defined by the manufacturer's license agreement but shall protect the manufacturer's rights to disclosure of Trade Secrets contained within such software.

3. The licensing agreement shall not preclude the use of the software by individuals under contract to the City for commissioning, servicing or altering the system in the future. Use of the software by individuals under contract to the City shall be restricted to use on the City's computers and only for the purpose of commissioning, servicing, or altering the installed system.

4. All project developed software, files and documentation shall become the property of the City. These include but are not limited to:

a. Server and workstation software

b. Application programming tools

c. Configuration tools

d. Network diagnostic tools

e. Addressing tools

f. Application files

g. Configuration files

h. Graphic files

i. Report files

j. Graphic symbol libraries

k. All documentation

1.08 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling and Unloading:

1. HMCS equipment shall be packaged at the factory prior to shipment to protect each item from damage during shipment and storage. Containers shall be protected against impact, abrasion, corrosion, discoloration and/or other damages.

2. Clearly label contents of each container and provide information on the required storage conditions necessary for the equipment. Keep DEP and ENGINEER informed of equipment delivery.

3. Deliver materials to the Site to ensure uninterrupted progress of the Work.

B. Storage and Protection:

1. Store materials and equipment to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms or other supports. Protect metal enclosures and parts and other material from corrosion.

2. Supplier shall notify Contractor, in writing, of the storage requirements and recommendations for the equipment prior to shipment.

3. Protection of materials and equipment shall comply with the requirements of Division 01, General Requirements, and in accordance with manufacturer's instructions and relevant organization standards.

4. Store all material in covered storage and protect from condensation and in accordance with the manufacturer’s recommendations.

5. Store computers and electronic devices in a secure environmentally control warehouse.

C. Acceptance At Site:

1. All boxes and crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to the components or equipment. Replace lost equipment or components and repair damage to like new condition in accordance with the manufacturer’s requirements.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The following manufactures are acceptable provided they meet the requirements of the Contract Documents.

1. Schneider Electric.
2. Siemens.
3. Johnson Controls.
4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. General Requirements:

1. Design requirements:

a. All HMCS components necessary to meet functional and operational requirements shall be provided to meet the intent of the Work.

b. Components located in Industrial Process and Industrial Non-Process Areas shall be heavy-duty type, designed for continuous service in industrial environments.

c. Components located in electrically classified areas (NFPA Class 1, Division 1 and 2) areas shall be rated for use in those areas. CONTRACTOR shall refer to the Electrical Drawings and the General Code Criteria Chart on the Drawings for areas that are electrically classified.

d. Components located in corrosive or wet electrically unclassified areas shall be provided with NEMA 4X enclosures.

e. Components located in or exposed to corrosive atmospheres shall be constructed of materials suitable for use in areas containing wet hydrogen sulfide, sodium hypochlorite, and sodium hydroxide laden atmosphere. Suitable exposed materials shall be Type 316 stainless steel, epoxy or Teflon coated aluminum or other similar materials approved by the ENGINEER. Steel, galvanized steel, and Type 304 stainless steel are not suitable materials for exposure in corrosive areas.

f. Refer to the General Code Criteria chart on the General drawings for a list of corrosive areas. Any area not listed in the chart shall be treated as a corrosive area.

g. Design all logic and control loops to fail safe.

h. Surge protection shall be provided for all instruments and all other control system components, which could be damaged by electrical surges.

i. Relays with interconnections to field devices shall be wired through terminal blocks. Terminals as part of the relay base are not an acceptable alternate.

j. Panel mounted instruments, switches, and other devices shall be selected and grouped for functionality and arranged to present a pleasing coordinated appearance. Similar type front of panel mounted devices shall be of the same manufacturer and model line.

k. Components furnished, including field and panel instruments, shall be tagged with the item number and nomenclature indicated as shown and/or approved Shop Drawings.

l. Ranges and scales shall be coordinated to suit equipment furnished.

m. Components shall be protected from exposure to freezing temperatures.

n. Fiber optics where applicable, are intended to be used only for Ethernet network level communication and shall not be used for controller to controller or I/O point communications or signals.

2. Power Supplies:

a. Electrically powered monitoring equipment, control equipment and devices shall be suitable for operation on 115 volt ±10 percent, 60 Hz ±2 Hz power. If a different voltage or closer regulation is required, a suitable regulator or transformer shall be provided.

b. Appropriate power supplies shall be provided. Power supplies shall be mounted in panels.

c. Design power supplies for a minimum of 130 percent of the maximum simultaneous current draw.

d. A power on off switch or an air circuit breaker shall be furnished for each item requiring electrical power.

3. Environmental Conditions:

a. The HMCS shall be designed and constructed for continuous operation in the temperature and humidity atmosphere in which the equipment is installed. Provide automatically controlled closed loop ventilation fans or closed loop air conditioners with filtered air louvers if required to maintain temperature inside each enclosure below the maximum operating temperature rating of the components inside the enclosure.

4. Spare Control Points:

   a. Provide sufficient control point capacity within each HMCS panel in order to provide an additional 20 percent of each type of input and output. These inputs/outputs shall be designated as spares.

B. System Architecture:

1. General

   a. The HMCS shall consist of Network Server/Controllers (NSCs), a family of Standalone Digital Control Units (SDCUs). The HMCS shall provide control, alarm detection, scheduling, and reporting and information management for the entire facility.

   b. The system shall be designed with all equipment controllers communicating on 10/100bT Ethernet network, using the BACnet/IP.

2. Modbus RTU/ASCII (and J-bus), Modbus TCP, BACnet MS/TP, BACnet IP, LonTalk FTT-10A, and WebServices shall be native to the NSCs. There shall not be a need to provide multiple NSCs to support all the network protocols, nor should there be a need to supply additional software to allow all three protocols to be natively supported. BACnet MS/TP, Modbus RTU/ASCII and LonTalk FTT-10A sub-networks shall support 3rd party integration as required for communication.

3. A sub-network of SDCUs using the BACnet IP only, shall connect the local, stand-alone controllers with Ethernet-level Network Server Controllers/IP Routers.

4. The TCP/IP layer connects all of the buildings on a single Wide Area Network (WAN) isolated behind the campus firewall. Fixed IP addresses for connections to the campus WAN shall be used for each device that connects to the WAN.

5. The fieldbus layer shall support all of the following types of SDCUs:

   a. BACnet IP SDCU requirements: The system shall consist of one or more BACnet/IP field buses managed by the Network Server Controller. The field bus layer shall consist of up to 50 IP SDCUs in daisy chain topology, or 39 if using RSTP, per layer, with a max of 5 sub networks in daisy chain for a total of 250 SDCUs or 6 sub networks in RSTP for a total of 234 SDCUs.

   b. Modbus SDCU requirements: The system shall consist of one or more Modbus RTU (RS-485 or RS-232) field buses managed by the Network Server Controller. The field bus layer shall consist of up to 31 SDCUs for operation of HVAC equipment. If utilizing Modbus TCP, the field bus layer shall consist of up to 100 SDCUs for operation of HVAC equipment. The NSCs shall be capable of at least two Modbus RTU field buses for a total capability of 62 SDCUs per NSC.

6. The HMCS shall be capable of being segmented, through software, into multiple local area networks (LANs) distributed over a wide area network (WAN). Workstations can manage a single LAN (or building), and/or the entire system with all portions of that LAN maintaining its own, current database.

7. All NSCs, Workstation(s) and Servers shall be capable of residing directly on the DEP's Ethernet TCP/IP LAN/WAN with no required gateways. Furthermore, the NSC's, Workstation(s), and Server(s) shall be capable of using standard, commercially available, off-the-shelf Ethernet infrastructure components such as routers, switches and hubs. With this design the City may utilize the investment of an existing or new enterprise network or structured cabling system. This also allows the option of the maintenance of the LAN/WAN to be performed by the DEP's Information Systems Department as all devices utilize standard TCP/IP components.

8. System Expansion

   a. The HMCS shall be scalable and expandable at all levels of the system using the same software interface, and the same TCP/IP level and fieldbus level controllers. Systems that require replacement of either the workstation software or field controllers in order to expand the system shall not be acceptable.

   b. Web-based operation shall be supported directly by the NSCs and require no additional software.

   c. The system shall be capable of using graphical and/or line application programming language for the Network Server Controllers.

9. All Network Server Controllers shall natively support the BACnet IP, BACnet MS/TP, LonWorks FTT-10, Modbus TCP, Modbus RTU (RS-485 and RS-232), and Modbus ASCII protocols. BACnet MS/TP, Modbus RTU/ASCII and LonTalk FTT-10A sub-networks shall support 3rd party integration as required for communication.

C. Operator Workstation Requirements:

1. General:

   a. The operator workstation portion of the HMCS shall consist of one or more full-powered configuration and programming workstations.

   b. The programming and configuration workstation software shall allow any user with adequate permission to create and/or modify any or all parts of the NSC and/or Enterprise Server database.

   c. All configuration workstations shall be personal computers operating under the Microsoft Windows operating system. The application software shall be capable of communication to all Network Server Controllers and shall feature high-resolution color

graphics, alarming, trend charting. It shall be user configurable for all data collection and data presentation functions.

2. Web-Based Operator PC Requirements:

   a. Any user on the network can access the system, using the following software:

      1) Mozilla Firefox 64 and later

      2) Google Chrome 71 and later

      3) Microsoft Edge (Edge HTML) 17 and later

      4) Safari 11.4 and later

3. General Administration and Programming Workstation Software:

   a. System architecture shall be truly client server in that the Workstation shall operate as the client while the NSCs shall operate as the servers. The client is responsible for the data presentation and validation of inputs while the server is responsible for data gathering and delivery.

   b. The workstation functions shall include monitoring and programming of all DDC controllers. Monitoring consists of alarming, reporting, graphic displays, long term data storage, automatic data collection, and operator-initiated control actions such as schedule and setpoint adjustments.

   c. Programming of SDCUs shall be capable of being done either off-line or on-line from any operator workstation. All information will be available in graphic or text displays stored at the NSC. Graphic displays will feature animation effects to enhance the presentation of the data, to alert operators of problems, and to facilitate location of information throughout the DDC system. All operator functions shall be selectable through a mouse.

4. User Interface:

   a. The software shall be designed so that each user of the software can have a unique username and password. This username/password combination shall be linked to a set of capabilities within the software, set by and editable only by, a system administrator. The sets of capabilities shall range from View only, Acknowledge alarms, Enable/disable and change values, Program, and Administer. The system shall allow the above capabilities to be applied independently to each and every class of object in the system. The system shall allow a minimum of 256 users to be configured per workstation. Additionally, the software shall enable the ability to add/remove users based upon Microsoft Windows Security Domains that enable the customer IT department to assist in user access.

b. Additional requirements include mandatory change of passwords:

1) At first logon with default credentials.

2) Of admin passwords before deploying.

c. No general accounts, one account per user.

d. Capability to integrate and use Windows Active Directory for user log on credentials.

e. Include a timed auto log off feature.

f. Use TLS 1.2 encryption or higher.

g. All devices and software that support HTTP shall allow disabling the HTTP access and require access via HTTPS.

5. Color Graphic Displays

a. The system shall allow for the creation of user defined, color graphic displays for the viewing of mechanical and electrical systems or building schematics. These graphics shall contain point information from the database including any attributes associated with the point (Engineering units, etc.). In addition, operators shall be able to command equipment or change setpoints from a graphic through the use of the mouse.

b. Requirements of the color graphic subsystem include:

1) The system shall support HTML5 enabled graphics.

2) Using the mouse, operators shall be able to adjust setpoints, start or stop equipment, modify PID loop parameters, or change schedules.

3) Status changes or alarm conditions shall be able to be highlighted by objects changing screen location, size, color, text, blinking or changing from one display to another.

4) Ability to link graphic displays through user defined objects, alarm testing, or the result of a mathematical expression. Operators shall be able to change from one graphic to another by selecting an object with a mouse - no menus will be required.

c. Additionally, the Graphics Editor portion of the Engineering Software shall provide the following capabilities:

1) Create and save pages.

2) Group and ungroup symbols.

3) Modify an existing symbol.

4) Modify an existing graphic page.

5) Rotate and mirror a symbol.

6) Place a symbol on a page.

7) Place analog dynamic data in decimal format on a page.

8) Place binary dynamic data using state descriptors on a page.

9) Create motion through the use of animated .gif files or JavaScript.

10) Place test mode indication on a page.

11) Place manual mode indication on a page.

12) Place links using a fixed symbol or flyover on a page.

13) Links to other graphics.

14) Links to web sites.

15) Links to notes.

16) Links to time schedules.

17) Links to any .exe file on the operator workstation.

18) Links to .doc files.

19) Assign a background color.

20) Assign a foreground color.

21) Place alarm indicators on a page.

22) Change symbol/text/value color as a function of an analog variable.

23) Change a symbol/text/value color as a function of a binary state.

24) Change symbol/text/value as a function of a binary state.

All symbols used by Schneider Electric Building Business in the creation of graphic pages shall be saved to a library file for use by the City.

d. Additionally, the Graphics Editor portion of the Engineering Software shall provide the following capabilities:

1) Create and save pages.

2) Group and ungroup symbols.

3) Modify an existing symbol.

4) Modify an existing graphic page.

5) Rotate and mirror a symbol.

6) Place a symbol on a page.

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8) Place binary dynamic data using state descriptors on a page.

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17) Links to any .exe file on the operator workstation.

18) Links to .doc files.

19) Assign a background color.

20) Assign a foreground color.

21) Place alarm indicators on a page.

22) Change symbol/text/value color as a function of an analog variable.

23) Change a symbol/text/value color as a function of a binary state.

24) Change symbol/text/value as a function of a binary state.

25) All symbols used by Schneider Electric Building Business in the creation of graphic pages shall be saved to a library file for use by the City.

6. The software shall allow for the automatic collection of data and reporting from any controller or NSC. The frequency of data collection shall be user configurable.

7. Alarm Management:

   a. The software shall be capable of accepting alarms directly from NSCs or controllers, or generating alarms based on evaluation of data in controllers and comparing to limits or conditional equations configured through the software. Any alarm (regardless of its origination) will be integrated into the overall alarm management system and will appear in all standard alarm reports, be available for operator acknowledgment, and have the option for displaying graphics, or reports.

   b. Alarm management features shall include:

      1) An operator shall have the capability to save and apply alarm favorites.

2) Alarm notifications shall support multiple distribution methods within one notification.

8. Report Generation:

a. The Reports Server shall be able to process large amounts of data and produce meaningful reports to facilitate analysis and optimization of each installation.

b. Reports shall be possible to generate and view from the operator Workstation, and/or Webstation, and/or directly from a reports-only web interface.

c. Reports can be of any length and contain any point attributes from any controller on the network.

d. Image management functionality shall be possible to enable the system administrators to easily upload new logos or images to the system.

9. Scheduling:

a. From the workstation or web station, it shall be possible to configure and download schedules for any of the controllers on the network.

b. Time of day schedules shall be in a calendar style and viewable in both a graphical and tabular view.

c. Schedules shall be programmable for a minimum of one year in advance.

10. Programmer's Environment:

a. Programming in the NSC shall be either in graphical block format or line-programming format or both.

b. Programming of the NSC shall be available offline from system prior to deployment into the field. All Engineering tasks shall be possible, except, of course, the viewing of live tasks or values.

c. The programmer's environment will include access to a superset of the same programming language supported in the SDCUs.

1) It shall be possible to save custom programs as libraries for reuse throughout the system. A wizard tool shall be available for loading programs from a library file in the program editor.

d. It shall be possible to view graphical programming live and real-time from the Workstation.

e. The system shall be capable of creating ‘binding templates’ allowing the user to bind multiple points to multiple objects all at once.

f. Key terms should appear when typing (IntelliType).

g. Applications should be able to be assigned different priorities and cycle times for a prioritized execution of different function.

h. The system shall be able to create objects that allow common objects such as power meters, VFD drives, etc. to be integrated into the system with simple import actions without the need of complicated programming or configuration setups.

11. Saving/Reloading:

a. The workstation software shall have an application to save and restore NSC and field controller memory files.

b. For the NSC, this application shall not be limited to saving and reloading an entire controller – it shall also be able to save/reload individual objects in the controller. This allows off-line debugging of control programs, for example, and then reloading of just the modified information.

12. Audit Trail:

a. The workstation software shall automatically log and timestamp every operation that a user performs at a workstation, from logging on and off a workstation to changing a point value, modifying a program, enabling/disabling an object, viewing a graphic display, running a report, modifying a schedule, etc.

It shall be possible to save custom filtered views of event information that are viewable and configurable in Workstation.

b. It shall be capable to search and view all forced values within the system.

13. Fault Tolerant Enterprise Server Operation (Top level NSC):

a. A single component failure in the system shall not cause the entire system to fail. All system users shall be informed of any detectable component failure via an alarm event. System users shall not be logged off as a result of a system failure or switchover.

14. Web-based Operator Software:

a. General:

1) Day-to-day operation of the system shall be accessible through a standard web browser interface, allowing technicians and operators to view any part of the system from anywhere on the network.

2) The system shall be able to be accessed on site via a mobile device environment with, at a minimum, access to overwrite and view system values.

b. Graphic Displays:

1) The browser-based interface shall share the same graphical displays as the Administration and Programming Workstations, presenting dynamic data on site layouts, floor plans, and equipment graphics. The browser's graphics shall support commands to change setpoints, enable/disable equipment and start/stop equipment.

2) Through the browser-based interface, operators shall be able to navigate through the entire system and change the value or status of any point in any controller. Changes are effective immediately to the controller, with a record of the change stored in the system database.

c. Alarm Management:

1) Systems requiring additional client software to be installed on a PC for viewing the web station from that PC will not be considered.

2) Through the browser interface, a live alarm viewer identical to the alarm viewer on the Administration and Programming workstation shall be presented, if the user's password allows it. Users shall be able to receive alarms, silence alarms, and acknowledge alarms through a browser. If desired, specific operator text shall be able to be added to the alarm record before acknowledgement, attachments shall be viewable, and alarm checklists shall be available.

15. Groups and Schedules:

a. Through the browser interface, operators shall be able to view pre-defined groups of points, with their values updated automatically.

b. Through the browser interface, operators shall be able to change schedules – change start and stop times, add new times to a schedule, and modify calendars.

16. User Accounts and Audit Trail:

a. The same user accounts shall be used for the browser interface and for the operator workstations. Operators shall not be forced to memorize multiple passwords.

b. All commands and user activity through the browser interface shall be recorded in the system's activity log, which can be later searched and retrieved by user, date, or both.

17. Web Services:

a. The installed system shall be able to use web services to "consume" information within the Network Server/Controllers (NSCs) with other products and systems. Inability to perform web services within the NSCs will be unacceptable.

1) Shall be able to “consume” data into the system via SOAP and REST web services.

D. Operator Interface Terminal (OIT):

1. General:

a. OIT shall include the same functionality and capability as defined in Article 2.02.C Operator Workstation.

2. Operator Interface Terminal Panel PC (PPC) shall be integrated touch monitor. The PPC shall be provided with the following features and functions:

a. Screen:

1) 12" inch or larger Color Display.

2) Resolution: 1280 x 800 pixels.

b. Memory: 2 GB

c. Storage: 64 GB.

d. Operating Temperature: 32°F to 104°F.

e. Storage Temperature: -4°F to 140°F.

f. Operating Humidity: 0 to 95% non-condensing

g. Include all programming software needed to configure the PPC as specified herein.

h. Include all drivers as needed to communicate with the control system.

i. Product and Manufacturer:

1) Advantech, TPC-1551WP.

2) Or Equal

E. Network Server Controllers (NSC):

1. Network Server Controllers shall combine both network routing functions, control functions, and server functions into a single unit.

2. The BACnet NSC shall be classified as a “native” BACnet device, supporting the BACnet Network Server Controller (B-BC) profile. Controllers that support a lesser profile such as B-SA are not acceptable. NSCs shall be tested and certified by the BACnet Testing Laboratory (BTL) as BACnet Network Server Controllers (B-BC).

3. Hardware Specifications:

a. Memory:

1) The operating system of the controller, application programs, and all other portions of the configuration database, shall be stored in non-volatile, FLASH memory. Servers/Controllers shall contain enough memory for the current application, plus required history logging, plus a minimum of 20% additional free memory.

b. Each NRC shall provide the following on-board hardware for communication:

1) Two 10/100b Ethernet for communication to Workstations, other NRCs, IP field bus controllers, other SDCUs, and onto the internet.

2) Two RS-485 ports for communication to BACnet MSTP bus or serial Modbus (software configurable)

3) One TP/FT port for communication to LonWorks devices.

4) One device USB port

5) One host USB port

c. Modular Expandability:

1) The system shall employ a modular I/O design to allow expansion. Input and output capacity is to be provided through plug-in modules of various types. It shall be possible to combine I/O modules as desired to meet the I/O requirements for individual control applications.

2) One shall be able to "hot-change" (hot-swap) the I/O modules preserving the system on-line without any intervention on the software; addressing and configuration shall be automatic.

3) If for any reason the backplane of the modular I/O system were to fail, I/O module addresses will be protected.

4. Hardware Override Switches:

a. All digital outputs shall, optionally, include three position manual override switches to allow selection of the ON, OFF, or AUTO output state. These switches shall be built into the unit and shall provide feedback to the controller so that the position of the override switch can be obtained through software. In addition, each analog output shall be equipped with an override potentiometer to allow manual adjustment of the analog output signal over its full range, when the 3 position manual override switch is placed in the ON position.

5. Universal Input Temperatures:

a. All universal inputs directly connected to the NSC via modular expansion shall be capable of using the following thermistors for use in the system without any external converters needed.

1) 10 kohm Type I (Continuum)

2) 10 kohm Type II (I/NET)

3) 10 kohm Type III (Satchwell)

4) 10 kohm Type IV (FD)

5) Linearized 10 kohm Type V (FD w/11k shunt)

6) Linearized 10 kohm (Satchwell)

7) 1.8 kohm (Xenta)

8) 1 kohm (Balco)

9) 20 kohm (Honeywell)

10) 2.2 kohm (Johnson)

b. In addition to the above, the system shall be capable of using the below RTD sensors, however it is not required that all universal inputs be compatible with them.

1) PT100 (Siemens)

2) PT1000 (Sauter)

3) Ni1000 (Danfoss)

6. Local Status Indicator Lamps:

a. The NSC shall provide as a minimum LED indication of CPU status, Ethernet LAN status, and field bus status. For each input or output, provide LED indication of the value of the point (On/Off). The LED indication shall support software configuration to set whether the illumination of the LED corresponds to On or Off or whether the color when illuminated is Red or Green.

7. Real Time Clock (RTC):

a. Each NSC shall include a real time clock, accurate to 10 seconds per day. The RTC shall provide the following: time of day, day, month, year, and day of week. Each NSC will allow for its own UTC offset, depending upon the time zone. When the time zone is set, the NSC will also store the appropriate times for daylight savings time.

b. The RTC date and time shall also be accurate, up to 30 days, when the NSC is powerless.

c. No batteries may be used to for the backup of the RTC.

8. Power Supply:

a. The 24 VDC power supply for the NSCs shall provide 30 watts of available power for the NSC and associated IO modules. The system shall support the use of more than one power supply if heavily power consuming modules are required.

b. The power supply, NSC, and I/O modules shall connect power wise and communication wise via the separate terminal base allowing for ease of replacement and no separate or loose wiring.

9. Automatic Restart After Power Failure:

a. Upon restoration of power after an outage, the NSC shall automatically and without human intervention update all monitored functions, resume operation based on current, synchronize time and status, and implement special start-up strategies as required.

10. Data Retention:

a. During a power failure, the NSC shall retain all programs, configuration data, historical data, and all other data that is configured to be retained. There shall be no time restriction for this retention, and it shall not use batteries to achieve it.

11. Software Specifications:

a. The operating system of the controller, application programs, and all other portions of the configuration database such as graphics, trends, alarms, views, etc., shall be stored in non-volatile, FLASH memory. There will be no restrictions placed on the type of application programs in the system. Each NSC shall be capable of parallel processing, executing all control programs simultaneously. Any program may affect the operation of any other program. Each program shall have the full access of all I/O facilities of the processor. This execution of control function shall not be interrupted due to normal user communications including interrogation, program entry, printout of the program for storage, etc.

b. Each NSC shall have an available capacity of 4 GB of memory. This shall represent 2 GB for application and historical data and 2 GB dedicated for backup storage.

12. User Programming Language:

a. The application software shall be user programmable. This includes all strategies, sequences of operation, control algorithms, parameters, and setpoints. The source program shall be either a script-based structured text or graphical function block based and fully programmable by the user. The language shall be structured to allow for the configuration of control programs, schedules, alarms, reports, telecommunications, local displays, mathematical

calculations, and histories. Users shall be able to place comments anywhere in the body of either script or function block programs.

b. Network Server Controllers that use a "canned" program method will not be accepted.

13. Control Software:

a. The NSC shall have the ability to perform the following pre-tested control algorithms:

1) Proportional, Integral plus Derivative Control (PID)

2) Two Position Control

3) Digital Filter

4) Ratio Calculator

5) Equipment Cycling Protection

14. Mathematical Functions:

a. Each controller shall be capable of performing basic mathematical functions (+, -, *, /), squares, square roots, exponential, logarithms, Boolean logic statements, or combinations of both. The controllers shall be capable of performing complex logical statements including operators such as >, <, =, and, or, exclusive or, etc. These shall be able to be used in the same equations with the mathematical operators and nested up to five parentheses deep.

15. NSCs shall have the ability to perform any or all of the following energy management routines:

a. Time of Day Scheduling

b. Calendar Based Scheduling

c. Holiday Scheduling

d. Temporary Schedule Overrides

e. Optimal Start

f. Optimal Stop

g. Night Setback Control

h. Enthalpy Switchover (Economizer)

i. Peak Demand Limiting

j. Temperature Compensated Duty Cycling

k. CFM Tracking

l. Heating/Cooling Interlock

m. Hot/Cold Deck Reset

n. Hot Water Reset

o. Chilled Water Reset

p. Condenser Water Reset

q. Chiller Sequencing

16. History Logging:

a. Each NSC controller shall be capable of LOCALLY logging any input, output, calculated value or other system variable either over user defined time intervals ranging from 1 second to 1,440 minutes or based upon a user configurable change of value. A minimum of 1,000 logs, with a minimum of 100,000 records, shall be stored. Each log can record either the instantaneous, average, minimum or maximum value of the point. Logged data shall be downloadable to a higher level NSC long term archiving based upon user-defined time intervals, or manual command.

b. For extended trend logging a minimum of 1,500 trends shall be capable, with a minimum number of 600,000 records within.

c. Management of a power meter replacement to ensure meter log data is accurate shall be possible in the NSC.

d. Every hardware input and output point, hosted within the NSC and attached I/O modules, shall be trended automatically without the requirement for manual creation, and each of these logs shall log values based upon a change of value and store at least 500 trend samples before replacing the oldest sample with new data.

e. The presentation of logged data shall be built into the server capabilities of the NSC. Presentation can be in time stamped list formats or in a chart format with fully configurable pen colors, weights, scales and time spans.

f. Tooltips shall be present, magnetic, and visible based on users preference.

g. Comments shall be visible whenever viewing the trend log list.

h. System shall give indication of memory usage and be able to alert the user if too many logs are allocated.

17. Alarm Management:

a. For each system point, alarms can be created based on high/low limits or in comparison to other point values. All alarms will be tested each scan of the NSC and can result in the display of one or more alarm messages or reports.

b. There is no limit to the number of alarms that can be created for any point

c. Alarms can be configured to be generated based upon a single system condition or multiple system conditions.

d. Alarms will be generated based on an evaluation of the alarm conditions and can be presented to the user in a fully configurable order, by priority, by time, by category, etc. These configurable alarm views will be presented to a user upon logging into the system regardless of whether the log in takes place at a WorkStation or a Webstation.

e. The alarm management system shall support the ability to create and select cause and action notes to be selected and associated with an alarm event. Checklists shall also be possible in order to present to an operator a suggested mode of troubleshooting. When acknowledging an alarm, it shall be possible to assign it to a user of the system such that the user is notified of the assignment and is made responsible for the alarm resolution.

f. Alarms shall be capable of being routed to any BACnet workstation that conforms to the B-OWS device profile and uses the BACnet/IP protocol.

18. Embedded Web Server:

a. Each NSC shall have the ability to serve out web pages containing the same information that is available from the WorkStation. The development of the screens to accomplish shall not require any additional Engineering labor over that required to show them at the WorkStation itself.

b. The NSC shall be configurable to logging all Embedded Web Server access attempts

c. The NSC shall have the option to redirect HTTP based Embedded Web Server connections to secure, HTTPS connections.

d. The NSC shall authenticate and authorize all users connecting to the Embedded Web Server

e. The NSC shall provide to ability to configure an automatic logoff for Embedded Web Server users that have not had any activity for an adjustable time period.

F. BACnet/IP Fieldbus Controllers:

1. Controllers – BACnet/IP Protocol

a. All BACnet/IP Fieldbus controllers shall be BACnet Testing Laboratory listed (v12 or later) as specified BACnet Advanced Application Controller (B-AAC)

b. All BACnet/IP Fieldbus controllers shall use the following communication specifications and achieve performance as specified herein:

1) All controllers shall be able to communicate peer-to-peer without the need for a NSC

2) Any BACnet/IP Fieldbus controllers on the Ethernet Data Link/Physical layer shall be able to act as a Master to allow for the exchange and sharing of data variables and messages with any other controller connected on the same communication cabling. Slave controllers are not acceptable.

2. The BACnet/IP Fieldbus controllers shall be equipped with 2x 10/100bT Ethernet communication ports with active switch and will support BACnet/IP communication protocols with the following configurations:
   a. Supporting IPv4 addressing
   b. Supporting Static IP setting, DHCP client and Auto-IP address acquisition
3. Topologies:
   a. BACnet/IP Fieldbus controllers shall support daisy chain.
   b. BACnet/IP Fieldbus Controllers shall support RSTP.
4. Performance:
   a. Each BACnet/IP Fieldbus Controllers shall have a 32-bit microprocessor operating at 500 MHz and support a BACnet protocol stack in accordance with the ANSI/ASHRAE Standard 135 and the BACnet Device Profile supported.
   b. They shall be multi-tasking, real-time digital control processors consisting of communication controllers, controls processing, power supplies with built-in inputs and outputs.
5. Programmability:
   a. The BACnet/IP Fieldbus controllers shall support both script programming language and graphical that will be consistent with the NSC.
   b. The control program will reside within the same enclosure as the input/output circuitry, that reads inputs and controls outputs
   c. All control sequences programmed into the BACnet/IP Fieldbus Controllers shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained.
   d. BACnet/IP Fieldbus controllers shall communicate with the Network Server Controller (NSC) via a BACnet/IP connection at a baud rate of not less than 100 Mbps
   e. BACnet/IP Fieldbus controllers shall support a dedicated communications port for connecting and supplying power to a matching room temperature and/or humidity sensor and/or CO2 and/or presence detector that does not utilize any of the I/O points of the controller.

f. BACnet/IP Fieldbus controllers (Excluding VAV) shall support an add-on display to supply and provide access in real-time for monitoring inputs and overriding of outputs

g. The override functionality shall be supported by a dedicated processor to assure reliable operation (overriding of output)

h. Each BACnet/IP Fieldbus controller shall have sufficient memory, to support its own operating system and databases, including:

1) Control processes

2) Energy management applications

3) Alarm management

4) Historical/trend data

5) Maintenance support applications

6) Custom processes

7) Manal override monitoring

i. Each BACnet/IP Fieldbus controller shall support local trend data up to 2x the built-in I/O and at a minimum be capable of holding 5 days @ 15 min intervals locally.

a) Built-in I/O: each BACnet/IP Fieldbus controllers shall support:

2) At minimum 8 and up to 20 configurable IO channels to monitor and to control the following types of inputs and outputs without the addition of equipment inside or outside the DDC Controller cabinet.

a) Universal Inputs – the following thermistors for use in the system without any external converters needed.

10 kohm Type I (Continuum)

10 kohm Type II (I/NET)

10 kohm Type III (Satchwell)

10 kohm Type IV (FD)

Linearized 10 kohm Type V (FD w/11k shunt)

Linearized 10 kohm (Satchwell)

1.8 kohm (Xenta)

1 kohm (Balco)

20 kohm (Honeywell)

2.2 kohm (Johnson)

PT100 (Siemens)

PT1000 (Sauter)

Ni1000 (Danfoss)

b) Analog inputs

Current Input - 0-20 mA

Voltage Input 0-10 Vdc

c) Digital inputs from dry contact closure, pulse accumulators, voltage sensing.

d) Digital outputs

e) Analog outputs of 4-20 mA and/or 0-10 Vdc

j. Real Time Clock (RTC):

1) Each BACnet/IP Fieldbus controller shall include a real time clock, accurate to +/-1 minute per month. The RTC shall provide the following: time of day, day, month, year, and day of week.

2) The RTC date and time shall also be accurate, up to 7 days, when the BACnet/IP Fieldbus controller is powerless.

3) No batteries may be used to for the backup of the RTC.

Each BACnet/IP Fieldbus controller shall have a minimum of 10% spare capacity for each point type represented on the controller for future point connection

k. Power Requirements.: 24VDC (21 to 33 VDC) and 24 VAC +/- 20% with local transformer power

6. Commissioning Tool - The BACnet/IP Fieldbus controller shall be supported via a dedicate mobile based commissioning tool for configuration, programming, air balancing and I/O checkout

a. The Commissioning Tool shall be supported across: iOS, Android and Windows 10 platforms

b. The Commissioning Tool shall be available for download on App Store, Google Store and Windows Store

c. Commissioning Tool Interface to BACnet/IP Fieldbus controllers shall be via a Bluetooth adapter interface through the Intelligent Space Sensor or via a Wi-Fi access point on the LAN

d. Functionality

1) Device Configuration – the Commissioning Tool shall be able to set or edit all Network configurations associated with the BACnet/IP Fieldbus controller

2) Programming – The Commissioning Tool shall be able to load offline Engineered applications directly in to the controller directly

3) Air Balancing

a) The Commissioning Tool shall allow the air balancer to manually control the action of the actuator including the following function: open VAV damper, close VAV damper, open all VAV dampers, and close all VAV dampers.

b) The Commissioning Tool shall be able to generate Air Balancing report

4) IO Checkout

a) The Commissioning Tool shall be able to support overriding of the outputs and reading value of inputs live

b) The Commissioning Tool shall be able to support generation of I/O checkout report

5) There shall be no limit to the number of Commissioning Tools that can be used on a network segment, however, one connection per controller is recommended

G. Sensors (Industrial Process Areas):

1. Provide sensors and instrumentation required to provide the Sequence of Operations described under Part 3, constructed and rated for the location in which they are installed.

2. Not all sensors and control devices required to provide the sequence of operations are explicitly described in this Article but shall be provided to meet the functional requirements of the Work.

3. Sensors and control devices specified below shall be used in both electrically classified and electrically non-classified areas. NEMA 4X rated control devices maybe used in non-classified areas provided they have similar rugged industrial construction to those devices specified herein.

4. Provide rugged industrial grade sensors and transmitters from one of the following manufacturers:

a. Dwyer Instruments.

b. Foxboro.

c. Rosemont.

d. Or Equal

5. Temperature Transmitter:

a. Temperature Sensor: Pt1000, 0.00385 DIN.

b. Output Temperature Ranges: User selectable - any range between -30 to 250°F with a minimum span of 40°F.

c. Temperature Limits: Ambient: 0 to 158°F (-18 to 70°C); Process: -30 to 250°F (-34.4 to 121.1°C).

d. Accuracy: Transmitter: ±0.1% F.S.; Probe: ±0.3% F.S.

e. Thermal Drift Effects: ±0.02%/°C max.

f. Response Time: 250 ms.

g. Wetted Materials: 316 Stainless Steel.

h. Process Connection: 1/2" male NPT.

i. Conduit Connection: 1/2" female NPT.

j. Probe Length: 2" to 18" (as required to suit application).

k. Pressure Limits: 2000 psi (137.9 bar).

l. Power Requirements: 10 to 35 VDC.

m. Output Signal: 4-20 mA (two wire loop powered).

n. Display: 2 Lines X 8 Character LCD.

o. Enclosure Rating: Weatherproof and Explosion-proof for Class I, Groups B, C, D; Class II, Groups E, F, G; Class III.

p. Weight: 2 lb 8 oz (1134 g).

q. Agency Approvals: FM, CE.

r. Mounting Bracket: Type 316 SS.

s. Dwyer Series TTE, or approved equal.

6. Humidity Transmitter:

a. Relative Humidity Range: 0 to 100% RH.

b. Temperature Range: -40 to 140°F (-40 to 60°C).

c. Accuracy: ±2% 10-90% RH, ±0.9°F at 72°F (±0.3°C at 25°C).

d. Hysteresis: ±1%.

e. Repeatability: ±0.1% typical.

f. Temperature Limits: -40 to 140°F (-40 to 60°C).

g. Storage Temperature: -40 to 176°F (-40 to 80°C).

h. Compensated Temperature: -40 to 140°F (-40 to 60°C).

i. Power Requirements: For intrinsically safe models HHT-IX, 9.5 to 28 VDC. For explosion-proof models HHT-EX, 16.5 to 28 VDC.

j. Output Signal: 4-20 mA, 2 channels for humidity/temperature models (loop power on RH).

k. Response Time: 15 seconds.

l. Electrical Connections: Screw terminal block.

m. Conduit Connection: 1/2" female NPT.

n. Drift: <1% RH/year.

o. RH Sensor: Capacitance polymer.

p. Temperature Sensor: Solid state band gap.

q. Housing Material: Aluminum.

r. Display: 2 line alpha numeric, 8 characters/line. Temperature display is °F/°C selectable.

s. Display Resolution: RH: 0.1%: Temperature 0.1°F (0.1°C).

t. Weight: 2 lb 8 oz (1134 g).

u. Enclosure Rating: NEMA 4X (IP66). Models HHT-EX: FM Explosion-proof, Class I Div. 1 Group B, C, D, Class II Div. 1 Group E, F, G, Class III Div. 1; Models HHT-IX: FM Intrinsically Safe, Class I Div. 1 Group A, B, C, D, Class II Div. 1 Group E, F, G, Class III Div. 1 T4.

v. Agency Approvals: FM, CE.

w. Mounting Bracket: Type 316 SS.

x. Dwyer Series HHT or approved equal.

7. Differential Pressure Transmitter:

a. Service: Compatible gases, steam, liquids or vapors.

b. Wetted Materials: 316L SS.

c. Accuracy: ±0.075% FS (@ 20°C).

d. Rangeability: 100:1 turn down.

e. Stability: ±0.125% FSO/yr.

f. Temperature Limits: Process: -40 to 248°F (-40 to 120°C); Ambient (without LCD): -40 to 185°F (-40 to 85°C); Ambient (with LCD): -22 to 176°F (-30 to 80°C).

g. Pressure Limits: Max. pressure: Range: -14.5 to 2000 psi; Burst pressure: 10000 psi.

h. Thermal Effect: ±0.125% span/32°C.

i. Power Requirements: 11.9 to 45 VDC.

j. Output Signal: 4 to 20 mA/HART® Communication.

k. Response Time: 0.12 seconds.

l. Damping Time: 0.25-60 seconds.

m. Loop Resistance: Operation: 0 to 1500 Ohm; HART® Communication: 250 to 500 Ohm.

n. Electrical Connection: Two 1/2" female NPT conduit, screw terminal.

o. Process Connection: 1/4" female NPT.

p. Display: Optional 5 digit LCD.

q. Enclosure Rating: NEMA 4X (IP66) and explosion-proof for Class I, Div I, Groups A, B, C and D.

r. Weight: 8.6 lb (3.9 kg).

s. Agency Approvals: CE, FM, ATEX.

t. Mounting Bracket: Type 316 SS.

u. Dwyer Series 3100D or approved equal.

8. Thermal Dispersion Air Flow Switch:

a. Service: Gases or liquids compatible with wetted materials.

b. Accuracy: +/- 10% of setpoint.

c. Repeatability: +/- 1% of setpoint.

d. Power Supply: 85 to 240 Vac or 24 Vdc

e. Wetted Materials: 316 SS.

f. Temperature Limit (Process): -4 to 176°F.

g. Pressure Limit: 4,351 psi.

h. Enclosure Rating: NEMA 4 (IP65).

i. Enclosure Materials: Glass filled nylon. Aluminum die cast optional.

j. Switch Type: 250 Vac SPDT 5 amp.

k. Switch Point Adjustment: Potentiometer.

l. Bargraph:

1) Green LED: Flow rate above setpoint.

2) Yellow LED: Flow is at setpoint.

3) Red LED: Flow is below setpoint.

m. Switch Point Status:

1) Red LED: No flow.

2) Green LED: Flow.

n. Switching Range:

1) Liquid: 0.09 to 9.84 ft/sec.

2) Air: 0.16 to 49 ft/sec.

o. Conduit Connection: 3/4" NPT.

p. Weight: 1.5 Lbs.

q. Omega FSW-6000/7000 Series or approved equal.

H. Sensors (Industrial Non-Process Areas):

1. Provide sensors and instrumentation required to provide the Sequence of Operations described under Part 3, constructed and rated for the location in which they are installed.

2. Not all sensors and control devices required to provide the sequence of operations are explicitly described in this Article but shall be provided to meet the functional requirements of the Work.

3. Sensors shall be similar to those described under Article 2.02.G Sensors (Industrial Process Areas) with the following exceptions:

a. The device shall be rated NEMA 4X if located in an electrically unclassified area.

b. The device can be less accurate and less rugged but must be suitable for an industrial setting.

I. Electrical Power Measurement:

1. Electrical Power Monitors, Single Point (Easy Install):

a. Acceptable Manufacturers:

1) Veris Industries E2xx Series.

2) ACI KW350 Series.

3) Or Equal.

b. General: Consist of three split-core CTs, factory calibrated as a system or ordered separately, hinged at both axes with the electronics embedded inside the master CT. The transducer shall measure true (rms.RMS) power demand real power (kW) consumption (kWh). Conform to ANSI C12.1 or C12.20 metering accuracy standards.

c. Voltage Input: 100-400VAC line to neutral or 100-690VAC line to line, 60 Hz.

d. Maximum Current Input: Up to 2400A.

e. Performance:

1) Accuracy: +/- 1% system from 10% to 100% of the rated current of the CT's or IEC 62053-22 0.5s Class / ANSI C12.00 0.5 Class.

2) Operating Temperature Range: 32-140°F, 122°F for 2400A.

f. Outputs shall be selected to suit application.

g. Ratings:

1) Agency: UL508 or equivalent.

2) Transducer internally isolated to 2000 VAC.

3) Case isolation shall be 600 VAC.

h. Accessories: Communications gateway.

J. Damper Actuators:

1. Type: Electric, Direct Coupled (over the shaft):

a. Proportional and two position as indicated in the Sequence of Operations.

b. Spring return where specified.

c. V-bolt and V-shaped cradle shaft attachment.

d. Electronic overload or digital rotation sensing circuitry to prevent damage to actuator throughout the rotation of actuator.

e. Spring return actuators shall be capable of either clockwise or counterclockwise spring return operation by changing mounting orientation.

f. Proportional actuators shall accept a 0 to 10 VDC or 0 to 20 mADC control input and provide a 2 to 10 VDC or 4 to 20 mADC operating range. Proportional control through a pulse width modulating signal is acceptable. Proportional control through floating (Tri-state) control is not acceptable. Actuators shall be capable of providing 2 to 10 VDC position feedback signals.

g. 24 VAC/VDC actuators shall operate on Class 2 wiring and shall not require more than 10 VA for AC or more than 8 watts for DC applications. Actuators operating on 120 VAC power shall not require more than 10 VA.

h. Modulating actuators shall have an external, built in switch to allow the reversing of direction of rotation.

i. External manual gear release with manual crank to allow manual positioning of shaft.

j. Factory-mounted electrical cable and conduit fitting for connection to junction box.

k. Conforming to UL 873.

l. Actuator shall be provided with sufficient torque to open and close the device. Provide a minimum torque of 133-in-lb.

m. 120VAC or 24VDC.

n. NEMA Type 2 housing.

o. Accessories:

1) Linkage kit.

2) Mounting bracket.

3) Auxiliary switches.

4) NEMA Type 4X enclosure in all corrosive atmospheres or as indicated on the drawings.

p. Manufacturers: Provide products of one of the following:

1) Belimo.

2) Schneider Electric

3) Or equal.

K. Smoke Detectors:

1. Smoke detectors are provided under the Electrical Work.

2. All duct penetrations required for smoke detector mounting shall be provided under the HVAC Work and coordinated with the Electrical Work.

L. Panels and Enclosures

1. General Construction Requirements

a. CONTRACTOR shall provide all electrical components and devices, support hardware, fasteners, and interconnecting wiring required to make the control panels and/or enclosures complete and operational.

b. CONTRACTOR shall locate and install all devices and components so that connections can be easily made and that there is ample room for servicing each item.

c. Components for installation on panel exterior shall be submitted for approval.

d. CONTRACTOR shall adequately support and restrain all devices and components mounted on or within the panel to prevent any movement.

e. All wiring to panel connections from field instruments, devices, and other panels shall be terminated at master numbered terminal strips, unless otherwise specified.

f. CONTRACTOR shall provide copper grounding studs for all panel equipment.

g. CONTRACTOR shall provide the following convenience accessories inside of each control panel:

1) One 120 VAC, 20A duplex, grounding type receptacle.

h. No device shall be mounted less than 36-inches above the operating floor level, unless otherwise specified.

2. Identification:

a. CONTRACTOR shall provide laminated plastic nameplates for identification of panels and components mounted thereon as follows:

1) Nameplates shall be of 3/32-inch thick laminated phenolic type with white matte finish surface and black letter engraving.

2) Panel identification nameplates to have 1/2 inch high letter engravings.

3) Panel mounted component (e.g., control devices, indicating lights, selector switches, etc.) identification nameplates to have 1/4-inch high letter engravings.

4) Nameplates shall be attached to the panel face with two stainless steel self-tapping screws.

5) Nameplate engravings shall include the instrument or equipment tag number and descriptive title.

6) Tag all internally mounted instruments in accordance with the following requirements:

a) The identifying tag number shall be permanently etched or embossed onto a stainless steel tag which shall be fastened to the device housing with stainless steel rivets or self tapping screws of appropriate size.

b) Where neither of the above fastenings can be accomplished, tags shall be permanently attached to the device by a circlet of 1/16-inch diameter stainless steel wire rope.

c) Identification tag shall be installed so that the numbers are easily visible to service personnel.

d) Front of panel mounted instruments shall have the tag attached to rear of device.

7) Tagging of the following items shall be accomplished with the use of adhesive plastic Brady USA, Inc. labels, or equal.

a) Tag all electrical devices (e.g., relays, timers, power supplies) mounted within control panels and enclosures.

b) Numerically tag all terminal blocks.

c) Color code and numerically tag wiring at each end.

3. Panels and Enclosures:

   a. General:

      1) Panels and enclosures shall meet the NEMA requirements for the type specified.

      2) Sizes shown are estimates. CONTRACTOR shall furnish panels and enclosures amply sized to house all equipment, instruments, front panel mounted devices, power supplies, power distribution panels, wiring, and other components installed within.

   b. General Construction Features:

      1) Fabricate enclosures using minimum 14-gauge steel for wall-mounted enclosures. Steel shall be free of pitting and surface blemishes.

      2) CONTRACTOR shall continuously weld all exterior seams and grind smooth. Also, surface grind complete removal of corrosion, burrs, sharp edges and mill scale.

      3) Reinforce sheet steel with steel angles where necessary to adequately support equipment and ensure rigidity and to preclude resonant vibrations.

      4) Panel shall be flat within 1/16-inch over a 24-inch by 24-inch area, or flat within 1/8-inch for a larger surface. Flatness shall be checked by using a 72-inch long straight edge. Out-of-flatness shall be gradual, in one direction only, and shall not consist of obvious depressions or a series of wavy sections.

      5) Panel shall use pan type construction for doors.

      6) Doors shall be mounted with full length heavy-duty piano hinges with stainless steel hinge pins.

      7) CONTRACTOR shall provide oil-resistant gasket completely around each door or opening.

      8) CONTRACTOR shall provide handle operated, oil-tight, key lockable three point stainless steel latching system with rollers on latch-rods for easy door closing.

      9) CONTRACTOR shall use stainless steel fasteners throughout.

      10) CONTRACTOR shall provide steel print pocket with white enamel finish.

      11) CONTRACTOR shall provide enclosure mounting supports as required for wall mounting.

12) CONTRACTOR shall provide all holes and cutouts for installation of conduit and equipment. All conduit and piping openings and all conduits shall be sealed watertight.

13) CONTRACTOR shall completely clean all interior and exterior surfaces so they are free of corrosive residue, oil, grease and dirt. Zinc phosphatize for corrosion protection.

14) One coat of primer shall be applied to all interior and exterior surfaces immediately after corrosion protection has been applied. Exterior surfaces shall then be given sufficient coats of primer surfacer, applied with sanding and cleaning between coats, until a Grade 1 finish can be produced on the finish coat.

15) All interior surfaces shall be painted with two coats of semi-gloss white polyurethane enamel.

16) All exterior surfaces shall be painted with a minimum of three finish coats of polyurethane enamel to ultimately produce a Grade 1 finish (super smooth; completely free of imperfections). Color to be selected by ENGINEER from complete selection of standard and custom color charts furnished by the manufacturer.

17) Primer and finish paint shall be compatible and shall be a low VOC, high solids polyurethane enamel, Hi-Solids Polyurethane B65 W300 Series as manufactured by Sherwin-Williams, Inc. or equal.

18) Provide one extra quart of touch-up paint for each exterior finish color.

c. Control panels located in non-corrosive areas shall be NEMA 12 rated.

d. Control panels located in corrosive areas shall be NEMA 4X rated:

1) Panels shall be Type 316 stainless steel construction with a minimum thickness of 12-gauge for all surfaces (except those areas requiring reinforcement) having a smooth brushed finish.

2) Panel shall be furnished with stainless steel screw clamp assemblies on three sides of each door.

3) Panels shall be furnished with rolled lip around three sides of door and along top of enclosure opening.

4) Panels shall be furnished with hasp and staple for padlocking.

5) Panels shall be provided with a clear plastic, gasketed lockable hinged door to encompass all non-NEMA 4X front

of panel instruments, where NEMA 4X panel instruments are not available.

e. Control Panels located in electrically classified areas shall be NEMA 7:

1) General: Explosion-proof control enclosures shall be used to house devices in hazardous environments. Enclosures shall be suitable for use in NEC Class 1, Groups C&D or Class II, Groups E, F & G applications and comply with UL and CSA standards.

2) Required Features:

a) Light-weight and corrosion resistant copper-free aluminum.

b) Integral, cast-on mounting lugs.

c) Left side door hinges.

d) Viewing windows sized to suit internally mounted components.

e) Stainless steel cover bolts.

f) Cad-plated steel mounting pans.

f. Electrical Systems:

1) Control of Environment:

a) Panels shall be furnished with adequately sized, automatically controlled 120 VAC strip heaters to maintain temperature 10°F above ambient for condensation prevention inside panels.

b) Panels shall be provided with automatically controlled closed loop ventilation fans or closed loop air conditioners with filtered air louvers if required to maintain temperature inside each enclosure below the maximum operating temperature rating of the components inside the enclosure.

2) Internal Power Distribution:

a) Panels shall be provided with an internal 120 VAC power distribution panel with number of circuits and separate circuit breakers sized as required to distribute power to the panel components. Distribution panel shall contain two spare breakers minimum.

3) Wiring:

a) Internal wiring shall be Type MTW stranded copper wire with thermoplastic insulation rated for 600 V at 85°C for single conductors, color coded and labeled with wire identification.

b) For DC panel signal wiring, use No. 18 minimum AWG shielded.

c) For AC power wiring, use No. 12 minimum AWG. For AC signal and control wiring, use No. 16 minimum AWG. For wiring carrying more than 15 Amps, use sizes required by NEC and NFPA 79 Standards.

d) Low voltage signal wiring and shielded wiring shall be separated from power and control wiring by a minimum of 6-inches.

e) Parallel runs of wire shall be grouped or bundled using covered troughs. Maximum bundle size to be 1-inch. Troughs shall have 40 percent spare capacity.

f) Wire troughs along horizontal or vertical routes shall be installed to present a neat appearance. Angled runs are not acceptable.

g) CONTRACTOR shall adequately support and restrain all wiring runs to prevent sagging or other movement.

h) CONTRACTOR shall terminate all field wiring using forked, insulated, crimp-on connectors (soldered type not acceptable) at 600 V rated barrier type terminal strips with screwed connections and permanently affixed numeric identifiers beside each connection. Identifiers to be self-stick plastic tape strips with permanent type, machine printed numbers. For DC field signal wiring, terminal strips shall be capable of handling No. 12 wiring (minimum). Manufacturers: Provide products of one of the following:

   (1) Phoenix Contact.

   (2) Entrelec Swartwout.

   (3) Allen Bradley.

   (4) Or equal.

i) All wiring shall be installed such that if wires are removed from any one device, power will not be disrupted to any other device.

j) For internal component to component wiring only, compression type terminal blocks are acceptable.

k) CONTRACTOR shall provide spare terminals equal in number to 20 percent of the terminals used for each type of wiring (e.g., DC signal and AC power).

l) CONTRACTOR shall provide a separate terminal for grounding each shielded cable.

m) CONTRACTOR shall use separate 5/16 inch diameter copper grounding studs for instrument signal cable shields and AC power.

n) Where wires pass through panel walls, provide suitable bushings to prevent cutting or abrading of insulation.

o) When DC power and/or low voltage AC power is required, provide and install the necessary power supplies and transformers in the panel.

p) CONTRACTOR shall provide circuit breakers to protect each circuit, with no more than six instruments on a single circuit.

q) CONTRACTOR shall provide complete wiring diagram showing "as-built" circuitry. Diagram shall be enclosed in transparent plastic and placed in easily accessible pocket built into panel door.

4) Surge Protection:

a) General: Surge protection shall be provided to protect the electronic instrumentation system from surges propagating along the signal and power supply lines. The protection systems shall be such that the protection level shall not interfere with normal operation but shall be lower than the instrument surge withstand level, and be maintenance free and self-restoring. Instruments shall be housed in suitable metallic cases, properly grounded. Ground wires for all surge protectors shall be connected to a good earth ground and where practical each ground wire run individually and insulated from each other. These protectors shall be mounted within the instrument enclosure or a

separate junction box (compatible with the area designation) coupled to the enclosure.

b) Manufacturers: Provide products of one of the following:

(1) Telecommunication Industries.

(2) Joslyn.

(3) Or equal.

5) Common, push-to-test circuitry shall be provided for each panel to simultaneously test all indicating lights, horn, and strobe on the panel using a single pushbutton.

6) Common, push-to-silence circuitry shall be provided for each panel to silence the alarm horn using a single pushbutton. Alarms strobe and alarm lights shall remain energized until the alarm is cleared from the system.

M. Control Relays

1. Type: General purpose, plug-in type rated for continuous duty.
2. Coil Voltages: 24 VDC and 120 VAC as required.
3. Contacts:
   a. Silver cadmium oxide rated not less than five amperes resistive at 120 VAC or 28 VDC continuous.
   b. For switching low energy circuits (less than 200 mADC) fine silver, gold flashed contacts rated not less than three amperes resistive at 120 VAC or 28 VDC continuous shall be provided.
4. Relays to have clear plastic dust cover.
5. Relays to be UL recognized.
6. Manufacturers: Provide products of one of the following:
   a. IDEC.
   b. Potter & Brumfield.
   c. Allen-Bradley.
   d. Or equal.

N. Selector Switches, Pushbuttons, and Indicating Lights

1. General:
   a. Selector switches, pushbuttons and indicating lights shall be provided by one manufacturer and is of the same series or model type.
   b. Type: Heavy-duty, oil-tight.

c. Provide legend plate for indication of switch, pushbutton or light function (e.g. “OPEN/CLOSED”, “ON/OFF/AUTOMATIC”).

d. Mounting: Flush mounted on control panel front, unless otherwise noted.

e. NEMA rated to match panel in which mounted.

2. Selector Switches:

a. Type: Provide selector switches with number of positions as required to perform intended functions.

b. Contacts:

1) Provide number and arrangement of contacts as required to perform intended functions specified but not less than one single pole, double throw contact.

2) Type: Double break, silver contacts with movable contact blade providing scrubbing action.

3) Rating: Compatible with AC or DC current with devices simultaneously operated by the switch contacts, but not less than ten amperes resistive at 120 VAC or DC continuous.

4) Switch Operator: Standard black knob.

c. Pushbuttons:

1) Type: Provide momentary, dual type pushbuttons as required to perform intended functions specified and shown.

2) Contacts: Comply with the requirements specified for selector switches.

d. Indicating Lights:

1) Type: Compact, integral transformer type.

2) Lamps: Six-volt, long life (20,000 hours minimum).

3) Indicating lights shall be provided with labeled escutcheon plates identifying the light function. (e.g. “RUN”, “STOP”, “ALARM”, “POWER”)

e. Button and Lens Colors:

1) Green for indication of closed, off (ready), stopped.

2) Red for indication of open, on, running.

3) Amber for indication of equipment malfunction, trouble and alarms (e.g. motor overload, etc.).

4) White for indication of electrical control power on.

f. Rotary Cam Switches:

1) Provide rotary cam switches with number of positions and poles as required to perform the required signal switching function specified and shown.

2) Contacts:

a) Gold-flashed contacts housed in mechanical contact blocks with number and arrangement of contacts as required to perform intended functions.

b) Contact Rating: Compatible with AC or DC through-put current of signals and devices simultaneously operated by the switch contacts, but not less than 20 amperes at 600 VAC or 250 VDC continuous.

c) Switch Operator: Standard black knob.

O. Strobe and Horn:

1. General: Strobe light with horn shall be a pulsating, illuminating, multi-tone audible device used to indicate common alarm at HMCS panels.

2. Service:

a. Corrosive and Non-Corrosive Areas: NEMA 4X construction.

b. Electrically Classified Areas: NEMA 7 construction.

3. Required Features:

a. Power Required: 120 VAC, 60 Hz.

b. Strobe Light: Minimum 250 candlepower; 360 degree pattern.

c. Flashing Mechanism: 72 to 75 flashes per minute.

d. Base Materials of Construction: Polycarbonate

e. Color: Amber/Red/Blue.

f. Base Materials of Construction: Aluminum (NEMA 4X Rated)/Cast Aluminum (NEMA 7 Rated).

g. Mounting: Mount on wall above HMCS panel. Provide appropriate mounting bracket and hardware.

h. Decibel Output: 100 at ten feet minimum with manual volume control.

4. Products and Manufacturers: Provide one of the following:

a. NEMA 4X Rated: 400 ST/350; NEMA 7 Rated: 27X ST/31x as manufactured by Federal Signal.

b. Or equal.

P. Conduit, Wire and Accessories:

1. Provide conduit and conduit supports in accordance with Section 26 05 33 – Raceways and Boxes for Electrical Systems and Section 26 05 29 – Hangers and Supports for Electrical Systems.
2. Provide wire in accordance with Section 26 05 20, Low Voltage Wires, Cables and Accessories.
3. Provide conduit, boxes and accessories in accordance with Section 26 05 33 – Raceways and Boxes for Electrical Systems.
4. Provide identification in accordance with Section 26 05 53 – Identification for Electrical Systems.

Q. Labeling:

1. Labeling of all equipment shall be in conformance with requirements specified herein.

R. Miscellaneous:

1. Provide additional controls and appurtenances as required to meet the intent of the HMCS and functional descriptions as specified in Sequence of Operations.
2. Provide all mounting accessories, as required.
3. Tubing, static pressure tips, mounting hardware, fasteners, and appurtenances shall be constructed of Type 316 stainless steel.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not used.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Factory Test:

1. CONTRACTOR shall submit information on factory testing procedures to verify that testing shall fulfill the requirements as specified herein. Submittal shall be made at least two months in advance of any scheduled testing and shall include dates of scheduled tests.
2. CONTRACTOR shall notify ENGINEER, in writing, at least 4 weeks before expected initiation of tests. City and ENGINEER shall be present at factory during operational test of system equipment, either for individual units or as an integrated system.
3. All input/output devices and components shall be tested to verify operability and basic calibration.
4. All system hardware components equipment shall be tested to verify proper operation of the equipment as stand alone units. Test shall include, but not be limited to, the following:
   a. AC/DC power checks.
   b. Power fail/restart tests.

c. Diagnostics checks.

d. Test demonstrating that all specified equipment functional capabilities are working properly.

5. All system components shall be tested to verify that communication between units is working properly.

6. An integrated system test with all system equipment connected (excluding field sensors and instruments) shall be performed to verify that all equipment is performing properly as an integrated system.

7. CONTRACTOR shall demonstrate all system software utility and security programs incorporated into the system to illustrate the various functions and capabilities specified.

8. CONTRACTOR shall demonstrate the operation and display of all software based on a simulation of five percent of total input/output count, both analog and discrete, as selected by the manufacturer. In addition, City/ENGINEER shall randomly select, at the time of the test, additional inputs and outputs to be simulated in an amount approximately equal to five percent of total input/output count. Demonstration shall show that the monitoring and control application software associated with the input/output points performs the functions intended.

9. System performance shall be tested using a fully integrated system, including all software and hardware if applicable. To achieve this, the entire control system, including all the peripheral devices and all interconnecting cables, shall be assembled on the factory test floor and simulated inputs applied. CONTRACTOR shall carry out a full system test, during which the entire system shall operate continuously without failure in accordance with the requirements of the Contract Documents. CONTRACTOR shall provide a control I/O simulation panel prior to the test with the following applicable devices:

   a. Toggle switches to simulate field or other input contacts.

   b. Indicating lights to simulate outputs from tested panels.

   c. Control relays to simulate motor control center coil inputs.

   d. Time relays to simulate position switches.

   e. Indications (mADC) to indicate every 4 to 20 mADC output from tested panel.

   f. Potentiometers to simulate 4 to 20 mADC inputs to tested panel.

10. Every device shall have nameplate with description and device's tag number. Nameplates shall be removable and interchangeable for multiple use of panel during the test.

11. Demonstration of communication between controllers or to remote I/O's shall be included in the Test Procedure, where applicable.

12. Human Machine Interface (HMI): Prior to the staging and testing of the system, the display environments shall have been configured in accordance with the agreed upon display structure, loaded and data base parameters linked to the specified fields. During this phase of the factory acceptance test, the overall display structure shall be demonstrated, including environment configurations, passwords, security, etc. The display contents shall be reviewed to demonstrate how an operator navigates within the overall display structure. Each graphic display shall be reviewed for correctness in terms of the layout, symbols, color scheme, etc. The operation of standard alarm management displays (Current Alarm Display, Alarm History, etc.) shall also be demonstrated. A demonstration of each type of report specified shall be performed. Printing shall be an integral part of the report demonstration.

13. When the factory tests have been successfully completed, a report shall be submitted to the ENGINEER. The equipment shall not be shipped until Notice of Acceptance of the test is received by CONTRACTOR.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Building openings and penetrations shall be capped to protect the building from outside conditions.

B. INSPECTION

1. Examine conditions under which materials and equipment will be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

2. Take field measurements where required prior to installation to ensure proper fitting of Work.

3.02 INSTALLATION

A. General:

1. Install the equipment in accordance with the Contract Documents and by manufacturer's instructions and recommendations. Obtain written interpretation from ENGINEER in the event of conflict between manufacturer's instructions and recommendations and the Contract Documents.

2. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

3. Install in accordance with Laws and Regulations.

4. Do not modify structures to facilitate installation of equipment, unless approved in writing by ENGINEER.

5. Installation to conform to requirements of all local and state codes.

6. All the Work described in this Section shall be installed, wired, circuit tested and calibrated by manufacturers trained and certified electricians, technicians and mechanics qualified for the Work.

7. CONTRACTOR shall be responsible for the proper operation and installation of all control systems herein specified. CONTRACTOR shall be responsible for coordination of all interfaces with other equipment and Contractors to achieve the required control operation.

8. Anchorage shall be provided in accordance with Section 40 05 96, Vibration, Seismic, and Wind Controls.

B. Sensors:

1. Wall sensors shall be installed five feet above finished floor unless otherwise noted.

2. Where sensors are located on exterior walls provide an insulated mounting subbase.

3. Outdoor air sensors will be mounted on the north building face directly in the outside air. Install these sensors such that the effects of heat radiated from the building or sunlight is minimized. Provide sunshield enclosures.

4. Space humidity or temperature sensors will be mounted away from machinery generating heat, direct light and diffuser air streams.

5. Provide all mounting accessories including but not limited to junction boxes, wall boxes, wall plates and mounting hardware as required for a complete installation.

C. Hardware Installation Practices for Wiring

1. All controllers are to be mounted vertically and per the manufacturer's installation documentation.

2. The 120VAC power wiring to each Ethernet or Remote Site controller shall be a dedicated run, with a separate breaker. Each run will include a separate hot, neutral and ground wire. The ground wire will terminate at the breaker panel ground. This circuit will not feed any other circuit or device.

3. A true earth ground shall be available in the building. Do not use a corroded or galvanized pipe, or structural steel.

4. All wiring shall be enclosed in conduit.

5. Conduit in finished areas will be concealed in ceiling cavity spaces, plenums, furred spaces and wall construction.

6. Exposed conduit will run parallel to or at right angles to the building structure.

7. Where sensor wires leave the conduit system, they are to be protected by a plastic insert.

8. Provide fire caulking at all rated penetrations.

D. Installation Practices for Field Devices

1. Well-mounted sensors will include thermal conducting compound within the well to insure good heat transfer to the sensor.
2. Actuators will be firmly mounted to give positive movement and linkage will be adjusted to give smooth continuous movement throughout 100 percent of the stroke.
3. Relay outputs will include transient suppression across all coils. Suppression devices shall limit transients to 150% of the rated coil voltage.
4. Water line mounted sensors shall be removable without shutting down the system in which they are installed.
5. For duct static pressure sensors, the high-pressure port shall be connected to a metal static pressure probe inserted into the duct pointing upstream. The low-pressure port shall be left open to the plenum area at the point that the high-pressure port is tapped into the ductwork.
6. For building static pressure sensors, the high-pressure port shall be inserted into the space via a metal tube. Pipe the low-pressure port to the outside of the building.

E. Enclosures

1. For all I/O requiring field interface devices, these devices where practical will be mounted in a field interface panel (FIP). The CONTRACTOR shall provide an enclosure which protects the device(s) from dust, moisture, conceals integral wiring and moving parts.
2. FIPs shall contain power supplies for sensors, interface relays and contactors, and safety circuits.
3. The FIP enclosure shall meet the requirements specified under Panels and Enclosures.

F. Identification

1. Identify all control wires with labeling tape or sleeves using words, letters, or numbers that can be exactly cross-referenced with as-built drawings.
2. All field enclosures shall be identified as specified under Panels and Enclosures.
3. Junction box covers will be marked to indicate that they are a part of the HMCS system.
4. All I/O field devices (except space sensors located in finished administration areas) that are not mounted within FIP's shall be identified with name plates.
5. All I/O field devices inside FIP's shall be labeled.

G. Software Installation

1. The CONTRACTOR shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software or other third-party software necessary for successful operation of the system.

H. Sequence of Operations:

1. General:

a. Safety devices shall be hardwired, interlocked to operate in all modes of operation.

b. Safety sequences shall override other automatic control sequences.

c. The following alarm conditions shall de-energize the unit and require manual reset:

1) Low discharge air temperature alarm for 100% outside air units.

d. Fan failure shall be annunciated when the fan is indexed to energize and doesn't achieve run status. This includes but is not limited to interlocked dampers not opening, motor overload, or VFD failure.

e. Reset schedules and set points shown in Sequence of Operations are for initial programming and start-up, during system check out the reset schedules and set points shall be fine-tuned to obtain desired comfort and energy savings results. The ENGINEER reserves the right to make setpoint changes based on installed operating conditions, at no additional cost to the OWNER.

f. Automatic control functions that switch equipment on and off must be programmed with dead bands and/or time delays to prevent short cycling of equipment.

g. All sensors described within the Sequence of Operations or as shown shall give real time output display at the OIT.

h. ON/OFF/AUTO (O-O-A) selector switch shall start the unit when in the "ON" position, stop the unit when in the "OFF" position, and perform a specified operation when in the "AUTOMATIC" position.

i. Status icons on the OIT shall be provided for each piece of equipment controlled from the HMCS panel and include the following where applicable:

1) Run.

2) Stop.

3) Motor overload alarm.

4) Low temperature alarm

5) Dirty filter.

6) Fail (Equipment indexed to run that has not been energized)

7) Variable frequency drive fail.

8) Packaged equipment fail.

9) Motorized damper opened/closed.

j. A horn shall be provided on the HMCS panel. The horn shall be energized whenever the equipment is in alarm for the following:

1) Motor Overload.

2) Low Temperature.

3) Fail.

4) Variable Frequency Drive fail.

k. An "HVAC Common Alarm" contact shall be provided within each HMCS panel. The contact shall close whenever the HMCS panel is in alarm.

l. All HMCS panels shall be provided with the following pilot lights (hardware):

1) Panel Power.

2) Common Alarm.

m. All HMCS panels shall be provided with the following switches (hardware):

1) Push to test circuitry for common alarm horn and light.

2) Push to Silence Circuitry for common alarm horn. Common alarm light and associated alarm icons shall remain annunciated until alarm is cleared.

n. Dampers are two positions, unless otherwise noted by "(modulating)" next to the damper mark number.

o. Motorized dampers shall be provided with sufficient torque to open and close the devices. As a result, more than one actuator may be required even though one actuator is shown. Additional actuators shall be provided at no additional cost to the OWNER.

p. Provide a filter differential pressure sensor/gage for measuring the air flow resistance through filters at all filter sections. The device shall indicate differential pressure at the filter section and provide pressure signal inputs into the HMCS. Dirty filter set point shall be per the filter manufacturer's recommendation.

q. Where 120V dampers are provided, provide a dedicated disconnect switch.

r. Where equipment is provided with modulating return and modulating outside air dampers that operate relative to one another, independent damper actuators shall be provided. Dampers shall be electronically linked. Mechanically linked dampers are not acceptable. Provide a range controller for each damper to compensate for non-linear control characteristics.

s. Refer to Article 2.02.K Smoke Detectors for HVAC equipment that shall be de-energized through hard wire interlocks from the fire alarm system.

2. TI-010 Dechlorination Facility:

a. Chemical Room B01/103 – Supply Air System (SF-1, EDH-1)

1) SF-1 shall be controlled by an ON/OFF switch located at the HMCS panel. SF shall be set to run continuously under normal operation.

2) MD-1 shall be interlocked with SF-1. When SF is set to operate MD shall prove fully open prior to SF energizing.

3) Heating Mode:

a) EDH-1 shall operate during heating mode and be controlled by the DDC system through a discharge air temperature sensor set to maintain a discharge air temperature of 55°F.

b) A low temperature function shall de-energize the supply fan if the discharge air temperature is less than 40°F after a pre-determined amount of time.

4) The following outputs from the HMCS shall be provided for equipment control:

a) Supply fan start/stop (digital)

b) Damper open/close (digital)

c) Heating (analog)

5) The following inputs shall be monitored at the HMCS:

a) Supply fan on/off (digital)

b) Damper open/close (digital)

c) Heating (analog)

d) Discharge air temperature (analog)

e) Heater common alarm (digital)

6) The following shall be annunciated at the HMCS:

a) Supply fan on/off (digital)

b) Damper open/close (digital)

c) Heating (analog)

d) Dirty filter (digital)

e) Discharge air temperature (analog)

f) Unit fail

g) Heater common alarm (digital)

7) The following shall be annunciated through an audible alarm at the HMCS:

a) Unit fail

b) Damper fail

b. Chemical Room B01/103 – Exhaust Air System (EF-1)

1) EF-1 shall be controlled by an ON/OFF/AUTO switch located at the HMCS panel. In AUTO, EF shall be interlocked with SF-1.

2) MD-2 and 3 shall be interlocked with EF-1. When EF is set to operate MDs shall prove fully open prior to EF energizing.

3) The following outputs from the HMCS shall be provided for equipment control:

a) Fan start/stop (digital)

b) Damper open/close (digital)

4) The following inputs shall be monitored at the HMCS:

a) Fan on/off (digital)

b) Damper open/close (digital)

5) The following shall be annunciated at the HMCS:

a) Fan on/off

b) Fan fail

c) Motor overload

d) Damper open/close (digital)

6) The following shall be annunciated through an audible alarm at the HMCS:

a) Fan fail

b) Damper fail

c. Chemical Room B01/103 – Emergency Exhaust Air System (EF-2)

1) EF-2 shall be controlled by an ON/OFF/AUTO switch located at the HMCS panel. In AUTO, EF shall be set to

operate upon receiving an alarm signal of a gas/leak detection from the gas/leak detection system. EF shall turn off when gas/leak alarm is cleared.

2) MD-4, 5 and 6 shall be interlocked with EF-2. When EF-2 is set to operate MDs shall prove fully open prior to EF-2 energizing.

3) The following inputs shall be monitored at the HMCS:

a) Fan on/off (digital)

b) Damper open/close (digital)

4) The following shall be annunciated at the HMCS:

a) Fan on/off

b) Fan fail

c) Motor overload

d) Damper open/close (digital)

5) The following shall be annunciated through an audible alarm at the HMCS:

a) Fan fail.

b) Damper fail

d. Electrical Room 102 – Heat Pump System (AC-1)

1) AC-1 shall be controlled by the manufacturer's temperature controller set to maintain 78°F for cooling and 55°F for heating.

2) Provide control hardware and accessories as required for interfacing with the HMCS panel.

3) The following inputs shall be monitored at the HMCS:

a) AC-1 common alarm (digital)

e. Electrical Room 102 – Emergency Exhaust System (EF-3)

1) EF-3 shall be controlled by an ON/OFF/AUTO switch located at the HMCS panel. In AUTO, EF shall be controlled by a space thermostat set to maintain 90°F within the space.

2) MD-7 and 8 shall be interlocked with EF-3. When EF-3 is set to operate, MDs shall prove fully open prior to EF-3 energizing.

3) The following inputs shall be monitored at the HMCS:

a) Fan on/off (digital)

b) Damper open/close (digital)

4) The following shall be annunciated at the HMCS:
   a) Fan on/off
   b) Fan fail
   c) Motor overload
   d) Damper open/close (digital)
5) The following shall be annunciated through an audible alarm at the HMCS:
   a) Fan fail.
   b) Damper fail

3. TI-011 Disinfection Facility:
   a. Chemical Room B03 – Supply Air System (SF-1, EDH-1)
      1) SF-1 shall be controlled by an ON/OFF switch located at the HMCS panel. SF shall be set to run continuously under normal operation.
      2) MD-1 shall be interlocked with SF-1. When SF is set to operate MD shall prove fully open prior to SF energizing.
      3) Heating Mode:
         a) EDH-1 shall operate during heating mode and be controlled by the DDC system through a discharge air temperature sensor set to maintain a discharge air temperature of 55°F.
         b) A low temperature function shall de-energize the supply fan if the discharge air temperature is less than 40°F after a pre-determined amount of time.
      4) The following outputs from the HMCS shall be provided for equipment control:
         a) Supply fan start/stop (digital)
         b) Damper open/close (digital)
         c) Heating (analog)
      5) The following inputs shall be monitored at the HMCS:
         a) Supply fan on/off (digital)
         b) Damper open/close (digital)
         c) Heating (analog)
         d) Discharge air temperature (analog)
         e) Heater common alarm (digital)

6) The following shall be annunciated at the HMCS:
   a) Supply fan on/off (digital)
   b) Damper open/close (digital)
   c) Heating (analog)
   d) Dirty filter (digital)
   e) Discharge air temperature (analog)
   f) Unit fail
   g) Heater common alarm (digital)

7) The following shall be annunciated through an audible alarm at the HMCS:
   a) Unit fail
   b) Damper fail

b. Chemical Room B03 – Exhaust Air System (EF-1)

1) EF-1 shall be controlled by an ON/OFF/AUTO switch located at the HMCS panel. In AUTO, EF shall be interlocked with SF-1.

2) MD-2 shall be interlocked with EF-1. When EF is set to operate MD shall prove fully open prior to EF energizing.

3) MD-3 shall be interlocked with EF-1 and EF-3 such that when either EF-1 or EF-3 is set to operate MD-3 shall prove fully open prior to EF-1 or 3 energizing.

4) The following outputs from the HMCS shall be provided for equipment control:
   a) Fan start/stop (digital)
   b) Damper open/close (digital)

5) The following inputs shall be monitored at the HMCS:
   a) Fan on/off (digital)
   b) Damper open/close (digital)

6) The following shall be annunciated at the HMCS:
   a) Fan on/off
   b) Fan fail
   c) Motor overload
   d) Damper open/close (digital)

7) The following shall be annunciated through an audible alarm at the HMCS:

a) Fan fail

b) Damper fail

c. Chemical Room B03 – Emergency Exhaust Air System (EF-2)

1) EF-2 shall be controlled by an ON/OFF/AUTO switch located at the HMCS panel. In AUTO, EF shall be set to operate upon receiving an alarm signal of a gas/leak detection from the gas/leak detection system. EF shall turn off when gas/leak alarm is cleared.

2) MD-4 and 5 shall be interlocked with EF-2. When EF-2 is set to operate MDs shall prove fully open prior to EF-2 energizing.

3) The following inputs shall be monitored at the HMCS:

a) Fan on/off (digital)

b) Damper open/close (digital)

4) The following shall be annunciated at the HMCS:

a) Fan on/off

b) Fan fail

c) Motor overload

d) Damper open/close (digital)

5) The following shall be annunciated through an audible alarm at the HMCS:

a) Fan fail.

b) Damper fail

d. Chemical Room B04 – Supply Air System (SF-2, EDH-2)

1) SF-2 shall be controlled by an ON/OFF switch located at the HMCS panel. SF shall be set to run continuously under normal operation.

2) MD-6 shall be interlocked with SF-2. When SF is set to operate MD shall prove fully open prior to SF energizing.

3) Heating Mode:

a) EDH-2 shall operate during heating mode and be controlled by the DDC system through a discharge air temperature sensor set to maintain a discharge air temperature of 55°F.

b) A low temperature function shall de-energize the supply fan if the discharge air temperature is less than 40°F after a pre-determined amount of time.

4) The following outputs from the HMCS shall be provided for equipment control:
   a) Supply fan start/stop (digital)
   b) Damper open/close (digital)
   c) Heating (analog)
5) The following inputs shall be monitored at the HMCS:
   a) Supply fan on/off (digital)
   b) Damper open/close (digital)
   c) Heating (analog)
   d) Discharge air temperature (analog)
   e) Heater common alarm (digital)
6) The following shall be annunciated at the HMCS:
   a) Supply fan on/off (digital)
   b) Damper open/close (digital)
   c) Heating (analog)
   d) Dirty filter (digital)
   e) Discharge air temperature (analog)
   f) Unit fail
   g) Heater common alarm (digital)
7) The following shall be annunciated through an audible alarm at the HMCS:
   a) Unit fail
   b) Damper fail

e. Chemical Room B04 – Exhaust Air System (EF-3)

1) EF-3 shall be controlled by an ON/OFF/AUTO switch located at the HMCS panel. In AUTO, EF shall be interlocked with SF-2.
2) MD-7 shall be interlocked with EF-3. When EF is set to operate MD shall prove fully open prior to EF energizing.
3) MD-3 shall be interlocked with EF-1 and EF-3 such that when either EF-1 or EF-3 is set to operate MD-3 shall prove fully open prior to EF-1 or 3 energizing.
4) The following outputs from the HMCS shall be provided for equipment control:
   a) Fan start/stop (digital)

b) Damper open/close (digital)

5) The following inputs shall be monitored at the HMCS:

a) Fan on/off (digital)

b) Damper open/close (digital)

6) The following shall be annunciated at the HMCS:

a) Fan on/off

b) Fan fail

c) Motor overload

d) Damper open/close (digital)

7) The following shall be annunciated through an audible alarm at the HMCS:

a) Fan fail

b) Damper fail

f. Chemical Room B04 – Emergency Exhaust Air System (EF-4)

1) EF-4 shall be controlled by an ON/OFF/AUTO switch located at the HMCS panel. In AUTO, EF shall be set to operate upon receiving an alarm signal of a gas/leak detection from the gas/leak detection system. EF shall turn off when gas/leak alarm is cleared.

2) MD-8 and 9 shall be interlocked with EF-4. When EF-4 is set to operate MDs shall prove fully open prior to EF-4 energizing.

3) The following inputs shall be monitored at the HMCS:

a) Fan on/off (digital)

b) Damper open/close (digital)

4) The following shall be annunciated at the HMCS:

a) Fan on/off

b) Fan fail

c) Motor overload

d) Damper open/close (digital)

5) The following shall be annunciated through an audible alarm at the HMCS:

a) Fan fail.

b) Damper fail

g. Electrical Room 102 – Heat Pump System (AC-1)

1) AC-1 shall be controlled by the manufacturer's temperature controller set to maintain 78°F for cooling and 55°F for heating.

2) Provide control hardware and accessories as required for interfacing with the HMCS panel.

3) The following inputs shall be monitored at the HMCS:

a) AC-1 common alarm (digital)

h. Electrical Room 102 – Emergency Exhaust System (EF-5)

1) EF-5 shall be controlled by an ON/OFF/AUTO switch located at the HMCS panel. In AUTO, EF shall be controlled by a space thermostat set to maintain 90°F within the space.

2) MD-10 and 11 shall be interlocked with EF-5. When EF-5 is set to operate, MDs shall prove fully open prior to EF-5 energizing.

3) The following inputs shall be monitored at the HMCS:

a) Fan on/off (digital)

b) Damper open/close (digital)

4) The following shall be annunciated at the HMCS:

a) Fan on/off

b) Fan fail

c) Motor overload

d) Damper open/close (digital)

5) The following shall be annunciated through an audible alarm at the HMCS:

a) Fan fail.

b) Damper fail

4. Miscellaneous:

a. EUH:

1) EUH shall be controlled by a space thermostat set to maintain 55°F within the space.

3.03 FIELD TESTING / QUALITY CONTROL

A. Integrated System Field Test:

1. Following checkout of the HMCS, CONTRACTOR, under the supervision of the Supplier shall perform an Integrated System Field Test to verify that all components and programmed software are operating properly as a fully

integrated system, and that the intended monitoring and control functions are fully implemented and operational.

2. The HMCS shall be fully operational and pretested by the CONTRACTOR prior to conducting the Integrated System Field Test.

3. CONTRACTOR shall demonstrate all Sequence of Operations in the presence of the ENGINEER.

4. Deficiencies found during the Integrated System Field Test shall be immediately corrected by CONTRACTOR and the system retested to demonstrate proper operation.

3.04 STARTUP / DEMONSTRATION

A. System Checkout and Start-Up:

1. CONTRACTOR, under the supervision of the Supplier, and other component suppliers, as applicable, shall perform the following:

2. Check and approve the installation of all HMCS components and all cable and wiring connections between the system components prior to placing the system into operation.

B. Conduct a complete system checkout and adjustment, including calibration of all instruments, tuning of control loops, checking operation functions, and testing of final control actions. When there are future operational functions included in the Work, they should be included in the system checkout. All problems encountered shall be promptly corrected to prevent any delays in start-up of the system.

C. CONTRACTOR and the Supplier shall be responsible for initial operation of monitoring and control system and shall make all necessary modifications or replacements to ensure that the operation, monitoring and control of the HVAC systems function in the manner intended by these Specifications.

D. CONTRACTOR shall submit to the ENGINEER certified calibration reports for field instruments and devices and panel mounted devices upon completion of calibration.

E. CONTRACTOR shall submit to the ENGINEER an installation inspection report certifying that all system components have been installed correctly and are operating in the manner intended. The report shall be signed by authorized representatives of CONTRACTOR and the Supplier.

F. Operational Availability Demonstration Test:

1. The Operational Availability Demonstration (OAD) test shall not begin until successful completion of the Integrated System Field test. The period of operation of the OAD test shall be until a time frame has been achieved wherein the system (both hardware and software) availability meets or exceeds 99.9 percent for 7 consecutive days without system failures. If a system failure occurs during this period, the problem shall be corrected and the OAD restarted.

2. During the OAD test, the system shall be available to plant operating personnel. CONTRACTOR and the Supplier shall be readily available to correct any problems with the system during the OAD test. All HMCS system training shall be completed prior to the commencement of the OAD test.

3. The conditions listed below shall constitute system failures which are considered critical to the operability and maintainability of the system. The OAD test shall be terminated if one or more of these conditions occur. Following correction of the problem, a new 7 consecutive day OAD test shall begin.

   a. Failure to repair a hardware or software problem within 48 consecutive hours from the time of notification of a system failure.

   b. Recurrent hardware or software problems (e.g. if the same type of problem occurs three times or more).

   c. Software problem causing a processor to halt execution.

4. The following conditions shall constitute a system failure in determining the system availability based on the equation specified below:

   a. Failure of any operator interface or controller.

   b. Loss of communications between devices on the communications network.

   c. Failure of one or more input/output components.

   d. Failures of any type affecting ten or more input/output points simultaneously.

   e. Failure of any type affecting one or more control loops or sequential control strategies thereby causing a loss of the automatic control of the control variable or control sequence of operation.

   f. Failure of power supply.

   g. Failure of three or more primary sensors/transducers or field instruments simultaneously.

5. The system availability shall be calculated based on the following equation:

$$A = [TTO / (TTO + TTR)] \times 100\%$$

where:

A= System availability in percent.

TTO = Total time in operation.

TTR = Total time to repair.

6. Time to repair shall be the period between the time that CONTRACTOR is notified of a system failure and the time that the system has been restored

to proper operation in terms of hours with an allowance for the following dead times which shall not be counted as part of the time to repair period.

a. Actual travel time for service personnel to get to the Site up to six hours for each incident from the time CONTRACTOR is notified of a system failure.

b. Time for receipt of spare parts to the Site once requested up to 24 hours for each incident. No work shall be done on the system while waiting for delivery of spare parts.

c. Dead time shall not be counted as part of the system available period. The dead time shall be logged and the duration of the OAD test extended for an amount of time equal to the total dead time.

7. Completion of a 7 consecutive day period without any restarts of the OAD test and with system availability in excess of 99.9 percent shall constitute acceptance of the HMCS by the City.

8. All parts and maintenance materials required to repair the system prior to completion of the OAD test shall be supplied by CONTRACTOR, at no additional cost to the City.

9. During the OAD test, a HMCS Malfunction/Repair Reporting Form shall be completed by CONTRACTOR to document system failures. The form shall include at a minimum, date and time of CONTRACTOR notification, arrival and repair dates and times, description of the problem, CONTRACTOR repair actions and ENGINEER approval signature. The HMCS Malfunction/Repair Reporting Form shall be completed by the plant personnel and ENGINEER to document system failures, to record CONTRACTOR notification, arrival and repair times and CONTRACTOR repair actions. Format of the form shall be developed and agreed upon prior to the start of the OAD test.

G. Manufacturer’s Services:

1. CONTRACTOR shall provide the following services in addition to other services specified herein, and required by these Specifications.

a. A factory trained manufacturer's representative shall be provided for minimum of three trips for a minimum of eight hour, on-Site, each day. The first trip shall be to provide installation supervision. Subsequent trips shall be for start-up services and training services. The installation services shall be coordinated between CONTRACTOR and the manufacturer. The startup and field testing services, and the training services shall be coordinated with the City.

b. After installation supervision and field testing services by the manufacturer, CONTRACTOR shall submit to the ENGINEER, a certification letter on the manufacturer's letterhead and signed by

the manufacturer certifying that the equipment was installed in accordance with the manufacturer's recommendations and requirements and shall furnish all field test data, as required.

2. Manufacturer's Training: CONTRACTOR shall retain the services of the System Supplier to provide operation, and maintenance training for the entire HMCS. For equipment items not manufactured by the System Supplier, the System Supplier shall provide for on Site training by an authorized representative of the equipment manufacturer. Training shall be as follows:

   a. The Supplier shall perform standardized, structured training courses on-Site. Training shall be conducted by the Supplier's regular full time training instructors covering both operation and maintenance of the system equipment furnished by the Supplier.

   b. All training shall be scheduled so that it has been completed prior to Start-up and Acceptance by the City.

   c. The City shall determine the exact number of personnel that will attend training.

   d. Provide a training course covering the following topics. Total minimum training days: 1, Total minimum training hours per day: 8.

      1) The structure and the functions of the HMCS components and devices. The course shall familiarize the City's personnel with the procedures for applying the control system. As a minimum, the course shall cover the following topics:

         a) Overview of systems functional capabilities.

         b) Equipment overview including system component functions, operating principals and proper use.

         c) Start up of the system hardware components.

      2) Preventive and troubleshooting maintenance for the system components. The course shall familiarize the City's personnel with diagnostic capabilities of the system, both software and hardware, and also the routine maintenance procedures on the system and the common peripheral devices. As a minimum, the course shall cover the following topics:

         a) System overview description, including the power subsystems and logic components of the processor bus.

b) Description of the maintenance and troubleshooting aids of the system including software diagnostic programs.

c) Description of all bus operations.

d) Description of peripheral and process interface devices.

e) The use of hardware diagnostic routines, test equipment and test procedures as required enabling The City's personnel to detect and isolate system faults to the circuit board or module level and to implement repairs by replacing failed circuit boards or modules.

3) Training in the use and configuration of the specified HMI software. An instructor certified by the software manufacturer to furnish such training shall perform this training. The level of training shall be sufficient to familiarize the City's personnel with the configuration and application of all system programs. All essential system operating procedures shall be described as required to enable the City's personnel to operate the system via the various work stations and local control panels. As a minimum, the course shall cover the following topics:

a) System overview and capabilities.

b) Database configuration.

c) Graphic display configuration, including linking of data to displays.

d) Historical data configuration (collection, manipulation, and display).

e) Real-time and historical trending.

f) Report configuration, generation, printing, and customization.

g) Alarm configuration and management.

h) System security.

i) I/O driver use and configuration.

j) System backup and recovery.

k) System command language.

l) Troubleshooting.

m) System optimization.

n) System startup and shutdown procedures.

o) LAN and WAN communications, as appropriate

3. Provide instruction covering use and operation of the equipment to perform the intended functions.

   a. Provide instruction covering procedures for routine, preventive and troubleshooting maintenance including equipment calibration.

   b. Explain procedures for placing the equipment in and out of operation and explain necessary actions and precautions to be taken regarding the overall HMCS.

4. All costs, including travel, lodging, meals and incidentals, for additional visits shall be at no additional cost to the City.

H. Manufacturer's Services After Construction:

1. Service shall be provided by a factory-trained and certified manufacturer's representative During the One Year Correction Period. The manufacturer shall maintain all equipment furnished under HMCS during the first year of operation.

2. Service provided shall include the following:

   a. Quarterly Service: Service intervals shall be quarterly for a minimum of 1day of 8 hours, on-Site, each day per quarter. The service duration shall be increased, as necessary by supplier, taking into consideration the system service requirements and system size. CONTRACTOR shall indicate the service duration and service scope. Prior to the visits, the Supplier shall contact the City and inquire as to problems encountered with the system. Service visits shall be scheduled at times agreeable to the City at least one week in advance. The quarterly service shall include, but not limited to the following:

      1) Provide manufacturer's recommended maintenance.

      2) Check all controls, components and recalibrate/adjust as necessary.

      3) Perform necessary cleaning and service that is scheduled on a quarterly basis in accordance with the approved Operations and Maintenance Manual. Provide all expendable materials, as necessary.

      4) Review and provide recommendations concerning City's operations.

      5) Replace or repair defective controls and components.

      6) Inspect control panels. Test panel indication lights and replace defective lights.

      7) Provide a detailed field report to the City.

3. Technical Support: Technical support shall be provided between the hours of 8 AM and 4 PM, Monday through Friday when requested by the City. Technical support shall include, but not limited to the following:

   a. Telephone Technical Support.

   b. On-Site Visits.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting:

1. Adjust the HMCS for proper settings and to achieve proper control.

B. Cleaning:

1. Thoroughly clean all equipment and accessories prior to installation and at substantial completion.

2. Remove all dirt, rust, dust, etc. from equipment and accessories.

3. Remove and dispose of all debris and waste from the Site resulting from installation.

C. Protection of Executed Work:

1. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.

2. Provide final protection and maintain conditions in a manner acceptable to the manufacturer that shall help ensure that the equipment is without damage at time of Substantial Completion.

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to furnish, install, and test all metal ductwork, with auxiliary equipment and accessories, complete and operational.

B. The following index of this Section is presented for convenience:

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C. The following schedule(s), attached after the end of section designation, are a part of this Section:

1. Schedule 23 31 14-1, Schedule of Metal Duct Construction Standards.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 07 92 00 – Joint Sealants.

B. Section 09 91 00 – Painting.

C. Section 22 31 16 – Non-Metallic Ducts and Accessories.

D. Section 40 05 07 – Hangers and Supports for Process Piping.

E. Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC.

F. Section 40 05 05 – Exposed Piping Installation.

G. Section 40 05 15 – Copper and Brass Process Pipe.

1.04 REFERENCES

A. ASHRAE Latest Edition.

B. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials

C. ASTM E437 Standard Specification for Industrial Wire Cloth and Screens (Square Opening Series)

D. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

E. SMACNA HVAC Duct Construction Standards.

F. SMACNA Rectangular Industrial Duct Construction Standards

G. SMACNA Seismic Restraint Manual - Guidelines for Mechanical Systems.

H. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems.

I. UL 181 Standard for Factory-Made Air Ducts and Air Connectors.

J. UL 214 Standard for Tests for Flame-Propagation of Fabrics and Films.

K. UL 555 Standard for Fire Dampers

1.05 DESCRIPTION

A. This Section includes requirements for providing metal ducts and accessories in accordance with applicable standards and regulations. In addition:

1. Metal duct and accessories shall include all painting, coating, lining, gaskets, harnesses, bolts, nuts, and other appurtenances and material required to provide and assemble the lines.

2. Attachments:

a. Exhibit A – TI-10C Duct Cleaning Scope

1.06 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Comply with applicable provisions of regulatory agencies below and others authorities having jurisdiction.

1. Underwriters Laboratories, Inc.

2. National Fire Protection Association.

3. National Electrical Code.

4. Local and State Building Codes and Ordinances:

   a. New York City Building Code.

   b. New York State Uniform Fire Prevention and Building Code.

B. Qualifications of Manufacturer:

1. Engage a single firm, with undivided responsibility for performance and other requirements and components of the metallic ductwork.

2. Engage a firm which can show successful experience in the fabrication and erection for metallic ductwork systems of scope and type similar to the required Work.

C. Qualifications of Installer:

1. The Contractor shall have at least five (5) years' experience in the installation of the Work specified herein. The Contractor shall employ only tradespersons with specific skills and experience in this type of Work.

2. The Contractor shall have undivided responsibility as a single firm for performance and other requirements for the installation of the Work specified herein.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

   a. The Contractor shall submit the following Shop Drawings and material specifications for the approval of the Engineer:

      1) ¼-in. scale duct layouts, complete with.

         a) Dimensions.

         b) Details of construction.

         c) Details of installation, hanger details and spacing.

      2) Manufacturer's literature, illustrations, specifications, and Engineering data for the following items, including weights of all component parts:

         a) Registers, grilles, and diffusers.

         b) Fire Dampers (UL Listed), including:

            (1) Closing mechanisms.

            (2) Fusible link operating temperature.

            (3) Installation details.

         c) Access Doors.

d) Duct Access Doors.

e) Flexible connections.

f) Duct sealants.

3) Details of sheet metal safing construction and installation.

4) An air outlet schedule indicating room name and location of each outlet. Cross reference contract designation and manufacturer's model number or name.

5) Details of construction and material to the Engineer for all access doors to ensure the access door material matches the appearance of the finished work.

b. Test Reports: Submit the following test reports for the following:

1) UL Label, Fire Dampers.

2) Volume Damper leakage tests from an AMCA-approved testing laboratory.

2. Information Submittals:

a. Contractor shall submit an affidavit stating that all stainless steel accessories (including, but not limited to: screws, hangers, supports, etc.) for stainless steel ductwork are Type 316 stainless steel.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. All ductwork shall arrive on site fully fabricated, and not in two halves for field fabrication.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall provide spare parts and special tools necessary to service, disassemble, repair and adjust the materials and products provided under this Section, and as per the requirements of the Contract Documents. In addition, furnish the following spare parts:

1. Twelve (12) spare fusible links.

B. Tools: Provide standard and special tools and supplies necessary to service, disassemble, repair and adjust the products.

1.10 WARRANTY

A. Not used.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Ductwork Accessories:

1. Transverse Duct Connections:
   a. Ductmate 35® System as manufactured by Duct Mate Industries Inc., Charleroi, PA.
   b. Or approved equal.
2. Volume Dampers:
   a. Ruskin Co., Grandview, MO.
   b. Or approved equal.
3. Rectangular Fire Dampers:
   a. Ruskin Co., Grandview, MO.
   b. Or approved equal.

B. Registers, Grilles, and Diffusers:

1. Supply Grilles:
   a. A-J Manufacturing Co., Inc., Kansas City, MO.
   b. Or approved equal.
2. Air Turning Devices:
   a. AJ Manufacturing Co., Inc., Kansas City, MO.
   b. Or approved equal.
3. Exhaust and Return Grilles:
   a. A-J Manufacturing Co., Inc., Kansas City, MO.
   b. Or approved equal.
4. Supply Air Drum Louvers:
   a. Krueger-HVAC, Richardson, TX.
   b. Or approved equal.

C. Filter Housing:

1. Product and Manufacturer: Provide one of the following:
   a. Model Surepleat, as manufactured by Flanders Corporation.
   b. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Metal Ductwork:

1. General:
    a. All work shall be constructed and installed properly in accordance with the recommendations given in the latest edition of SMACNA HVAC Duct Construction Standards and SMACNA Rectangular Industrial Duct Construction Standards.
    b. All ductwork shall be constructed in accordance with Schedule 23 31 14-1, Schedule of Duct Construction Standards, located after the "End of Section" designation.
2. Materials:
    a. The following ductwork shall be constructed of aluminum (with 3003 ductwork H-14 alloy and temper) and all duct accessories (e.g., air outlets, hardware, and fasteners, etc.) shall also be:
        1) Ductwork located in entry hall and electrical room.
3. Stainless Steel Ductwork:
    a. Stainless steel duct sheet thicknesses shall be two (2) gauges heavier than the thickness specified for galvanized steel duct in the SMACNA Duct Construction standards.
4. Connections:
    a. The transverse duct connections shall be bolted, gasketed connections.
5. Duct Elbows:
    a. Duct elbows shall have a minimum centerline radius of 1½ times the width of the duct.

B. Ductwork Accessories:

1. Hangers and Supports:
    a. All ductwork shall be securely hung and anchored to the building structure.
        1) Unless otherwise explicitly shown on the Contract Drawings, hangers and stiffeners for ducts shall conform to all the recommendations and requirements given in the SMACNA HVAC Duct Construction Standards and the SMACNA Seismic Restraint Manual - Guidelines for Mechanical Systems.
        2) Unless otherwise specified herein, hangers and supports shall also conform to all the requirements of Section 40 05 07, Hangers and Supports for Process Piping.
        3) Provide equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

b. Ducts shall be supported on trapeze hangers with angles or rods – the use of strap hangers, sheet metal duct hangers, and/or straps is prohibited.

c. Hanger rod thickness shall be as follows:

1) For all ducts with half-perimeter up to 72-in.: Hanger rods shall be minimum ⅜-in. thick.

d. For all ducts with half perimeter larger than 72 in.: Hanger rods shall be minimum ½-in. thick. A pair of rods shall be provided at each duct support point.

e. Support shall also be furnished at each fitting.

f. The maximum hanger spacing shall be as follows:

1) For ducts with half perimeter up to 72-in.: 8 ft

2) For ducts with half perimeter larger than 72-in.: 6 ft

g. All hangers, rods, supports, bolts, nuts, washers, inserts, and appurtenances shall be Type 316 stainless steel, except for use on galvanized steel ductwork, when such may be of galvanized steel construction.

h. Seismic Requirements:

1) All piping and ductwork shall be provided with seismic restraints in accordance with the SMACNA Seismic Restraint Manual – Guidelines for Mechanical Systems and in accordance with the New York City Building Code and referenced Uniform Building Code requirements.

2) Piping and ductwork shall be supported to withstand seismic forces anticipated in seismic zones 2A.

2. Sleeves:

a. Where ductwork passes through masonry walls, partitions, or floors, provide sleeves.

b. Material:

1) For stainless steel and aluminum ductwork: Provide sleeves of minimum 16 gauge, Type 316 stainless steel.

2) For galvanized ductwork: Provide sleeves of galvanized steel.

3. Volume Dampers:

a. Volume dampers shall comply with SMACNA Standards.

b. Materials:

1) For stainless steel ductwork: Provide manual volume dampers of Type 316 stainless steel construction.

2) For aluminum: Provide manual volume dampers of and aluminum construction.

c. Blades: Opposed blades, vinyl edge seals.

d. Provide outside handle, quadrant, and approved position indicator and locking device.

e. Performance:

1) Damper Leakage: Not more than 16 cfm/ft^2 at 4-in. W.G.

4. Fire Dampers (Dynamic Type):

a. Provide fusible link fire dampers and access doors where indicated on the Contract Drawings and in accordance with the New York City Building Code. The fire dampers shall conform to all requirements of the latest edition of NFPA 90A and shall have a 1½ hr or 4 hr standard fire protection rating in accordance with the requirements of UL 555. All fusible links shall be UL rated at 165°F.

b. Materials:

1) For stainless steel and aluminum ductwork: Provide fire dampers of Type 316 stainless steel construction, with Type 316 stainless steel blades, interlocking joints, and fusible links.

2) For galvanized ductwork: Provide fire dampers of galvanized steel, with galvanized blades, interlocking joints, and fusible links.

3) Collars, angles, and hardware used for installing stainless steel fire dampers shall be Type 316 stainless steel.

c. Fire dampers shall be of the curtain type with interlocking blades set in a one-piece frame.

d. Fire dampers shall be suitable for installation in the vertical or horizontal position.

e. All fire dampers shall be Dynamic Rated for closure against airflow in the following six installation configurations:

1) Vertical Mount (Horizontal Airflow): Ducted and unducted.

2) Horizontal Mount (Airflow Up): Ducted and unducted.

3) Horizontal Mount (Airflow Down): Ducted and unducted.

f. Each fire damper shall be rated to close against maximum design airflow at its installed location with a 10% safety factor and against 8-in. w.g. maximum pressure across the closed damper.

g. Label:

1) All fire dampers shall have UL Label attached.

2) Label Materials:

a) For stainless steel and aluminum fire dampers: Provide label of Type 316 stainless steel construction.

b) For galvanized steel fire dampers: Provide label of galvanized steel construction.

3) Label shall have a fire rating of, at a minimum:

a) 1½ hrs for fire separations (walls, floors, and partitions) rated at 2 hrs.

b) 3 hrs for fire separations (walls, floors and partitions) rated at 3 hrs and above.

5. Sheet Metal Safing:

a. Provide insulated aluminum sheet metal safing to close off and seal airtight all unused areas behind louvers.

b. Insulation shall be 2-in. thick rigid fiberglass, permanently sandwiched between two 16 ga. minimum metal sheets.

c. Insulation shall be secured to the sheets with adhesive.

d. The sheets, channels, and hardware used for the sheet metal safing shall be Type 316 stainless steel.

e. All edges of the panels shall be provided with a 16 ga. minimum channel secured in place with sheetmetal screws 6-in. on centers.

f. Insulated sandwich panels shall be removable type with maximum space of 18 in., and supported on 3-in. × 3-in. × ¼-in. angle. Provide intermediate supports.

6. Duct Access Doors:

a. Provide gasketed, cam lock cover type access doors in accordance with SMACNA Standards.

b. Construction:

1) Duct access doors shall be rigid and airtight, and provided with neoprene gaskets, hinges, and sash locks.

c. Materials: Each access doors shall be of the same material as the duct or duct accessory to which said access door shall be affixed.

d. Unless otherwise shown on the Contract Drawings or specified herein, access doors shall be of the following sizes:

1) For duct sizes under 14-in.: Provide 12-in. × 6 in. access doors.

2) For ducts sized 14-in.: Provide 12-in. × 12-in. access doors.

3) For duct sizes between 14-in. and 36 in.: Provide 21-in. × 14-in. access doors.

4) For duct sizes between 36-in. and 60-in.: Provide 25-in. × 17- in. access doors.

5) For ducts larger than 60-in.: Provide quantity two (2) 25-in. × 17 in. access doors.

e. Access doors for fire dampers shall be stenciled "FIRE DAMPER ACCESS" with minimum ½-in. high letters.

7. Flexible Connections:

a. Provide flexible connections in accordance with SMACNA HVAC Duct Construction Standards.

1) Flexible connections shall be for a pressure classification of 3 in. w.g.

b. Materials:

1) For galvanized steel ductwork: Provide 16 ga., 3-in. wide galvanized steel strip flexible connections.

2) For stainless steel ductwork: Provide Type 316 stainless steel flexible connections.

3) For aluminum ductwork: Provide 0.080-in. thick, 3-in. wide aluminum strip flexible connections.

8. Vibration Isolation Flexible Connections:

a. Provide flexible connections for preventing the transmission of vibrations through the ductwork at the locations specified herein.

b. Materials: Vibration isolation flexible connections shall be neoprene-impregnated fabric collars with cemented seams fastened with straps and bolts of the same material as the connecting ductwork.

9. Turning Vanes:

a. Provide turning vanes in accordance with SMACNA HVAC Duct Construction Standards.

b. Materials: Provide turning vanes of the same materials as ductwork in which they are installed.

c. Construction: Vanes shall be of double thickness design.

10. Air Volume Extractors:

a. Provide air volume extractors in accordance with SMACNA Standards.

b. Material: Provide air volume extractors of the same material as the ductwork in which they are installed.

c. Construction: Provide gang-operated curved adjustable blades controlled through manual adjusting lever.

11. Hardware:

a. Materials:

1) All fastening devices used for aluminum and stainless steel ductwork and accessories shall be Type 316 stainless steel.

2) All fastening devices used for galvanized and aluminum ductwork and accessories shall be galvanized.

3) All gasketing material shall be butyl.

C. Registers and Grilles:

1. General:

a. Register and grille units shall distribute the volume of air (cfm) specified and/or as shown on the Contract Drawings.

b. Outlets for diffusion, spread, throw, and noise level shall be as required for specified performance.

1) Performance shall be certified according to ASHRAE 70.

2) Inlets and outlets shall be sound rated and certified according to ASHRAE 70.

c. Where the inlet and outlet openings are located less than 7 ft above the floor, they shall be protected by a grille or screen according to NFPA 90A.

d. Materials:

1) For stainless steel ductwork: Register, grille, and diffuser units shall be of Type 316 stainless steel construction.

2) For aluminum: Register, grille, and diffuser units shall be of aluminum construction.

e. Volume Dampers:

1) Diffusers and registers shall be provided with volume damper with accessible operator, unless otherwise indicated; or if standard with the manufacturer, an automatically controlled device will be acceptable.

2) Volume dampers shall be opposed blade type for all diffusers and registers, except linear slot diffusers.

a) Linear slot diffusers shall be provided with round or elliptical balancing dampers.

f. Registers and Grilles:

1) Units shall be four-way directional-control type, except that return and exhaust registers may be fixed horizontal or vertical louver type similar in appearance to the supply register face.

2) Registers shall be provided with sponge-rubber gasket between flanges and wall or ceiling.

3) Grilles shall be as specified for registers, without volume control damper.

2. Supply Registers:

a. Supply registers shall be double deflection type.

b. Supply registers shall be provided complete with:

1) Adjustable vertical face bars

2) Key-operated opposed blade damper.

3. Air Turning Devices:

a. The air turning devices shall be provided complete with:

1) Two (2) sets of individually adjustable blades to equalize flow and control volume at collar takeoffs.

2) Gasketed perimeter.

4. Exhaust and Return Registers:

a. Exhaust and return registers shall be provided complete with:

1) Fixed vertical face bars, set straight.

2) Key-operated opposed blade damper.

5. Exhaust and Return Grilles:

a. Exhaust shall be provided complete with:

1) Fixed vertical face bars, set straight.

6. Supply Air Drum Louvers:

a. Supply air drum louvers shall have a felt seal around the rotating drum to prevent leakage.

b. Supply air drum louvers shall be adjustable to direct the air stream at any angle up to 30° from the louver centerline either by rotating the drum or by adjusting the position of the pivoted vanes.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Stainless Steel Ductwork:

1. All stainless steel ductwork shall be shop fabricated in sections with welded flanged ends.

2. No field welding of stainless steel ductwork shall be permitted.

3. Welding equipment and electrodes shall be of a type specifically suited for welding light gauge Type 316 stainless steel to provide consistently good quality welds.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Field Measurements:

1. Take field measurements where required prior to installation to ensure proper fitting of Work.

3.02 INSTALLATION

A. Metal Ductwork:

1. All ductwork shall conform accurately to the dimensions shown on the Contract Drawings, with the exception that:

a. Ductwork shall be as shown on the Contract Drawings, subject to such modifications as may be necessary to suit field conditions to clear any obstruction or conflicts with other equipment.

2. All ductwork shall be straight and smooth on the inside with neatly finished joints, and shall not be decreased at any point to avoid obstructions.

3. No piping, conduit, or structural work shall be installed in or through any ductwork.

4. All ductwork shall be run as close as possible to structural members, walls, and ceilings.

5. Where existing walls, floors, or roofs must be penetrated, Contractor shall neatly cut the required openings and patch the existing work to provide a neat and finished appearance.

6. Ductwork shall be installed so as to preclude the possibility of vibration under all operating conditions.

7. Install all ductwork and accessories to provide a system free from buckling, warping, breathing, or vibration.

8. Where required, and as shown on the Contract Drawings, the Contractor shall provide blank off baffles to eliminate drafts caused by nearby obstructions.

B. Ductwork Joints:

1. After the installation is completed, the Contractor shall seal all joints.
2. Tape and seal all joints as per SMACNA Duct Construction Standards.
3. Sealants and tape shall have the following ratings:
   a. Flame Spread Rating, as per ASTM E84: ≤ 25
   b. Smoke Developed Rating: ≤ 50
4. Flanged duct joints shall be 0.25-in Butyl gasketed and bolted together with stainless steel (Type 316) bolts, nuts, washers and lock washers.
5. All metal duct joints shall be airtight with no leakage.

C. Coordinate all air outlets for compatibility with ceiling system.

D. Sleeves:

1. Caulk sleeves airtight with fire resistant sealant between sleeve and ductwork in accordance with Section 07 92 00, Joint Sealants.

E. Floor Openings:

1. Curbs to prevent water leakage shall be provided around all floor openings.
2. Where concrete curbs are not shown on the Contract Drawings:
   a. Provide curbs fabricated of 4-in. × 4-in. × ¼-in. thick angles with welded corners.
   b. The curb shall be set in a mastic compound and securely fastened to the floor to provide a watertight installation.
3. Curbs associated with stainless steel ductwork shall be fabricated of Type 316 stainless steel.

F. Turning Vanes:

1. The turning vanes shall be quiet and free from vibration when the system is in operation.
2. Turning vanes shall be double thickness type.
3. Turning vanes shall be installed in the following locations:
   a. All miter elbows to permit air to make the abrupt turns with a minimum of turbulence.
   b. All collar take-offs to supply registers.
   c. All short radius elbows in accordance with SMACNA standards and Industrial Duct Construction standards.

4. Duct clean out doors shall be provided at each elbow with turning vanes.

G. Volume Dampers:

1. Manual volume dampers larger than 11-in. in any dimension shall be opposed blade type.

2. The damper blades shall be operated by a lockable dial regulator and may be set in any position.

   a. The dial regulators shall be marked so that the "open" and "shut" positions are clearly identified.

   b. The dial regulators on insulated ductwork shall be mounted on an elevated platform which will finish flush with the surface of the insulation.

3. Manual volume dampers shall be located at accessible points and wherever possible some distance from a duct transition or fitting.

4. Care shall be taken during installation to make certain that sheet metal fasteners do not protrude into the duct and interfere with damper operation.

5. Install volume dampers where indicated on the Contract Drawings and as required to facilitate accurate volume control. Volume dampers specified with air devices shall be installed in addition to those shown on the Contract Drawings. In addition, dampers shall be installed in all of the following locations:

   a. Each branch duct take off, and

   b. In both ducts downstream of each trunk duct split.

   c. An additional volume damper shall be installed in duct stub to each air outlet for balancing of air volume.

H. Splitter type dampers are not permitted and shall not be installed.

I. Duct Access Doors:

1. Duct access doors shall be provided in all of the following locations for inspection and maintenance:

   a. Within working distance of (and on the fusible link side of) all fire dampers.

   b. Adjacent to all dampers.

   c. On the linkage side of all automatic dampers.

   d. At all other apparatus requiring service or inspection in the duct system.

2. Whenever space requirements are such that a hinged access door is impractical, a screw fastened lift-out door shall be provided instead.

J. Access Doors:

1. Provide access doors for all concealed valves, controls, test openings, duct access doors, and at all other locations requiring service, inspection, and/or adjustment of a concealed item. Behind finished work such as walls, plaster, and wood paneling, and in suspended ceilings which do not have removable panels. The access doors shall match the appearance of the finished work in which they are installed and shall be of sufficient size to permit service, inspection, and/or adjustment of the concealed item.

K. Test openings:

1. The test openings shall be sealed by a screw cap and gasket, and shall be installed so that the insulation is not disturbed when the cover is removed.

2. The test openings shall be located as follows in all heating, ventilating, air conditioning systems:

a. In the outside air duct adjacent to the unit.

b. In the exhaust air duct adjacent to the unit.

c. In the main supply duct on each unit.

L. Flexible Connections:

1. All expansion joints in ducts at building expansion joints shall be suitably supported at each end by support guides within 12-in. of joint.

2. All ducts at flexible connections with air handling equipment, and fans shall be supported at free end within 12-in. of flexible connection.

3. Provisions shall be made for supporting all ductwork, dampers, and other ductwork accessories, where necessary.

M. Vibration Isolation Flexible Connections:

1. Install vibration isolation flexible connections between the ductwork and all air moving equipment and at the building joints.

a. Provide flexible connections at both the inlet and discharge of air all handling equipment.

2. Vibration isolation flexible connections shall not be painted or used to correct misalignment.

N. Fire Dampers:

1. Fire dampers shall be installed where shown on the Contract Drawings and where required by UL and authorities having jurisdiction, and shall be approved by local building codes and in accordance with the requirements of the NFPA.

a. Two (2) fire dampers, rated at 1½ hours each, with one on each face of the fire separation or fire division, are required for fire separations having a 3-hr fire rating or above as per the New York City Building Code and Uniform Building Code requirements.

2. Fire dampers shall be secured to a Type 316 stainless steel collar with ¼-in. diameter stainless steel nuts and bolts with maximum spacing of 12-in. on center and a minimum of two (2) fastenings per side, beginning 2-in. in from the corners of the collar.

3. The collars shall be at a minimum the same gauge as the ductwork to which the collar is attached or 24 ga. thick (Type 316 stainless steel), whichever thickness is greater.

4. Retaining angles shall be installed on four sides of the collar and on both sides of the protected opening with a minimum of 1-in. overlap on the wall or floor.

   a. The Type 316 stainless steel angles shall be a minimum of 1½-in. × 1½-in. × ⅛-in. and shall be fastened to the collar only – do not fasten angles to the wall or floor.

   b. The retaining angles shall be increased in size to provide the minimum overlap of one inch on the wall or floor.

   c. The angles shall be fastened to the collar with ¼-in. diameter stainless steel nuts and bolts with a maximum spacing of 6-in. on center and a minimum of two (2) fastenings per side, beginning 2-in. from the corners of the collar.

   d. Where gas tight seals are required, the angles shall be fastened to the collar with a continuous weld and a sealant shall be installed between the angle and the wall or floor.

5. Clearance for expansion is required between the collar and the opening on the top and on each vertical side.

   a. The clearance shall be ⅛-in. per linear ft of sleeve, with clearance on the sides distributed equally and all vertical clearance on the top.

6. The ductwork shall be connected to the collar on each side of the wall or floor with a breakaway connection on all four sides of the collar.

   a. The distance from the wall or floor to the breakaway connection shall not exceed 6-in..

7. Provide firestopping at fire separations where fire dampers are installed.

8. Provide an access door in duct at each fire damper located in duct.

O. Prefabricated Roof Curbs:

1. Install before the installation of roofing.

P. Contractor shall furnish and install sleeves for registers, grilles, and dampers mounted in the masonry, concrete plenums or shafts. Sleeves shall be 16 ga. Type 316 stainless steel.

Q. Sheet Metal Safing:

1. Install safing to seal off remaining portions of shafts and louvers which are not covered by the plenums or equipment attached to the shaft or louver.

R. Drip Pans:

1. Route drain pipe of a diameter necessary and required from drip pan to nearest plant drain in accordance with the requirements of Section 40 05 05, Exposed Piping Installation.

2. Drain pipe shall be of copper or brass as per Section 40 05 15, Copper and Brass Process Pipe.

3. Install and restrain drain pipe as per Section 40 05 05, Exposed Piping Installation.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjustment:

1. Set volume control devices for approximate positions in preparation for final testing and balancing.

2. Install fusible links in fire dampers and verify that dampers are in open position.

3. Start fan system and check for excessive leaks and vibration and correct.

B. Balancing:

1. Systems shall be completely tested, adjusted and balanced by a qualified engineer. A complete balancing procedure shall be submitted for approval. All equipment and connections required to balance the systems shall be provided.

2. All duct systems shall be balanced as specified in Section 23 05 93, Testing, Adjusting, and Balancing for HVAC.

C. Cleaning:

1. Remove all loose materials and obstructions from interior of ducts.

2. Remove debris and waste materials resulting from installation.

D. Existing Ductwork:

a. General:

1) Contractor shall provide cleaning services to ductwork associated with the following equipment:

a) HV-7 located in TI-10C. Refer to Exhibit A at the end of this specification for additional information regarding extent of ductwork to be cleaned.

b. The Contractor shall engage a suitable duct cleaning Contractor to provide cleaning services for the ductwork associated with ductwork systems serving the chemical room for the existing FB CSO Facility. Services shall include the following:

1) Employ a NADCA certified duct cleaning agency that will provide cleaning services following NADCA's ACR Standard for Assessment, Cleaning & Restoration of HVAC Systems. Agency shall be regularly engaged in industrial type duct cleaning operations and be experienced with cleaning industrial process piping, exhaust systems, mist and dust collectors, grease exhaust, paint spray booths, and other industrial duct systems.

2) Provide all equipment and chemicals required for the duct cleaning program.

3) Furnish trained personnel to supervise and perform the duct cleaning program.

c. Performance:

1) Engineering Controls:

a) As required by NADCA.

b) Level 1 containment.

d. Inspection:

1) Provide certified inspection service such as Air Systems Cleaning Specialist (ASCS), Certified Ventilation Inspector (CVI) or equal to verify and document the preliminary state of HVAC system cleanliness and determine the exact scope of work, engineering controls required, safety measures required, tools and equipment required.

e. Cleanliness Verification:

1) NADCA Method 2 for Cleanliness verification and documentation shall be performed to verify compliance with the standard.

E. Painting:

1. Surface Preparation and Shop Painting:

a. Clean and prime coat ferrous metal surfaces of equipment in the factory/shop in accordance with the requirements of Section 09 91 00, Painting.

b. Coat polished and non-ferrous metal surfaces with corrosion prevention compound which shall be maintained during storage and until equipment begins operations.

2. Field Painting:

a. Painting required for exterior surfaces of ductwork and insulation, and finish painting of items only primed at the factory, are specified in Section 09 91 00, Painting.

END OF SECTION

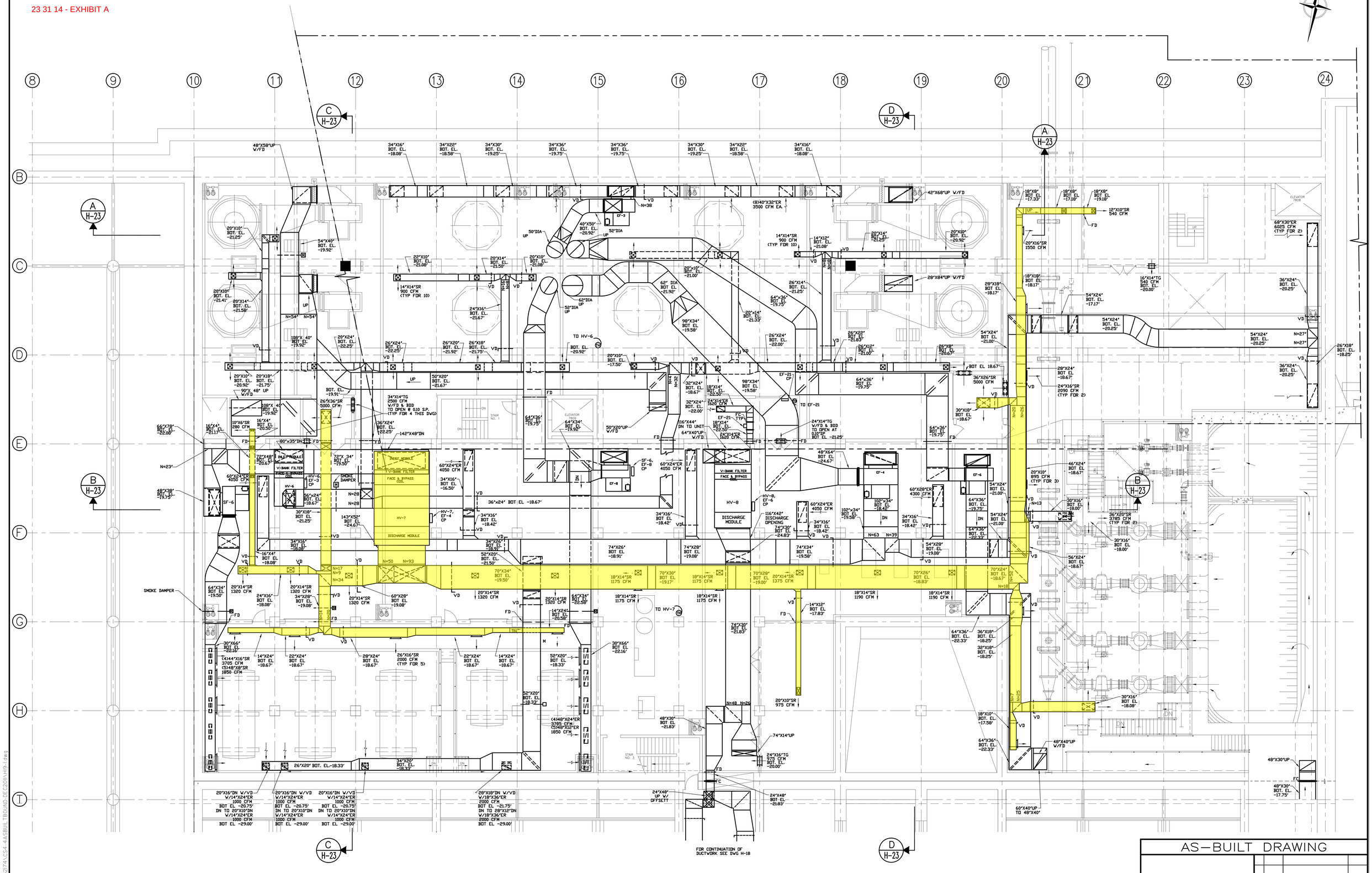
SCHEDULE 23 31 14-1
SCHEDULE OF METAL DUCT CONSTRUCTION STANDARDS [1,2]

Service:	**Pressure Classification: (in. W.G.)**	**Construction Standards:**
All ductwork on fan discharge side	+3	SMACNA HVAC Duct Construction Standards
All ductwork on suction side	-3	
Transfer air duct not connected to fan	±2	

Notes:

1. All accessories (including, but not limited to: turning vanes, air turning devices, manual volume dampers, motor operated control dampers, fire dampers, access doors, supports, angles, clamps, hangers, and hardware) shall be suitable for the pressure classification given above.

NO TEXT ON THIS PAGE



LEGEND:

DUCTWORK TO BE CLEANED

NOTES:

1. FOR SYMBOLS AND ABBREVIATIONS AND GENERAL NOTES SEE DWG. H-1.
2. FOR EQUIPMENT SCHEDULES SEE DWG.'S H-8, H-9 & H-10.
3. FOR PIPING SCHEMATICS AT EQUIPMENT AND DETAILS SEE DWG.'S H-6 & H-7.
4. FOR CONTROL DIAGRAMS SEE DWG.'S H-11 & H-12.
5. FOR CONTINUATION OF DUCTWORK GOING UP SEE DWG. H-20.

UNAUTHORIZED ALTERATIONS OR ADDITIONS TO A PLAN BEARING A LICENSED ENGINEER'S SEAL IS A VIOLATION OF SECTION 7209, SUBDIVISION 2, OF THE NEW YORK STATE EDUCATION LAW.

AS—BUILT DRAWING

NYC Environmental Protection

NO.	DATE	DESCRIPTION	APPR'D.

REVISIONS

CAPITAL PROJECT NAME & NO.:
FLUSHING BAY WATER QUALITY IMPROVEMENT PROJECT WP—169

CONTRACT NAME & NO.:
FLUSHING BAY CSO RETENTION FACILITY STORAGE FACILITY CONTRACT NO. CS4—4

DRAWING TITLE: HVAC

STORAGE FACILITY — PLAN AT EL.(—) 30.00' DUCTWORK

URS CORPORATION
650 FROM ROAD, SUITE 475
PARAMUS, NEW JERSEY 07652—3909
TEL: 201—262—7000
WWW.URSCORP.COM

PROJECT COMPLETION DATE: DECEMBER 2010

DESIGNED BY:
DRAWN BY:
CHECKED BY:
GROUP LEADER:
CHIEF:
PROJ MGR.:
GRAPHIC SCALE 0 1 2 3 4 6 8 10 12 16 20 24
SCALE: 1/8"=1'-0"
DWG. NO.: AB—H19
DATE: DEC 2010

Time: 1:35 P.M. Date: 1/9/2012 reagie dorin Drawing File: H:\32741\CS4-4ASBUILTBOUND-DEC2011\H19-1.dwg

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to furnish, install, and test all non-metallic ductwork, with auxiliary equipment and accessories, complete and operational.

B. The following index of this Section is presented for convenience.

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1.04	References	2
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1.06	Quality Assurance	3
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C. The following schedule(s), attached after the end of section designation, are a part of this Section:

1. Schedule 23 31 17-1, Schedule of Non-Metal Duct Construction Standards.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 09 91 00 – Painting

B. Section 40 05 07 – Hangers and Supports

C. Section 23 31 14 – Metal Ducts and Accessories

D. Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC

1.04 REFERENCES

A. Abbreviations and Acronyms:

1.	FRP	Fiber Reinforced Plastic
2.	HDPE	High Density Polyethylene

B. Definitions:

1. In this Section and/or as shown on the Contract Drawings, the terms "HDPE Pipe" and "HDPE Duct" (or "HDPE Ductwork") shall be used interchangeably to refer to the HDPE Ductwork as specified herein.

C. Reference Standards:

1.	AASHTO H-20	Bridge Design Criteria
2.	ASHRAE	Latest Edition.
3.	SMACNA	HVAC Duct Construction Standards.
4.	SMACNA	Thermoset FRP Duct Construction Manual.
5.	SMACNA	Seismic Restraint Manual - Guidelines for Mechanical Systems.
6.	ASTM C581-655	Tentative Method of Test for Chemical Resistance of Thermosetting Resins Used in Glass Fiber Reinforced Structures.
7.	ASTM D1248	Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
8.	ASTM D2310	Classification for Machine-Made Reinforced Thermosetting Resin Pipe.
9.	ASTM D2563	Classifying Visual Defects In Glass Reinforced Plastic Laminate Parts.
10.	ASTM D2583	Test for Indentation Hardness of Plastics by Means of a Barcol Impressor.
11.	ASTM D2996	Filament-Wound Reinforced Thermosetting Resin Pipe.
12.	ASTM D3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

13.	ASTM D4024	Reinforced Thermosetting Resin Flanges, Spec. For,
14.	ASTM D4097	Contact Molded Glass Fiber Reinforced Thermoset Chemical Resistant Tank.
15.	ASTM E2016	Standard Specification for Industrial Woven Wire Cloth
16.	PS15-69	Custom Contact Molded Reinforced-Polyester Chemical Resistant Process Equipment. Standards of Society of the Plastic Industry.

1.05 DESCRIPTION

A. This Section includes requirements for providing non-metal ducts and accessories in accordance with applicable standards and regulations. In addition:

1. Non-metal duct and accessories shall include all painting, coating, lining, gaskets, harnesses, bolts, nuts, and other appurtenances and material required to provide and assemble the lines.

B. Non-metal ductwork shall be FRP construction.

1.06 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Comply with applicable provisions of regulatory agencies below and others having jurisdiction.

1. Underwriters Laboratories, Inc.
2. National Fire Protection Association.
3. National Electrical Code.
4. Local and State Building Codes and Ordinances.
    a. Building code of the City of New York.
    b. New York State Uniform Fire Prevention and Building Code.

B. Qualifications of Manufacturer:

1. Engage a single firm, with undivided responsibility for performance and other requirements and components of the non-metallic ductwork.
2. Engage a firm which can show successful experience in the fabrication and erection for non-metallic ductwork systems of scope and type similar to the required Work.

C. Installer Qualifications:

1. The Contractor shall have at least five (5) years' experience in the installation of the Work specified herein. The Contractor shall employ only tradesperson with specific skills and experience in this type of Work.

2. The Contractor shall have undivided responsibility as a single firm for performance and other requirements for the installation of the Work specified herein.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. The Contractor shall submit the following Shop Drawings and material specifications for the approval of the Engineer:

1) ¼-in. scale duct layouts, complete with:

a) Dimensions.

b) Details of construction.

c) Details of installation, hanger details and spacing.

2) Manufacturer's literature, illustrations, specifications and Engineering data for the following items, including weights of component parts:

a) Registers, grilles, and diffusers.

b) Fire Dampers (UL Listed), including:

(1) Closing mechanisms.

(2) Fusible link operating temperature.

(3) Installation details.

c) Access Doors.

d) Duct Access Doors.

e) Flexible connections.

f) Duct sealants.

3) An air outlet schedule indicating room name and location of each outlet. Cross reference contract designation and manufacturer's model number or name.

4) Specifications for FRP resins and reinforcing material used.

5) Contractor shall submit FRP ductwork wall thickness calculations for review. Calculations shall include the following:

a) Wall thickness determination shall be based on the structural fiberglass reinforced wall only.

b) Wall thickness shall have a safety factor of 10:1 for pressure and 5:1 for vacuum service.

c) Wall thickness shall be suitable for use up to 120°F in pressure service and vacuum service.

d) Wall thickness shall be based on a 0.50-in. maximum deflection between supports and for any side of duct under worst case operating conditions.

e) Where ductwork is located outdoors, wall thickness shall be based on the following occurring simultaneously:

f) Wind Load: 25 lbs/ft^2.

g) Rectangular duct may be reinforced with fiberglass angles, channels, tees or tubes as required to meet required pressure/vacuum service.

h) All calculations shall be signed and sealed by a Professional Engineer (P.E.) licensed in the State of New York.

6) Specifications for fire-retardant epoxy FRP ductwork coating and reinforcing material used.

7) The manufacturer shall submit test data indicating that the fire retardant system does not exceed listed ratings and has been tested by Factory Mutual Research Corporation.

8) Specification of FRP ductwork laminate construction including schedule of duct sizes indicating weight per foot, wall thickness and all other data required for indicating conformance to FRP round duct schedule. Submit procedures for hand layup of duct joints.

9) FRP rectangular duct schedule with sizes, thickness, vacuum pressure, weight per foot pressure, spans, joint type, and flange data.

10) Submit standard and custom color selection chart. Color will be selected by the Engineer from the submitted charts.

a) Contractor shall submit a sample FRP panel not less than 2 ft^2 that shall be painted and allowed to dry for not less than 48 hrs and then be checked for paint adhesion by the paint system manufacturer and submitted to the Engineer for approval.

b. Test Reports: Submit test reports for the following:

1) UL Label, Fire Dampers.

2) Individual and separate volume damper leakage tests from an AMCA approved testing laboratory for all types and sizes of dampers furnished under this Section.

2. Information Submittals:

   a. A letter stating that the proposed resins proposed in the fabrication of the FRP ductwork will give satisfactory performance under the specified service conditions or a corrosion resistance chart indicating same.

   b. Contractor shall submit an affidavit certifying that all FRP equipment shall be fabricated, cured and assembled as described in this Section.

   c. Contractor shall submit an affidavit stating that all stainless steel accessories (including, but not limited to: screws, hangers, supports, etc.) for stainless steel ductwork are Type 316 stainless steel.

   d. Manufacturer's certified literature indicating compliance with proposed pressure and vacuum classification and wheel loading classification indicated below.

   e. Tabulation in check list forms to indicate compliance with ASTM D 2563 Table I, Level II visual acceptance levels.

   f. Notification of failure of Barcol hardness and/or acetone tests, and manufacturers course of action (i.e., retest or reject the materials represented by the test).

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents.

   1. A thorough inspection of each piece of ductwork will be conducted upon arrival at construction site to inspect for damage incurred in transit. Any damage shall be immediately repaired by respective equipment fabricators personnel (not a sales representative)

   2. All ductwork shall arrive on site fully fabricated, not in two halves for field fabricated.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall provide spare parts and special tools necessary to service, disassemble, repair and adjust the materials and products provided under this Section, and as per the requirements of the Contract Documents. In addition:

   1. One (1) set of special tools required to maintain and repair the system.

   2. All materials in kit form to make or repair joints. Kits shall be in a number sufficient to repair 10% of the joints.

3. Names and addresses of all manufacturers of: Fiberglass reinforcements, resins, hardeners and components used to repair and maintain FRP duct system.

B. Tools: Provide standard and special tools and supplies necessary to service, disassemble, repair and adjust the products.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. FRP Ductwork:

1. Product and Manufacturer: Provide one of the following:

a. Perry Fiberglass Products, Inc, Westlake, OH.

b. Kenway; Augusta, ME.

c. Or approved equal.

2. Resins:

a. Derakane 510A, as manufactured by Dow Chemical Company, Midland, MI.

b. Dion 9300 FR, as manufactured by Reichhold Chemicals Company, Newark, NJ.

c. Hetron FR 992, as manufactured by Ashland Chemical Company, Covington, KY.

3. Synthetic Surfacing Veil:

a. Veil-Nexus 1012 (apertured), as manufactured by Precision Fabrics Group, Inc., Greensboro, NC.

b. Or approved equal.

4. Two component catalytic epoxy intumescent fire-retardant coating:

a. No. 46081 Thermal Insulating (Intumescent) Epoxy Paint, as manufactured by Flame Control Coatings of Canada, Ajax, ON.

b. Or approved equal.

B. Filter Housing:

1. Product and Manufacturer: Provide one of the following:

a. Model Surepleat, as manufactured by Flanders Corporation.

b. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. FRP Ductwork:

1. General:

a. All work shall be constructed and installed properly in accordance with the recommendations given in the latest edition of SMACNA HVAC Duct Construction Standards.

b. Provide FRP ductwork where shown on the Contract Drawings.

c. All accessories, hardware, and fasteners associated with the FRP ductwork shall be Type 316 stainless steel unless otherwise noted.

2. Painting:

a. Surface Preparation and Shop Painting:

1) Clean and prime coat surfaces of non-metal ductwork in the factory/shop in accordance with the requirements of Section 09 91 00, Painting.

2) Coat polished and non-ferrous metal surfaces with corrosion prevention compound which shall be maintained during storage and until equipment begins operations.

b. Painting for Exterior Ductwork/Piping:

1) FRP ductwork/piping installed exterior to the building (exposed to the weather) shall be provided with a topcoat of pigmented paraffinated gel coat with ultraviolet inhibitors designed for direct exposure to the sun and weather elements.

3. Access doors for fire dampers shall be stenciled "FIRE DAMPER ACCESS" with minimum ½-in. high letters.

a. The FRP duct system shall be specifically designed, constructed, and installed for all ductwork related to chemical room exhaust and ventilation systems, and other areas where shown on the Contract Drawings.

4. Design Conditions: FRP Ductwork shall comply with the following conditions, at a minimum:

a. Air Temperature: -10°F to 120°F.

b. Corrosion resistance to hydrogen sulfide, chlorine, mercaptans and other gases commonly encountered in wastewater treatment plants.

c. Service Conditions: Manufacturer shall design ductwork so that it shall be free from buckling, pulsing, warpage, and sagging, and that it shall have the following pressure ratings:

1) Vacuum Service: ≥ -12 in. W.G.

2) Pressure Service: ≤ 12 in. W.G.

5. FRP Ductwork Construction:

a. General:

1) FRP ductwork shall be of filament wound or hand lay-up construction.

2) FRP ductwork shall be of flame retardant material inside and outside in accordance with NFPA-91.

3) Duct shall meet the applicable requirements of ASTM D 2310, Type 1, Grade 1 or 2, with Class "E" liner, 20 mills minimum thickness, and be manufactured in accordance with ASTM D 2996.

4) Flanges and bolt drilling circles and diameters shall conform to NBS PS 15-69 except that flanges shall be a minimum of 0.75-in. thick.

5) Ductwork shall be fabricated of vinylester resin as specified below.

6) All interior and exterior surfaces shall contain 0.010-inches (10 mil) C-Glass veil saturated with 90% resin by weight.

7) Square or rectangular FRP ductwork shall be constructed of the same materials and conform to the same standards as specified above for round FRP ductwork.

b. Laminates:

1) Laminates shall consist of a 10 to 20 mil chemical resistant liner with a synthetic surfacing veil embedded in a resin rich surface.

2) The corrosion barrier shall be a minimum of 100 mils and include no less than two (2) layers of 1½ oz mat with 25% glass and 75% resin content.

3) The structural layer shall be of sufficient thickness to meet the minimum thickness requirements specified.

4) The exterior surface layer shall be resin rich apertured nexus veil not less than 20 mils thick.

5) Outside finish shall have a paraffinated pigmented gel coat finish with an ultra violet inhibitor.

6) The composition specified for the inner surface and interior layer is intended to achieve optimum chemical resistance.

c. Resins:

1) Resins used in the laminate shall be premium corrosion resistant and fire retardant brominated bispenol-A vinylester resins.

d. All cut edges shall be sealed with a resin coating of the same resin as used in the fabrication.

1) The resin shall contain paraffin.

e. Two component catalytic epoxy intumescent fire-retardant coating:

1) All FRP ductwork installed within the interior of any building shall be additionally protected with a two component catalytic epoxy intumescent fire-retardant coating in accordance with the requirements of Mil-C-46081A.

2) The fire-retardant coating shall have the following ratings:

a) Flame Spread Rating, as per ASTM E84: ≤ 25

b) Smoke Developed Rating: ≤50

6. Connections:

a. All connections to expansion joints, butterfly dampers, tanks, or other equipment shall be flanged.

b. Gaskets shall be EPDM or Butyl and bolts, nuts and washers shall be Type 316 stainless steel.

c. Flanges shall be hand laid up to PS 15-69 thickness, except that minimum thickness shall be ¾-in.

d. The flange shall be hand laid-up anchored to a waxed table to achieve the flatness tolerance outlined within this Section.

e. The face shall be textured for use with full face gaskets, ⅛-in. minimum thickness.

f. Pipe flange drilling shall be NBS PS 15-69.

g. All FRP duct and pipe flange bolt holes shall be back spot faced for a washer seat.

h. All flange bolts shall be torqued to values as recommended by manufacturer.

7. FRP Ductwork Fittings:

a. General:

1) All FRP fittings (such as elbows, laterals, tees, and reducers) shall:

a) Be of the same FRP resin as the adjacent FRP duct section.

b) Be equal or superior in strength to the adjacent FRP duct section

c) Have the same internal diameter as the adjacent FRP duct section.

b. Construction:

1) Round duct joints shall be butt wrapped or bell and spigot joints as shown on the Contract Drawings or as required.

c. Standard Elbows:

1) Standard elbow centerline radius shall be equal to 1½ times the diameter.

2) Standard elbows up to 24-in. diameter shall be smooth radius molded elbows.

3) Standard elbows 30-in. diameter and greater may be mitered sections, as follows:

a) 0° to 44° elbows shall contain one (1) mitered joint and two (2) sections.

b) 45° to 80° elbows shall have a minimum of two (2) mitered joints and three (3) sections.

c) Elbows greater than 80° shall have a minimum of four (4) mitered joints and five (5) sections.

d. Square Elbows:

1) All square elbows shall have FRP or Type 316 stainless steel double thickness turning vanes with streamlined leading edges.

B. FRP Ductwork Accessories:

1. Hangers and Supports:

a. All ductwork shall be securely hung and anchored to the building structure.

1) Unless otherwise explicitly shown on the Contract Drawings, hangers and stiffeners for ducts shall conform to all the recommendations and requirements given in the SMACNA HVAC Duct Construction Standards and the SMACNA Seismic Restraint Manual. - Guidelines for Mechanical Systems.

2) Unless otherwise specified herein, hangers and supports shall also conform to all the requirements of Section 40 05 07, Hangers and Supports for Process Piping.

3) Provide equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

b. Ducts shall be supported on trapeze hangers with angles or rods – the use of strap hangers and/or straps is prohibited.

1) There shall be not less than a 1/4-inch buildup of FRP over the duct at each support.

2) Each support shall be furnished with a 1/8-inch thick teflon sheet to shield the duct from the support.

c. Hanger rod thickness shall be as follows:

1) For all ducts with half perimeter up to 72 in.: Hanger rods shall be minimum ⅜-in. thick.

2) For all ducts with half perimeter larger than 72 in.: Hanger rods shall be minimum ½-in. thick.

d. A pair of rods shall be provided at each duct support point.

e. Support shall be furnished at each fitting.

f. The maximum hanger spacing shall be as follows:

1) For ducts with half perimeter up to 72 in.: 8 ft

2) For ducts with half perimeter larger than 72 in.: 6 ft.

g. All hangers, rods, supports, bolts, nuts, washers, inserts, and appurtenances shall be Type 316 stainless steel.

h. Seismic Requirements:

1) All piping and ductwork shall be provided with seismic restraints in accordance with the SMACNA Seismic Restraint Manual - Guidelines for Mechanical Systems and in accordance with the New York City Building Code and referenced Uniform Building Code requirements.

2) Piping and ductwork shall be supported to withstand seismic forces anticipated in seismic zones 2A.

2. Flexible Connections:

a. General:

1) Provide flexible connectors in the following locations:

a) For every 100 linear ft of duct run at a minimum.

b) Wherever ductwork crosses an expansion joint.

c) As shown on the Contract Drawings.

2) Provide flexible connections complete with anchors and guides.

3) Flexible connections shall be W-design.

b. Materials: Provide either:

1) EPDM

2) Butyl

c. Construction:

1) EPDM or Butyl shall be $^{3}/_{16}$-in. thick, reinforced with a strong synthetic asbestos-free fabric suitable for corrosive service.

d. Corners on rectangular expansion joints shall be molded and free of patches or splices.

e. Service Conditions:

1) The flexible connections shall be suitable for outdoor service and temperature ranges from -65°F up to 300°F, and pressure to 5 psig.

2) Expansion service flexible connections shall be designed to allow 1-in. of contraction and 3.8-in. of expansion.

3) Working length or flange to flange length shall be a minimum of 12-in.

f. Ends Connections:

1) Flanged conforming to NBS PS 15-69.

2) Specially fabricated split ⅜-in. thick Type 316 stainless steel retaining back-up bars shall be supplied to prevent damage to the EPDM rubber flanges when Type 316 stainless steel bolts are tightened.

3. Rectangular FRP Dampers:

a. General:

1) Provide manually operated, opposed-blade, rectangular FRP dampers where shown on the Contract Drawings.

2) Dampers shall be fabricated from materials similar to those specified for the FRP ductwork. Type 316 stainless steel may be used as a substitute to FRP material for rectangular FRP dampers.

b. Service Conditions:

1) Maximum Velocity Through Damper: 4000 fpm.

2) Pressure Rating: 15 in. W.G.

3) Maximum Allowable Leakage: 7.5 cfm/ft^{2}at 15-in. W.G. pressure.

c. Materials:

1) Bearings: Teflon.

2) Blade: FRP, airfoil shape, 4-in. wide blades.

3) Frame: FRP channel.

4) Shafts: ¾–in. Type 316 stainless steel, full length of damper size as shown on the Drawings.

5) Finish: FRP.

6) Handle (manual damper): Type 316 stainless steel.

7) Pins: Type 316 stainless steel.

8) Bushings: Teflon.

9) Hardware: Type 316 stainless steel.

10) Angles: FRP.

11) Ends: Flanged with bolt holes drilled. Flange thickness shall not vary more than $^1/_{16}$-in.

12) Blade, Shaft and Jamb Seals: EPDM suitable for use in a hydrogen sulfide atmosphere.

d. Dimensions: As shown on the Contract Drawings.

4. Round FRP Dampers:

a. General:

1) Provide manually operated, butterfly, round FRP dampers where shown on the Drawings.

2) Dampers shall be fabricated from materials similar to those specified for the FRP ductwork. Type 316 stainless steel may be used as a substitute to FRP material for round FRP dampers.

b. Rating Conditions:

1) Maximum Velocity Through Damper: 6000 fpm.

2) Pressure Rating: 30 in. W.G.

3) Maximum Allowable Leakage: 5.25 cfm/ft^2 at 30-in. W.G. pressure.

c. Materials:

1) Bearings: Teflon.

2) Blade: FRP, reinforced.

3) Frame: FRP channel.

4) Shaft: Type 316 stainless steel rods, full length of damper size as shown on the Drawings.

5) Blade and Shaft Seals: EPDM suitable for use in a hydrogen sulfide atmosphere.

6) Finish: FRP.

7) Handle (manual damper): Type 316 stainless steel.

8) Pins: Type 316 stainless steel.

9) Bushings: Teflon.

10) Hardware: Type 316 stainless steel.

11) Angles: FRP.

12) Ends: Flanged with bolt holes drilled. Flange thickness shall not vary more than $^{1}/_{16}$-in..

13) Blade Stops: FRP angles with full circumference elastomer seals suitable for use in a hydrogen sulfide atmosphere.

d. Dimensions: As shown on the Contract Drawings.

5. Access Doors:

a. Type: Gasketed cam lock cover type doors in accordance with SMACNA Standards.

b. Construction:

1) Duct access doors shall be rigid and airtight, and provided with neoprene gaskets, hinges and sash locks.

c. Materials: FRP.

d. Unless otherwise specified, access doors shall be:

1) For duct sizes under 14-in.: Provide 12-in. × 6-in. access doors.

2) For ducts sized 14-in.: Provide 12-in. × 12-in.access doors..

3) For duct sizes between 14-in. and 36-in.: Provide 21-in. × 14-in.access doors.

4) For duct sizes between 36-in. and 60-in.: Provide 25-in. × 17-in.access doors.

5) For ducts larger than 60-in.: Provide quantity two (2) 25-in. × 17-in. access doors..

6. Vibration Isolation Flexible Connections:

a. Provide flexible connections for preventing the transmission of vibrations through the ductwork at the locations specified herein.

b. Materials: Vibration isolation flexible connections shall be shall be neoprene-impregnated fabric collars with cemented seams fastened with Type 316 stainless steel straps and bolts.

7. FRP Transition Pieces:

a. General:

1) Provide transition pieces as shown on the Contract Drawings.

b. Construction:

1) ¼-in. minimum thickness FRP sheets and thickness not to be less than thickness of adjacent FRP ducting.

2) All exposed hardware shall be Type 316 stainless steel with stainless steel screws, nuts, bolts and washers as required.

3) Flanges shall be designed as required to connect to adjacent fan and/or duct work.

c. Pressure Classification: Manufacturer shall design transition pieces so that they shall be free from buckling, pulsing, warpage, and sagging, and that it shall have the following pressure ratings:

1) Vacuum Service: ≥ -12 in. W.G.

2) Pressure Service: ≤ 12 in. W.G.

8. Sleeves:

a. Sleeves: Where ductwork passes through masonry walls, partitions or floors provide sleeves.

b. Materials: Provide sleeves of minimum 16 ga., Type 316 stainless steel.

9. Other Ductwork Accessories:

a. For ductwork accessories not specified in this Section (including but not limited to: fire dampers, bird screens, etc.), yet required for a fully functional FRP duct system and/or as shown on the Contract Drawings, provide ductwork accessories as per all the requirements of Section 23 31 14, Metal Ducts and Ductwork Accessories.

1) Provide these ductwork accessories in Type 316 stainless steel construction, as specified in Section 23 31 14, Metal Ducts and Ductwork Accessories.

2) Submit data on these ductwork accessories as per all the submittal requirements specified in Section 23 31 14, Metal Ducts and Ductwork Accessories. Include this submittal data with the other submittals for this Section.

10. Registers, Grilled, and Diffusers:

a. For registers, grilles, and diffusers required for a fully functional FRP duct system and/or as shown on the Contract Drawings, provide these products as per all the requirements of Section 23 31 14, Metal Ducts and Ductwork Accessories.

1) Provide these ductwork products in Type 316 stainless steel construction, as specified in Section 23 31 14, Metal Ducts and Ductwork Accessories.

2) Submit data on these ductwork products as per all the submittal requirements specified in Section 23 31 14, Metal Ducts and Ductwork Accessories. Include this submittal data with the other submittals for this Section.

11. Filter Housings:

a. Details of Construction:

1) Materials:

a) Type 316 stainless steel construction for stainless steel and FRP ductwork.

2) Double wall construction with 1-in thick insulation and predrilled standing flanges.

3) Side, top or bottom access doors as dictated by access requirements shown on Drawings.

4) Access doors shall be swing open type and include neoprene gasket to ensure door-to-filter seal.

5) Access doors shall be equipped with adjustable and replaceable positive sealing UV-resistant star-style knobs and replaceable door hinges.

6) Filter holding frame shall include centering dimples, multiple fastener lances, and polyurethane filter sealing gasket.

7) Provide pressure taps and fittings for installation of differential pressure sensor reading.

8) Provide 2-inch deep throwaway pleated panel filters.

a) Filter media shall be a cotton and synthetic fiber blend lofted to a uniform depth and formed into a uniform radial pleat.

b) A welded wire grid, spot-welded and treated for corrosion resistance shall be bonded to the downstream side of the media to maintain radial pleats and prevent media oscillation.

c) A biodegradable enclosing frame of virgin-origin Kraft board, produced under an initiative for sustainable forest management, shall provide a rigid and durable enclosure. The frame shall be bonded to the media on all sides to prevent air bypass. Integral diagonal support members on the air entering and air exiting side shall be bonded to the apex of each pleat to maintain uniform pleat spacing in varying airflows.

d) Filter efficiency shall be determined in accordance with ASHRAE Standard 52.2 with a minimum MERV 8 rating.

e) Filter shall be UL 900 Class 2 rated.

f) Initial resistance to airflow shall not exceed 0.41-inch W.G. for a 2-inch deep or 0.35-inch W.G. for a 4-inch deep filter at a velocity of 500 fpm.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Factory Painting:

1. All exterior surfaces of FRP ductwork located outdoors shall be factory painted as specified herein.

B. Factory application of two component catalytic epoxy intumescent fire-retardant coating:

1. Surface Preparation: All mold release agents and other foreign matter shall be completely removed. All glossy surfaces shall be brush-blasted or sanded and cleaned.

2. Laminate must be fully cured before application of fire-retardant coating.

3. Apply first coating minimum 8-10 mil (wet) over duct.

4. Immediately apply one layer of C-Veil onto wet coating. Brush or roll C-Veil to remove any creases and to completely wet C-Veil.

5. Apply second layer of intumescent coating at 8-10 mil (wet) minimum thickness. Dry thickness of two coats plus C-Veil shall be not less than 10 mils.

6. Apply additional coats as required to ensure that C-Veil is completely immersed in the epoxy coating and completely wetted and that the total dry thickness will be greater than 10 mils. There shall be no exposed or dry C-Veil.

C. Ductwork markings:

1. Each standard and random length of pipe used for ductwork shall be clearly marked with the following information:

a. Pipe Size (nominal diameter, in.).

b. Pipe Class (Pressure class, or schedule).

c. Production Code.

d. Material Designation.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. FRP ductwork and accessories shall be fabricated in a heated and well ventilated structure protected from weather and temperature extremes (minimum 50°F). Entire fabrication, curing and assembly process of any piece of FRP equipment shall be indoors.

B. The Manufacturer shall test resin cure for all FRP ductwork by Barcol hardness and acetone tests:

1. Hardness shall be within 90% of resin manufacturer's specification.

2. Barcol test shall be required for inside and outside surfaces of all fiberglass fabrications in accordance with ASTM D2583.

C. Failure of Shop Tests:

1. If the Barcol hardness and acetone test results do not meet the requirements specified, the Barcol hardness and acetone tests shall be deemed a failure.

2. In the event of failure, the manufacturer may take only one (1) of the following two course of action:

a. Retest the materials represented by the tests one (1) time.

1) The manufacturer shall bear all costs of repeating the Barcol hardness and acetone tests and no additional costs shall be passed on to the Contractor.

2) The Contractor shall submit to the Engineer in writing of any failures of the Barcol hardness and/or acetone tests, and the manufacturers course of action (i.e., retest or reject the materials represented by the test).

3) In retesting, all the product requirements of this Section shall be met, and the test methods specified in this Section shall be followed.

4) If upon retest, failure again occurs, then the quantity of product represented by the tests shall be rejected.

b. Reject the quantity of product represented by the tests.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Field Measurements:

1. Take field measurements where required prior to installation to ensure proper fitting of Work.

3.02 INSTALLATION

A. Non-Metal ductwork:

1. General:

a. All ducts shall be installed in accordance with manufacturer's recommendations.

b. All ductwork shall conform accurately to the dimensions shown on the Contract Drawings, with the exception that:

1) Ductwork shall be as shown on the Contract Drawings, subject to such modifications as may be necessary to suit field conditions to clear any obstruction or conflicts with other equipment.

c. All ductwork shall be straight and smooth on the inside with neatly finished joints, and shall not be decreased at any point to avoid obstructions.

d. No piping, conduit, or structural work shall be installed in or through any ductwork.

e. All ductwork shall be run as close as possible to structural members, walls, and ceilings.

f. Where existing walls, floors or roofs must be penetrated, Contractor shall neatly cut the required openings and patch the existing work to provide a neat and finished appearance.

g. Ductwork shall be installed so as to preclude the possibility of vibration under all operating conditions.

h. Install all ductwork and accessories to provide a system free from buckling, warping, breathing, or vibration.

2. Tolerances:

a. Out-of-roundness of duct shall be limited to ±⅛-in. or ±1% of duct inside diameter, whichever is greater, for duct sizes 8-in. diameter and greater.

b. Length of all flange pipe sections shall not vary more than ±⅛-in. at 70°F.

c. All unflanged duct shall be square on the ends in relation to the pipe axis and ±⅛-in. up to and including 24-in. diameter and $\pm^{3}/_{16}$-in. for all diameters greater than 24-in.

d. Fittings: The tolerance on angles of all fittings shall be ±1°, up to and including 24-in. diameter and ±½° for 30-in. diameter and above.

e. Flanges:

1) Flange faces shall be perpendicular to the axis of the duct within ½ degree.

2) Flange faces shall be flat to within ± $^{1}/_{32}$-in., up to and including 18-in. diameter and flat within ±$^{1}/_{16}$-in. for 20-in. diameter and larger.

3) Provide custom filler pieces as required to mate flanges squarely.

B. Ductwork Joints:

1. After the installation is completed, the Contractor shall seal all joints air tight.

2. Sealants and tape shall have the following ratings:

a. Flame Spread Rating, as per ASTM E84: ≤ 25

b. Smoke Developed Rating: ≤ 50

3. Bell and Spigot Joints:

a. Bell and spigot joints shall be sealed with a standard butt joint overlay as per PS 15-69.

b. All interior surfaces of joint to be coated with a paraffinated resin-rich gel coat.

c. Total width of overlay for butt-wrap joints shall be:

1) For FRP ductwork diameters from 8 in. up to and including 30-in.: ≥ 6-in..

2) For FRP ductwork diameters 36-in. and larger: ≥ 10-in..

4. All non-metal duct joints shall be airtight with no leakage.

5. Deflection:

a. Maximum allowable deflection for any size ductwork shall be ½-in. between supports and for any side of duct under worse case operating conditions.

C. Sleeves:

1. Install round duct sleeves and mechanical link seals for round ductwork as required.

D. Turning Vanes:

1. The turning vanes shall be quiet and free from vibration when the system is in operation.

2. Turning vanes shall be double thickness type.

3. Turning vanes shall be installed in the following locations:

a. All miter elbows to permit air to make the abrupt turns with a minimum of turbulence.

b. All short radius elbows in accordance with SMACNA standards and Industrial Duct Construction standards.

4. Duct clean out doors shall be provided at each elbow with turning vanes.

E. Volume Dampers:

1. Manual volume dampers larger than 11-in. in any dimension shall be opposed blade type.

2. The damper blades shall be operated by a lockable dial regulator and may be set in any position.

a. The dial regulators shall be marked so that the "open" and "shut" positions are clearly identified.

b. The dial regulators on insulated ductwork shall be mounted on an elevated platform which will finish flush with the surface of the insulation.

3. Manual volume dampers shall be located at accessible points and wherever possible some distance from a duct transition or fitting.

4. Care shall be taken during installation to make certain that sheet metal fasteners do not protrude into the duct and interfere with damper operation.

5. Install volume dampers where indicated on the Drawings and as required to facilitate accurate volume control. Volume dampers specified with air devices shall be installed in addition to those shown on the Drawings. In addition, dampers shall be installed in all of the following locations:

a. Each branch duct take off, and

b. In both ducts downstream of each trunk duct split.

6. Splitter type dampers shall not be installed.

F. Duct Access Doors:

1. Duct access doors shall be provided in all of the following locations for inspection and maintenance.

a. Within working distance of (and on the fusible link side of) all fire dampers.

b. Adjacent to all dampers.

c. On the linkage side of all automatic dampers.

d. At all other apparatus requiring service or inspection in the duct system.

2. Whenever space requirements are such that a hinged access door is impractical, a screw fastened lift-out door shall be provided instead.

G. Test openings:

1. The test openings shall be sealed by a screw cap and gasket.
2. The test openings shall be located as follows:
   a. In the exhaust air duct adjacent to the unit (fan, scrubber).
   b. In suction side of each unit (fan, scrubber).
   c. Where indicated on Drawings.

H. Flexible Connections:

1. All expansion joints in ducts at building expansion joints shall be suitably supported at each end by support guides within 12-in. of joint.
2. All ducts at flexible connections with air handling equipment, and fans shall be supported at free end within 12-in. of flexible connection.
3. Provisions shall be made for supporting all ductwork, dampers, and other ductwork accessories, where necessary.

I. Vibration Isolation Flexible Connections:

1. Install vibration isolation flexible connections between the ductwork and all air moving equipment and at the building joints.
   a. Provide flexible connections at both the inlet and discharge of air handling equipment.
2. Vibration isolation flexible connections shall not be painted or used to correct misalignment.

J. Fire Dampers:

1. Fire dampers shall be installed where shown on the Contract Drawings and where required by UL and authorities having jurisdiction, and shall be approved by local building codes and in accordance with the requirements of the NFPA.
   a. Two (2) fire dampers, rated at 1½ hours each, with one on each face of the fire separation or fire division, are required for fire separations having a 3-hr fire rating or above as per the New York City Building Code and Uniform Building Code requirements.
2. Fire dampers shall be secured to a Type 316 stainless steel collar with ¼-in. diameter stainless steel nuts and bolts with maximum spacing of 12-in. on center and a minimum of two (2) fastenings per side beginning 2-in. in from the corners of the collar.
3. The collars shall be at a minimum the same gauge as the ductwork to which the collar is attached; or 24 ga. thick (Type 316 stainless steel), whichever thickness is greater.

4. Retaining angles shall be installed on four sides of the collar and on both sides of the protected opening with a minimum of 1-in. overlap on the wall or floor.
    a. The Type 316 stainless steel angles shall be a minimum of 1½-in. × 1½-in. × ⅛-in. and shall be fastened to the collar only – do not fasten angles to the wall or floor.
    b. The retaining angles shall be increased in size to provide the minimum overlap of one inch on the wall or floor.
    c. The angles shall be fastened to the collar with ¼-in. diameter stainless steel nuts and bolts with a maximum spacing of 6-in. on center and a minimum of two (2) fastenings per side, beginning 2-in. from the corners of the collar.
    d. Where gas tight seals are required, the angles shall be fastened to the collar with a continuous weld and a sealant shall be installed between the angle and the wall or floor.
5. Clearance for expansion is required between the collar and the opening on the top and on each vertical side.
    a. The clearance shall be ⅛-in. per linear foot of sleeve, with clearance on the sides distributed equally and all vertical clearance on the top.
6. The ductwork shall be connected to the collar sides of the collar.
    a. The distance from the wall or floor to the breakaway connection shall not exceed 6-in.
7. Provide firestopping at fire separations where fire dampers are installed.
8. Provide an access door in duct at each fire damper located in duct.

K. Contractor shall furnish and install sleeves for registers, grilles, and dampers mounted in the masonry, concrete plenums or shafts. Sleeves shall be 16 ga. Type 316 stainless steel.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjustment:
1. Set volume control devices for approximate positions in preparation for final testing and balancing.
2. Install fusible links in fire dampers and verify that dampers are in open position.

3. Start fan system and check for excessive leaks and vibration and correct.

B. Balancing:

1. Systems shall be completely tested, adjusted and balanced by a qualified engineer. A complete balancing procedure shall be submitted for approval. All equipment and connections required to balance the systems shall be provided.

2. All duct systems shall be balanced in accordance with Section 23 05 93, Testing, Adjusting, and Balancing for HVAC.

C. Cleaning:

1. Prior to final inspection, all surfaces shall be made clean by brushing, wiping, or with a compressed-air blast to remove all loose foreign materials.

2. Remove all loose materials and obstructions from interior of ducts.

3. Remove debris and waste materials resulting from installation.

D. Painting:

1. Field Painting:

a. Painting required for surfaces not otherwise specified, and finish painting of items only primed at the factory, are specified in Section 09 91 00, Painting.

END OF SECTION

SCHEDULE 23 31 17-1
SCHEDULE OF NON-METAL DUCT CONSTRUCTION STANDARDS[1,2]

Service:	**Pressure Classification: (in. W.G.)**	**Construction Standards:**
All ductwork on fan discharge side	3	SMACNA HVAC Duct Construction Standards
All ductwork on suction side	3	
Transfer air duct not connected to fan	3	

Notes:

1. All accessories (including, but not limited to: turning vanes, air turning devices, manual volume dampers, motor operated control dampers, fire dampers, access doors, supports, angles, clamps, hangers, and hardware) shall be suitable for the pressure classification given above.
2. Schedule: All ductwork in the Chemical Rooms shall be FRP construction.

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required to furnish, install, and test all HVAC fans, complete and operational.

B. The following index of this Section is presented for convenience:

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C. All HVAC fans shall be provided in accordance with the schedule shown on the Contract Drawings.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 05 23 – Metal Fastenings

B. Section 09 91 00 – Painting

C. Section 23 05 93 – Testing, Adjusting and Balancing for HVAC

D. Section 26 05 91 – Low-Voltage Electric Motors

E. Section 40 05 97 – Identification for Process Equipment

1.04 REFERENCES

A. Abbreviations and Acronyms:

1.	FRP	Fiber Reinforced Plastic

B. Reference Standards:

1.	AISI C1045	Medium Carbon Steel
2.	AMCA 210	Laboratory Methods of Testing Fans for Ratings
3.	AMCA 301	Methods for Calculating Fan Sounds Ratings from Laboratory Test Data.
4.	ANSI S2.19, G6.3	Mechanical Vibration - Balance Quality Requirements Of Rigid Rotors

5. SMACNA Seismic Restraint Manual: Guidelines for Mechanical Systems

1.05 DESCRIPTION

A. This Section includes requirements for providing HVAC fans and accessories in accordance with applicable standards and regulations. In addition:

1. HVAC fans shall be furnished complete with all accessories, special tools, spare parts, base attachments, mountings, anchor bolts and other appurtenances as specified and/or required for proper installation.

1.06 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Comply with the applicable provisions of the standards organizations and regulatory agencies, below:

1. Underwriters Laboratories, Inc.
2. National Fire Protection Association.
3. National Electrical Code.
4. Local and State Building Codes and ordinances
   a. Building Code of the City of New York.
   b. New York State Uniform Fire Prevention and Building Code.

B. Qualifications of Manufacturer:

1. All components of the HVAC fans shall be provided by the Contractor through a single HVAC fan vendor.
   a. The Contractor (through the HVAC fan vendor) shall have the sole responsibility of matching all components and providing equipment which functions together as a system.

2. The HVAC Fans shall be standard equipment of the manufacturer.

3. The HVAC fans shall be designed, constructed, and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Contract Drawings.

4. All fans shall be selected from performance curves and not from rating tables.

   a. Performance data for all fans shall be based on tests conducted in accordance with AMCA 210 and shall be licensed to bear the AMCA certified rating seal for both sound and air performance.

5. Provide units listed by the Underwriters Laboratories, Inc.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

   a. Equipment specifications and data sheets identifying all materials used and methods of fabrication.

   b. Complete assembly, layout, installation, and foundation drawings with clearly marked dimensions.

   c. Fan performance curve indicating the operating point.

   d. Details of corrosion resistance coating.

   e. Weights of assembled units.

   f. Motor nameplate data as specified in Section 26 05 91, Low-Voltage Electric Motors.

   g. Detailed specifications and data sheets for all accessories such as roof curbs, dampers, damper operators, disconnect switches, vibration isolators, etc.

   h. Example equipment nameplate data sheet.

   i. Schematic diagrams for electric and control systems showing wiring for individual equipment items and interconnecting wiring diagrams.

   j. Shop and field testing procedures.

   k. Deviations from the Contract Documents.

   l. Wiring diagrams with numbered terminal blocks for all external connections.

   m. Description of control system.

   n. Motor Tests and Data: For each motor submit a certified motor test data sheet or a certified motor data sheet from an electrically

duplicate motor, in accordance with Section 26 05 91, Low-Voltage Electric Motors.

o. List of recommended lubricants.

p. Operation and maintenance manuals.

q. Fan manufacturer shall provide sound power ratings in the eight octave bands.

1) Sound power levels shall be based on AMCA Standard 301.

2) Sound power ratings shall be in decibels, referenced to 10^{-12} W.

2. Information Submittals:

a. Spare Parts List

b. Special Tools List

c. Reports of Certified Shop Tests

d. AMCA Approval for Fan Ratings

e. List of Lubricants:

1) The manufacturer shall submit a list with a minimum of four (4) manufacturers' standard lubricants which may be used interchangeably for each type of lubricant required.

a) The Contractor shall utilize this list in preparing his comprehensive lubrication survey as described in the Contract Documents.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. The cleaning, preservation, and packing of the HVAC fans for shipment shall be in accordance with the manufacturer's commercial practice.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. The HVAC fans shall be handled in such a manner that they may be transported and unloaded without being over-stressed, deformed, or otherwise damaged.

2. The HVAC fans shall be protected from corrosion and deterioration and shall be stored in a dry area.

a. Materials stored outdoors shall be supported above ground surfaces on wood runners and protected with effective and durable waterproof covers approved by the Engineer.

3. Interiors shall be kept free from dirt and foreign matter.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall provide spare parts and special tools necessary to service, disassemble, repair, and adjust the equipment provided under this Section, as per the requirements of the Contract Documents and/or as recommended by the manufacturer. In addition:

1. Provide the following spare parts for up to every four (4) of the same size, model, and type of HVAC fan furnished under this Section:

a. One (1) blower with wheel

b. One (1) set bearing and seal

c. One (1) set sheave

d. One (1) shaft

e. Two (2) sets of belts for each belt driven fan

2. Provide electric motor spare parts in accordance with Section 26 05 91, Low Voltage Electric Motors.

B. Tools: Provide standard and special tools and supplies necessary to service, disassemble, repair, and adjust the equipment.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wall Mounted Propeller Fans:

1. Model SER-09SH as manufactured by Hartzell, Piqua, OH;

2. Aerovent, Minneapolis, MN;

3. Or approved equal.

B. Fiberglass Up Blast Roof Mounted Centrifugal Fan:

1. Model Series 88 as manufactured by Hartzell, Piqua, OH;

2. Aerovent, Minneapolis, MN;

3. Or approved equal.

C. Fiberglass Duct Vane Axial Fans:

1. Model 35V as manufactured by Hartzell, Piqua, OH;

2. Aerovent, Minneapolis, MN;

3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. General:

1. Fans shall be as shown on the Contract Drawings.

   a. The capacity of all HVAC fans shall be as shown on the Contract Drawings.

   b. Where shown on the Contract Drawings, explosion proof motors and AMCA Type "A" spark resistant construction HVAC fans shall be provided.

2. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

3. Motors:

   a. Motors shall comply with the requirements of Section 26 05 91, Low Voltage Electric Motors.

   b. Unless otherwise indicated, motors shall be of the totally enclosed premium efficiency fan cooled type.

   c. Motors shall not be selected for operation in the service factor range/zone. The maximum brake horsepower required at any point on the performance curve shall not exceed the rated horsepower of the motor.

4. Electrical Service:

   a. Motors ≤ ⅓ hp : 115V, single phase, 60 Hz.

   b. Motors ≥ ½ hp : 460V, 3-phase, 60 Hz

5. Two speed motors: Shall be two winding type.

6. Disconnect Switches: All fans and damper operators shall each be provided with individual externally mounted disconnect switches.

7. Enclosures:

   a. All enclosures shall be NEMA 4X, and of stainless-steel construction, unless otherwise shown on the Contract Drawings.

8. Bearings:

   a. All fan bearings shall be selected for a minimum L-50 life of 100,000 hrs at maximum operating speed.

9. Shafts:

   a. All shafts shall be sized so the first critical speed is at least 20% over the maximum operating speed.

   b. Close tolerance shall be maintained along the length of the shaft.

10. Drive Type:

a. The fans shall be either direct connected or V-belt drive as indicated on the HVAC Fan Schedule shown on the Contract Drawings.

b. V-belt Drives:

1) V-belt Drives shall have the following rated capacities:

a) For motors ≤ 10 hp: 120% of rated capacity.

b) For motors > 10 hp, 150% of rated capacity.

2) All V-belt drives shall be provided with adjustable sheaves.

3) Belt Guards:

a) Exposed V-belt drives shall have removable belt guards with openings to allow for tachometer readings at both drive and fan shafts.

b) Guards shall be so constructed as to allow visual inspection of the belts without removing the guard.

c) All belt guards shall be OSHA-approved.

d) Exterior, exposed belt guards shall be weatherproof.

11. Seismic Restraints:

a. All fans shall be secured or anchored to withstand seismic forces anticipated in seismic zone 2A.

b. Equipment shall be provided with seismic restraints in accordance with SMACNA Seismic Restraint Manual: Guidelines for Mechanical Systems, as published by, and in accordance with the latest edition of the City of New York Building Code and referenced Uniform Building Code requirements.

12. Vibration isolators:

a. Isolators shall have a minimum efficiency of 90%.

b. Installation, type, number, and size of vibration isolators shall be in conformance with the manufacturer's recommendations for the frequencies involved.

B. Wall Mounted Propeller Fans:

1. General:

a. Propellers shall be airfoil design, statically and dynamically balanced.

2. Materials and Construction:

a. Fan shall be constructed of aluminum.

b. Propellers shall be of cast aluminum alloy.

c. Propellers shall be equipped with malleable iron split-taper bushing for alignment and locking of propeller to the shaft.

1) Bushing held in place by compression and keyed to the shaft to prevent slipping or loosening.

d. Propeller shall be mounted in a high efficiency air seal fan orifice with smaller diameter of the ring overlapping the propeller tips.

e. Fan bearing shall be heavy-duty, self-aligning ball type and relubricable selected for continuous service.

f. Mounting hardware shall be steel.

g. The Contractor to provide additional stiffeners, angles and supports as required to mount the fans.

3. Drive:

a. Safety Guard shall have removable sections to provide for easy access to motor.

b. Belt shall be oil, heat and static resistant, sized for continuous duty.

4. Coating:

a. All external and internal metal surfaces of fans, guards, (except propellers and motors) shall be factory primed and factory painted in accordance with Section 09 91 00, Painting.

b. All structural steel used for mounting fans shall be corrosion resistant coated.

5. Accessories:

a. Fan boot.

b. Motorized damper.

C. Fiberglass Reinforced Up-Blast Centrifugal Fans:

1. General:

a. Roof exhaust fans shall be up-blast centrifugal belt driven type.

2. Housing:

a. All fiberglass reinforced plastic surfaces shall be constructed of Derakane 510-A epoxy vinyl ester resin.

b. All structural parts in the air stream shall be fiberglass and resin or epoxy coated Type 316 stainless steel.

c. Dome motor cover, curb cap, and venturi inlet and outlet shall be formed from solid fiberglass and resin.

d. All internal hardware (air stream) shall be encapsulated Type 316 stainless steel.

e. All external hardware (out of airstream) shall be Type 316 stainless steel.

f. All air stream surfaces shall be provided with a synthetic veil and electrostatically conductive surface coating.

3. Fan Wheel:

a. Backward curved airfoil blades with tapered inlet side.

b. Manufactured as a single piece, removed from the pattern whole using solid fiberglass die formed and coated with a corrosion resistant vinyl ester resin, Ashland Derakane 510-A or equivalent.

c. Totally encapsulated aluminum core insert for secure attachment to the shaft.

d. Provided with a synthetic veil and electrostatically conductive surface coating.

4. Shaft (Belt Drive Only):

a. Type 316 stainless steel, turned, ground, and polished.

b. Machined and keyed at both ends with a fiberglass sleeve in the air stream.

c. Fan wheel shall be held tightly against the shaft shoulder by a Type 316 stainless steel bolt in the end of the shaft.

d. Type 316 stainless steel set screws shall be used to hold the key in place.

5. Shaft Seal (Belt Drive Only):

a. Fiberglass and neoprene shaft seal shall be located where the shaft leaves the housing.

6. Bearings (Belt Drive Only):

a. Heavy duty, self-aligning type with extended lube tubes for continuous service.

7. Motor Base (Belt Drive Only):

a. Motor mounting plates shall be steel encapsulated with resin, mat, and cloth and mounted onto the housing.

b. Fully adjustable platform style.

8. Accessories:

a. Manufacturer’s roof curb.

D. Fiberglass Duct Vane Axial Fans:

1. Housing:

a. All fiberglass reinforced plastic surfaces shall be constructed of Derakane 510-B.

b. All structural parts in the air stream shall be fiberglass and resin or epoxy coated Type 316 stainless steel.

c. All internal hardware (air stream) shall be encapsulated Type 316 stainless steel.

d. All external hardware (out of airstream) shall be Type 316 stainless steel.

e. All air stream surfaces shall be provided with a synthetic veil and electrostatically conductive surface coating.

2. Propeller:

a. Six airfoil blades.

b. Manufactured as a single piece, removed from the pattern whole using solid fiberglass die formed and coated with a corrosion resistant vinyl ester resin, Ashland Derakane 510-A or equivalent.

c. Totally encapsulated aluminum core insert for secure attachment to the shaft.

d. Provided with a synthetic veil and electrostatically conductive surface coating.

3. Shaft (Belt Drive Only):

a. Type 316 stainless steel, turned, ground, and polished.

b. Machined and keyed at both ends with a fiberglass sleeve in the air stream.

c. Propeller shall be held tightly against the shaft shoulder by a Type 316 stainless steel bolt in the end of the shaft.

d. Type 316 stainless steel set screws shall be used to hold the key in place.

4. Shaft Seal (Belt Drive Only):

a. Fiberglass and teflon shaft seal shall be located where the shaft leaves the bearing cover.

5. Bearings (Belt Drive Only):

a. Heavy duty, self-aligning type with extended lube tubes for continuous service.

6. Motor Base (Belt Drive Only):

a. Motor mounting plates shall be steel encapsulated with resin, mat, and cloth and mounted onto the housing exterior.

b. Fully adjustable platform style.

7. Accessories:

a. Provide guide vane section.

E. Hangers and Supports:

1. Provide equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
2. Equipment shall be supported from the building structure.
3. Unless otherwise specified herein, hangers and supports shall also conform to all the requirements of Section 40 05 07, Hangers and Supports for Process Piping.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Anchorage Devices:

1. Provide anchorage devices in accordance with Section 05 05 23, Metal Fastenings.
2. Contractor shall furnish anchor bolts and nuts of Type 316 stainless steel, of ample size and strength for the purpose intended, sized by the equipment manufacturer.
3. All hardware for mounting of motor drives and control panels shall be Type 316 stainless steel.

B. Identification:

1. Provide in accordance with Section 40 05 97, Identification for Process Equipment.
2. Each unit of equipment shall be identified with the equipment item numbers shown on the Contract Drawings.
3. A corrosion resistant tag and nameplate, securely affixed in a conspicuous place on each unit shall give the equipment item number, manufacturer's name or trademark and such other information as the manufacturer may consider necessary, or as specified, to complete identification.

C. Dampers:

1. All dampers for roof mounted fans shall be mounted in the mounting pedestal with removable access panel for inspection and servicing of damper and operator.
2. Mounting pedestal shall provide solid ventilator support and a weather tight seal.

D. Balancing:

1. All fans shall be statically and dynamically balanced at the speed at which the unit is scheduled to operate. Fans with corrosion resistant coatings shall be balanced after being coated.

E. Coatings:

1. Clean and prime coat ferrous metal surfaces of equipment in the shop in accordance with the requirements of Section 09 91 00, Painting.

2. If no other coating is otherwise specified for a type of fan on the HVAC Fan Schedule shown on the Contract Drawings, fans shall be provided (inside and outside) with baked on phenolic corrosion resistant coating including all accessories but not limited to the housing, wheels, curbs, liners, dampers, damper access sections. Coating shall be applied in the shop using the manufacturer's approved system.

3. Motors shall be painted in accordance with either Section 26 05 91, Low Voltage Electric.

4. Coat machined, polished, and non-ferrous metal surfaces and similar un-painted surfaces with corrosion prevention compound which shall be maintained during storage and until equipment begins operation.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. All HVAC Fans shall be as efficient as those HVAC Fans that have been tested to perform satisfactorily for at least two (2) years.

B. Shop Tests:

1. All shop tests shall be witnessed by a licensed Professional Engineer.

2. The licensed Professional Engineer shall sign and seal all shop test reports.

a. The state of the Professional Engineer's registration, the Professional Engineer's license number, and the Professional Engineer's name on the seal shall be clearly legible.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Inspection:

1. The inspection shall include welding, dimensions, bearings and overall workmanship.

2. The Contractor shall not install damaged items until repairs are made in accordance with manufacturer's written instructions and approval by Engineer.

a. Only minor repair work will be permitted in the field.

b. All damaged items requiring remedial work shall be returned to the manufacturer for repair or replacement.

3.02 INSTALLATION

A. Install HVAC fans in complete accordance with the manufacturer's printed installation instructions and the approved shop drawings. In addition:

1. Units shall be electrically grounded in the field by installing contractor.

3.03 FIELD TESTING / QUALITY CONTROL

A. Furnish the services of a qualified manufacturer's representative to check and approve all installations before operation as well as conduct field testing, in accordance with the requirements of the Contract documents. In addition:

1. The Contractor shall verify that all work furnished and installed conforms to the requirements the Contract Documents.

2. Reports: Submit a report from the manufacturer of each visit to the site. Reports shall provide complete information on time, schedule, tasks performed, persons contacted, problems corrected, test results, training, instruction and all other pertinent information.

3. Motor tests shall be performed in accordance with Section 26 05 91, Low-Voltage Electrical Motors.

4. Perform field tests in accordance with Section 23 05 93, Testing, Adjusting, and Balancing for HVAC.

3.04 STARTUP / DEMONSTRATION

A. Furnish the service of a qualified manufacturer representative to assist and train the plant operations and maintenance staff in the care, operation, and maintenance of the HVAC fans in accordance with the requirements of the Contract Documents. In addition:

1. The Contractor shall make all adjustments required to place Work in proper operating condition.

2. The Contractor shall include instruction on care and maintenance of the HVAC fans in the training of plant personnel.

3. In the event of trouble with the equipment, the manufacturer's representative shall revisit the site as often as required until all troubles are corrected and the installation is entirely satisfactory.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting:

1. Upon completion of the installation, the Contractor shall adjust all HVAC fans for their intended use.

a. Assembled fans shall then be dynamically balanced using a vibration analyzer to measure velocity.

b. The final reading shall not exceed 0.1-in./sec at the fan shaft speed.

c. The exact level of vibration will be recorded on the fan as proof of the final dynamic balance.

B. Protection:

1. The HVAC fans shall be protected as per the requirements of the Contract Documents. The use of HVAC fans shall not be permitted until permission is given by the Engineer.

a. When permission is given, the Contractor shall operate each HVAC fan to ensure their performance.

C. Cleaning:

1. In addition to the requirements of the Contract Documents, the Contractor shall thoroughly clean all surfaces of the installed HVAC fans and remove all debris and waste materials resulting from installation.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified, and required to furnish, install, and test intake and relief vents, complete and operational.

B. The following index of this Section is presented for convenience:

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C. All gravity ventilators shall be provided in accordance with the schedule shown on the Contract Drawings.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. This Section includes requirements for providing gravity ventilators as well as accessories in accordance with applicable standards and regulations. In addition:

1. Gravity ventilators shall be furnished complete with all accessories, special tools, spare parts, mountings, anchor bolts, and other appurtenances as specified and/or required for proper installation.

1.06 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Comply with the applicable provisions of the standards organizations and regulatory agencies, below:

1. Underwriters Laboratories, Inc.
2. National Fire Protection Association.
3. National Electrical Code.
4. Local and State Building Codes and Ordinances:
   a. Building Code of the City of New York.
   b. New York City Fire Code.
   c. New York City Energy Conservation Code.

B. Qualifications of Manufacturer:

1. All components of the gravity ventilators shall be provided by the Contractor through a single gravity ventilator vendor.
   a. The vendor shall engage manufacturer(s) which can show successful experience in the fabrication and manufacture of the equipment specified herein.
      1) The manufacturer(s) shall (each) have at least five (5) years' experience in the installation of Work specified.
   b. The Contractor (through the gravity ventilator vendor), shall have the sole responsibility of matching all components and providing equipment which functions together as a system.
2. The gravity ventilator shall be the standard equipment of the manufacturer(s).

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited, to:

1. Action Submittals:

a. Manufacturer's literature, illustrations, specifications, and Engineering data including:

1) Dimensions.

2) Materials of construction.

3) Details of installation.

4) Prefabricated curb details.

5) Air velocity through throat (fpm).

6) Air pressure drop through unit (in. W.G.).

b. Drawings showing:

1) The general arrangement of the equipment and methods of installation with detailed mounting information.

c. Documentation from the factory substantiating painting systems in accordance with the specifications. Include types applied and dry film thicknesses. Include color chart for color selection.

d. Operation and maintenance manuals

2. Information Submittals:

a. Spare parts list

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. The cleaning, preservation and packing of the gravity ventilator for shipment shall be in accordance with the manufacturer's commercial practice.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. The gravity ventilator shall be handled in such a manner that they may be transported and unloaded without being over-stressed, deformed, or otherwise damaged.

2. The gravity ventilator shall be protected from corrosion and deterioration and shall be stored in a dry area.

a. Materials stored outdoors shall be supported above ground surfaces on wood runners and protected with effective and durable waterproof covers approved by the Engineer.

3. Interiors shall be kept free from dirt and foreign matter.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall provide spare parts and special tools necessary to service, disassemble, repair and adjust the equipment provided under this Section, and as

per the requirements of the Contract Documents and/or as recommended by the manufacturer.

B. Tools: Provide standard and special tools and supplies necessary to service, disassemble, repair, and adjust the equipment.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gravity Ventilators:

1. Model TRE, as manufactured by Loren Cook Company, Powder Springs GA;
2. Greenheck Fan Corporation, Valley Forge, PA;
3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Air Intake and Relief Vents:

1. Capacity: As shown on the Contract Drawings.
2. General:
   a. Provide low contour, rectangular or square hood type, as shown on the Contract Drawings.
   b. Provide multitier louver type as shown on the Contract Drawings.
3. Construction:
   a. Housing:
      1) Minimum 0.081 gauge extruded aluminum tiers.
      2) Minimum 8-gauge aluminum support structure.
      3) Hood shall be constructed of minimum 0.063 aluminum with anti-condensate coating.
   b. Base:
      1) Welded aluminum construction.

B. Accessories:

1. Bird Screen: ½-in. (13 mm) mesh Type 316 stainless steel screen securely anchored to housing at gravity ventilator.

2. Curb Gasket: Self-adhesive gasket of Buna-N, EPDM, or Hypalon cemented to inner edge of curb to provide air and water seal between curb and housing.

3. Base to Curb Fasteners: Type 316 stainless steel lag screws and bolts.

4. Prefabricated Roof Curb:

   a. Weatherproof, continuous welded minimum 14 ga. aluminum construction.

   b. Insulated with 2-in. minimum fiberglass sandwiched between inner and outer walls of curb.

   c. 45° canted type sides.

   d. Provide curb with gasket as per above and wood blocking to mount curb. Provide flashing and counter flashing at curb as required to make watertight installation.

   e. 12-in. minimum curb height measured from finished roof to top of pressure treated wood nailer.

   f. Curb to Roof Deck Fasteners: Type 316 stainless steel lag screws and bolts.

   g. Refer to architectural Contract Drawings for curb flashing details.

   h. Contractor shall furnish prefabricated roof curbs from the same manufacturer as the air intakes and relief vents.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Painting:

1. All exterior and interior surfaces of equipment, including all accessories, shall be coated with a dry phenolic coating system.

   a. Finish and color to match housing.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Inspection:

1. The Contractor shall not install damaged items until repairs are made in accordance with manufacturer's written instructions and approval by Engineer.

   a. Only minor repair work will be permitted in the field.

b. All damaged items requiring remedial work shall be returned to the manufacturer for repair or replacement

B. Examine curbs to receive air intake and relief vents for:

1. Horizontal mounting surface.

2. Water tightness.

3. Proper anchoring and flashing of prefabricated curb to roof deck.

4. Unevenness, irregularities, and incorrect dimensions that would affect quality and execution of installation.

C. Do not proceed with installation of air intake and relief vents until curbs conform to Contract requirements.

3.02 INSTALLATION

A. Roof openings and penetrations shall be capped to prevent weather from entering building prior to installation of air intakes or relief vents.

B. Install gravity ventilator in complete accordance with manufacturer's printed installation instructions and the approved shop drawings.

C. Anchor base to wood nailer on curb with lag screws or bolts in manner that allows for easy removal for damper service.

D. Check proper connections for electrical wiring hook-ups for motorized dampers.

3.03 FIELD TESTING / QUALITY CONTROL

A. Furnish the services of a qualified manufacturer's representative to check and approve all installations before operation, in accordance with the requirements of the Contract documents. In addition:

1. The Contractor shall verify that all work furnished and installed conforms to the requirements the Contract Documents.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting:

1. Upon completion of the installation, the Contractor shall adjust all air intake and relief vents for their intended use.

B. Protection:

1. The gravity ventilator shall be protected as per the requirements of the Contract Documents. The use of the gravity ventilator shall not be permitted until permission is given by the Engineer.

C. Cleaning:

1. In addition to the requirements of the Contract Documents, the Contractor shall thoroughly remove all debris and waste materials resulting from installation.
2. Clean tar, dirt, and marks from exterior of units.
3. Touch up all chips in factory finishes.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 23 81 26 – DUCTLESS SPLIT-SYSTEM AIR-CONDITIONERS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Contractor shall provide all labor, materials, tools, equipment and incidentals as shown, specified, and required to furnish and install ductless split-system air-conditioners complete and operational with accessories.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 23 05 29 – Hangers and Supports for HVAC Ductwork, Piping, and Equipment.

B. Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC

C. Section 23 09 00 – Instrumentation and Control for HVAC.

1.04 REFERENCES

A. Air-Conditioning, Heating, and Refrigeration Institute (AHRI).

1. AHRI 210/240 – Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

1. ASHRAE Standard 15 – Safety Standard for Refrigeration Systems.

C. American Society for Testing and Materials (ASTM).

1. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

2. ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.

3. ASTM B280 – Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

D. National Electrical Code (NEC).

E. National Electrical Manufacturers Association (NEMA).

F. Underwriters Laboratories Inc. (UL).

1. UL 1995 – Heating and Cooling Equipment.

1.05 DESCRIPTION

A. This Section includes requirements for providing ductless split systems and accessories in accordance with applicable standards and regulations. In addition:

1. Ductless split systems shall be furnished complete with all accessories, special tools, spare parts, base attachments, mountings, anchor bolts and other appurtenances as specified and/or required for proper installation.

1.06 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Comply with the applicable provisions of the standards organizations and regulatory agencies, below:

1. Underwriters Laboratories, Inc.

2. National Fire Protection Association.

3. National Electrical Code.

4. Local and State Building Codes and ordinances

a. Building Code of the City of New York.

b. New York City Fire Code.

5. Permits: Contractor shall obtain and pay for all required permits, fees and inspections.

B. Qualifications of Manufacturer:

1. All components of the ductless split system shall be provided by the Contractor through a single ductless split system vendor.
    a. The Contractor (through the ductless split system vendor) shall have the sole responsibility of matching all components and providing equipment which functions together as a system.
2. The ductless split system shall be standard equipment of the manufacturer.
3. The ductless split system shall be designed, constructed, and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Contract Drawings.
4. Provide units listed by the Underwriters Laboratories, Inc.
5. Require the ductless split-system air-conditioner manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
6. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall equipment assembly by the ductless split-system air-conditioner manufacturer.
7. Certifications:
    a. Ductless split-system air-conditioners shall bear an approved label with all the necessary identification marks, electrical data, and any necessary cautions as required by the National Electric Code.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:
    a. Drawings showing fabrication methods, assembly, accessories, installation details, and wiring diagrams.
    b. Detailed drawings of each individual component's wiring diagrams.
    c. Detailed drawings of control panel layout.
    d. Detailed installation drawing of each individual component showing:
        1) Mounting requirements.
        2) Locations (panel, field, etc.).
        3) Piping, and wiring connections, labeled and coded.
    e. Setting drawings, templates, and directions for the installation of anchor bolts and other anchorages.
    f. Manufacturer's literature, illustrations, specifications, weight, dimensions, required clearances, materials of construction, and performance data for all equipment.

g. Complete component list.

h. Detailed description of each component.

i. Catalog cut sheets for each component.

j. Fan performance curves with operating points.

k. Deviations from Contract Documents. Any exceptions to the Contract Documents must be clearly defined. Contractor shall be responsible for any additional expenses that may occur due to any exception made.

l. Lubricant Specification: Furnish lubricant specification for type and grade required for equipment furnished.

m. Operation and maintenance manuals.

n. Installation data.

o. Other technical data related to specified material and equipment as requested by Engineer.

2. Informational Submittals: Submit the following:

a. Spare parts list.

b. Special tools list.

c. Reports of Certified Shop Tests.

d. Independent certification reports:

1) UL Label or approved equal.

2) AHRI Label.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. The cleaning, preservation, and packing of the ductless split system for shipment shall be in accordance with the manufacturer's commercial practice.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. The ductless split system shall be handled in such a manner that they may be transported and unloaded without being over-stressed, deformed, or otherwise damaged.

2. The ductless split system shall be protected from corrosion and deterioration and shall be stored in a dry area.

a. Materials stored outdoors shall be supported above ground surfaces on wood runners and protected with effective and durable waterproof covers approved by the Engineer.

3. Interiors shall be kept free from dirt and foreign matter.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall provide spare parts and special tools necessary to service, disassemble, repair, and adjust the equipment provided under this Section, as per the requirements of the Contract Documents and/or as recommended by the manufacturer.

B. Tools: Provide standard and special tools and supplies necessary to service, disassemble, repair, and adjust the equipment.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Indoor Units:

1. Ceiling Cassette:

a. Model PLA, as manufactured by Mitsubishi Electric.

b. LG.

c. Or approved equal.

B. Outdoor Units:

1. Model PUZ, as manufactured by Mitsubishi Electric.

2. LG

3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Equipment Description:

1. Units shall be completely factory assembled and tested, and internally piped and wired. Units shall consist of indoor air conditioners (indoor units) with filters, evaporator coils, supply fans, motors, and remotely located outdoor heat pumps (outdoor units).

2. Units shall include all unit mounted controls, wiring, and accessories.

3. Indoor units and refrigerant pipes shall be purged with dry air before shipment from the factory.

4. Outdoor units shall be pre-charged with refrigerant for a minimum of 70 feet of refrigerant tubing.

B. Design Criteria:

1. Design conditions shall be as indicated on the Equipment Schedule.
2. Units shall conform and be certified to the latest editions of ASHRAE Standard 15 and UL 1995.

C. Performance Criteria:

1. Minimum performance data for each unit shall be as indicated on the Equipment Schedule. Provided equipment shall not exceed scheduled total power.
2. Units shall meet or exceed the Energy Efficiency Ratio (EER) shown on the Equipment Schedule when tested in accordance to the latest editions of AHRI Standard 210/240.
3. Outdoor units shall be capable of cooling operation down to 0-degree F ambient temperature without additional low ambient controls.
4. Outdoor units configured as heat pumps shall be capable of heating operation down to -13 degree F ambient temperature.
5. Outdoor units shall be able to operate with a maximum height difference of 100 feet between indoor and outdoor units.
6. System shall be capable of operating up to a minimum refrigerant tubing length of 100 feet between indoor and outdoor units without the need for line size changes, traps or additional oil.

D. Indoor Unit:

1. Type: Ceiling Cassette Air Conditioners:
    a. Cabinet:
        1) Cabinet shall be formed from galvanized sheet metal coated with high-density foam insulation.
        2) Cabinet shall be for recessed mounting and provided with four corner mounting supports behind removable corner pockets in grille assembly allowing adjustment of mounting height from front of unit.
        3) White grille assembly shall be attached to the front of the cabinet to provide supply air vanes in four directions and a center mounted return air section. Four-way grille shall allow two, three, or four-way blow.
        4) Cabinet panel shall have provisions for a field installed filtered outside air intake.
        5) Cabinet shall have a knock-out to provide a branch air duct for conditioning a secondary space.
    b. Evaporator Coil:

1) Coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. All tube joints shall be brazed with PhosCopper or silver alloy.

2) Coil shall be pressure tested at the factory.

3) Coil shall be furnished with a condensate pan and drain.

4) Unit shall include a built-in, automatic condensate lift mechanism that will be able to raise condensate 33 inches above the condensate pan. The lift mechanism shall be equipped with a positive acting liquid level sensor to shut down the indoor unit if liquid level in the drain pan reached maximum level.

c. Supply Fans:

1) Direct drive, turbo propeller fan shall be driven by a single motor.

2) Multi-speed fan motor shall have permanently lubricated bearings.

3) Fan shall have a selectable AUTO fan setting that will adjust the fan speed based on the difference between controller setpoint and sensed space temperature.

d. Vanes:

1) Motorized adjustable air outlet system shall provide two-way, three-way, or four-way airflow with switches that can be set to provide optimum airflow based on ceiling height and number of outlets used.

2) Vane angles shall be individually adjustable from the remote controller to customize the airflow pattern for the conditioned space.

3) Vanes shall have five fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.

4) Vanes shall have the selectable capability to randomly cycle the vanes up and down to evenly heat the space in the heating mode.

e. Filter:

1) Return air shall be filtered by means of an easily removable, washable polypropylene honeycomb filter.

E. Outdoor Units:

1. Units shall be configured as an air-source heat pump and shall include a four-way solenoid valve and compressor muffler.

2. Cabinet:
   a. Casing shall be fabricated of galvanized steel.
   b. Mounting feet shall be provided and shall be welded to the base of the cabinet.
   c. Removable panel sections shall allow easy access to all serviceable parts.
   d. Fan grill shall be constructed from ABS plastic.
   e. Cabinet mounting and construction shall be sufficient to withstand 155 MPH wind speed conditions for use in Hurricane condition areas.
3. Condenser Fans:
   a. Direct drive fan and motor shall be configured for horizontal discharge airflow.
   b. Fan blades shall be of aerodynamic design for quiet operation and the fan motor bearings shall be permanently lubricated.
   c. Fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front.
   d. Fan shall be provided with a raised guard to prevent external contact with moving parts.
4. Condenser Coil:
   a. Coil shall be of copper tubing with flat aluminum fins.
   b. Coil shall be protected with an integral metal guard.
5. Compressors:
   a. Compressor shall be hermetically sealed, variable speed, rotary or scroll type. Compressor shall be equipped with an internal thermal overload.
   b. Compressor shall be driven by inverter circuit to control compressor speed.
   c. In lieu of a crankcase heater, minimal amount of current shall be automatically and intermittently applied to the compressor motor windings to maintain sufficient heat to vaporize any refrigerant during the off cycle to prevent liquid accumulation.
   d. Compressor shall be mounted so as to avoid transmission of vibration.
6. Refrigeration System:
   a. Refrigerant flow from the condenser shall be controlled by means of an electronic linear expansion valve (LEV) metering device. The LEV shall be control by a microprocessor-controlled step motor.

b. System shall include an accumulator, high pressure safety switch, refrigerant line filter driers (strainers), Schrader type service fittings (stop valves) for liquid and suction connections, and service ports.

F. Accessories:

1. Hangers and Supports:

a. Provide equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

b. Equipment shall be supported from the building structure.

c. Unless otherwise specified herein, hangers and supports shall also conform to all the requirements of Section 40 05 07, Hangers and Supports for Process Piping.

2. Refrigerant Piping and Insulation:

a. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, Type ACR, meeting ASTM B280 requirements.

b. Refrigerant piping shall be individually insulated in twin-tube, flexible, closed-cell, CFC-free (ozone depletion potential of zero), elastomeric material.

c. Insulation shall have a maximum thermal conductivity of 0.27 Btu-in/hr-ft2-degree F at 75 degrees F and a maximum water vapor transmission of 0.08 perm-in.

d. Insulation shall have a maximum Flame Spread Index of 25 and a maximum Smoke Developed Index of 50 when tested in accordance with ASTM E84.

e. Insulation thickness shall be a minimum 1-1/2-inch.

3. Weatherproof Insulation Jacketing:

a. General: Provide for refrigerant piping insulation exposed to the outdoors.

b. Aluminum Protective Jacketing:

1) Product and Manufacturer: Provide one of the following:

a) Model Strap-On, as manufactured by Pabco-Childers Metals.

b) Model Insul-Mate, as manufactured by RPR Products, Inc.

c) Or approved equal.

2) Material: Smooth aluminum (Alloy 3003 – H-14).

3) Thickness: 0.016-inch.

4) Moisture Retarder: 3-mil thick coextrusion of polyethylene and DuPont's Surlyn.

5) Fastening: Continuous modified Pittsburgh Z-lock longitudinal seam with self-gauging 2-inch built-in overlap.

6) Bands: 1/2-inch stainless steel bands with wing seals.

7) Fittings:

a) Type: Pre-fabricated aluminum (Alloy 3003 – H-14) fittings.

b) Thickness: 0.016-inch.

4. Indoor units shall be provided with a condensate mini-pump that is capable of lifting condensate 23 inches above the drain pan.

5. Indoor units shall be equipped with a temperature sensor kit that provides uniform temperature detection from floor to ceiling to automatically adjust the temperature setpoint.

6. Outside air temperature and humidity sensor shall be furnished with the units for field installation.

7. Outdoor units shall be provided with wind baffle for low ambient cooling operation.

8. Provide manufacturer's wall mounting bracket.

G. Controls:

1. Refer to Section 23 09 00 - Instrumentation and Control for HVAC, for additional information and sequence of operations. Provide provisions for interfacing with the instrumentation and control (IC) system. Contractor shall coordinate operating system requirements with Section 23 09 00 - Instrumentation and Control for HVAC, for a complete system.

2. Unit shall be completely factory wired with the necessary controls, starters, contactors and terminal blocks for power and control wiring.

3. A color-coded circuit diagram of the approved electrical drawing shall be provided with the unit.

4. All electrical components shall bear the UL label.

5. Unit shall be designed for single point electrical connection. All necessary power transformers shall be factory provided and installed.

6. The system shall be capable of satisfactory operation within voltage limits of 198 VAC to 253 VAC, 1 Phase, 60 Hz.

7. The power to the indoor unit shall be supplied from the outdoor unit. A factory provided three AWG-14 wire conductors with ground shall provide power feed and bi-directional control transmission between the outdoor and

indoor units. The outdoor unit shall have Pulse Amplitude Modulation circuit to utilize 98 percent of input power supply.

8. The control system shall consist of a minimum of two microprocessors, one on each indoor and outdoor unit, interconnected by a single non-polar two-wire cable. The outdoor unit shall be controlled by the microprocessor located in the indoor unit using 24 VDC pulse control signal.

9. The indoor unit control board shall have auxiliary control contact connectors to provide:

   a. Heat Recovery.

   b. Back-up Heat.

   c. Remote Switch.

   d. Central Control.

   e. IP Terminal.

10. The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from a wireless or wired controller, providing emergency operation and controlling the outdoor unit.

11. The system shall include a 3-minute time delay mechanism, an automatic restart function when power is restored after power interruption, and a test run switch.

12. The system shall have self-diagnostics ability, including total hours of compressor run time. Diagnostics codes for indoor and outdoor units shall be displayed on the controller panel.

13. Remote Controllers:

   a. Wired, Wall Mounted:

      1) Remote controller shall be approximately 5-inch by 5-inch in size and white in color with a light-green LCD display.

      2) The control voltage from the wired controller to the indoor unit shall be 12/24 VDC.

      3) Field wiring shall run directly from the indoor unit to the wall mounted controller with no splices. Up to two wired controllers shall be able to be used to control one unit.

      4) Controller shall support a selection from multiple languages (Spanish, German, Japanese, Chinese, English, Russian, Italian, or French) for display information.

      5) Controller shall include be a built-in weekly timer with up to 8 pattern settings per day.

6) Controller shall consist of an ON/OFF button, Increase/Decrease Set Temperature buttons, a Cool/Auto/Fan/Dry mode selector, a Timer Menu button, a Timer ON/OFF button, Set Time buttons, a Fan Speed selector, a Ventilation button, a Test Run button, and a Check Mode button.

7) Controller shall have a built-in temperature sensor.

8) Temperature shall be displayed in either Fahrenheit (°F) or Celsius (°C), and temperature changes shall be by increments of 1 degree F (0.5 degree C).

9) Controller shall have the capability of controlling up to a maximum of 16 systems, as a group with the same mode and temperature setpoint for all, at a maximum developed control cable distance of 1,500 feet.

10) Basic functions of the controller shall include:

a) ON/OFF for run and stop operation.

b) Operation mode for switching between Cool/Dry/Auto/Fan/Heat.

c) Temperature setpoints:

(1) Cool/Dry: 67-87 degrees F.

(2) Heat: 63-83 degrees F.

(3) Auto: 67-83 degrees F.

d) Fan speed settings.

e) Air flow direction settings.

f) Scheduling.

g) Operating conditions and error code display.

h) Ventilation control.

i) Auto lock out function for setting or releasing of all buttons.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Outdoor units shall be provided with a full seacoast protection package which include the following features:

1. Casings shall be fabricated with alloyed galvanized sheet metal with thermoset polyester-resin coating on internal and external surfaces.

2. Compressor covers shall be fabricated with galvanized-aluminum sheet metal with thermoset polyester-resin coating on internal and external surfaces.

3. Electrical panels shall be fabricated with galvanized-aluminum sheet metal with thermoset polyester-resin coating on external surface.

4. Fan motor supports shall be fabricated with galvanized steel with thermoset polyester-resin coating on internal and external surfaces.

5. Printed circuit boards shall be coated with epoxy resin and polyurethane top coat on external surface.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Equipment shall be completely manufactured and pre-assembled in accordance with Reference Standards. Perform the following tests and inspections at factory before shipment:

1. Tested and inspected for approval as a unit by Underwriters Laboratories Inc., UL Label or approved equal.

2. Factory test equipment to ensure that the entire package has been properly fabricated and assembled, that all the controls function as specified herein and that the package meets the specified performance requirements including manufacturer's data report.

3. Fan wheels and shafts shall be statically and dynamically balanced.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Protection of Surrounding Areas/Surfaces:

1. Openings and penetrations shall be capped to protect the building from outside conditions.

2. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.

B. Examine conditions under which materials and equipment will be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

C. Take field measurements where required prior to installation to ensure proper fitting of Work.

3.02 INSTALLATION

A. Install the equipment in accordance with the Contract Documents and by manufacturer's instructions and recommendations. Obtain written interpretation from Engineer in the event of conflict between manufacturer's instructions and recommendations and the Contract Documents.

B. Install in accordance with Laws and Regulations.

C. Do not modify structures to facilitate installation of equipment, unless approved in writing by Engineer.

D. Installation to conform to requirements of all local and state codes.

3.03 FIELD TESTING / QUALITY CONTROL

A. Furnish the services of a qualified manufacturer's representative to check and approve all installations before operation as well as conduct field testing, in accordance with the requirements of the Contract documents. In addition:

1. The Contractor shall verify that all work furnished and installed conforms to the requirements the Contract Documents.

2. Reports: Submit a report from the manufacturer of each visit to the site. Reports shall provide complete information on time, schedule, tasks performed, persons contacted, problems corrected, test results, training, instruction and all other pertinent information.

3. Perform field tests in accordance with Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC.

3.04 STARTUP / DEMONSTRATION

A. Furnish the service of a qualified manufacturer representative to assist and train the plant operations and maintenance staff in the care, operation, and maintenance of the HVAC fans in accordance with the requirements of the Contract Documents. In addition:

1. The Contractor shall make all adjustments required to place Work in proper operating condition.

2. The Contractor shall include instruction on care and maintenance of the ductless split system in the training of plant personnel.

3. In the event of trouble with the equipment, the manufacturer's representative shall revisit the site as often as required until all troubles are corrected and the installation is entirely satisfactory.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting:

1. Adjust all controls for proper settings.

2. While system is operable, balance all equipment to achieve design conditions.

B. Protection:

1. The ductless split systems shall be protected as per the requirements of the Contract Documents. The use of ductless split systems shall not be permitted until permission is given by the Engineer.

a. When permission is given, the Contractor shall operate each HVAC fan to ensure their performance.

C. Cleaning:

1. In addition to the requirements of the Contract Documents, the Contractor shall thoroughly remove all debris and waste materials resulting from installation.

2. Clean tar, dirt, and marks from exterior of units.

3. Touch up all chips in factory finishes.

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified, and required to furnish, install, and test all electric heaters, complete and operational.

B. The following index of this Section is presented for convenience:

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C. All electric heaters shall be provided in accordance with the schedule shown on the Contract Drawings.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 09 91 00 – Painting

B. Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC

1.04 REFERENCES

A. Reference Standards:

1. UL Standard 1096 - Electrical Central Air Heating Equipment

1.05 DESCRIPTION

A. This Section includes requirements for providing electric heaters and accessories in accordance with applicable standards and regulations. In addition:

1. Electric heaters shall be furnished complete with all accessories, special tools, spare parts, attachments, mountings, anchor bolts, and other appurtenances as specified and/or as may be required for a proper installation.

1.06 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Comply with applicable provisions of the standards organizations and regulatory agencies, below.

1. Underwriters Laboratories, Incorporated.
2. National Fire Protection Association.
3. National Electrical Code.
4. Local and State Building Codes and Ordinances.
   a. New York City Building Code.
   b. New York City Fire Code.
   c. New York City Energy Conservation Code.

B. Qualifications of Manufacturer:

1. All components of the electric heaters shall be provided by the Contractor through a single electric heater vendor.
   a. All electric heaters included in the Work shall be one of a single manufacturer and of similar character in a location.
   b. The Contractor (through the electric heater vendor) shall have the sole responsibility of matching all components and providing equipment which functions together as a system.
2. The electric heaters shall be standard equipment of the manufacturer.
3. The electric heaters shall be designed, constructed, and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Contract Drawings.
4. Provide units listed by the Underwriters Laboratories, Inc.

C. Qualifications of Contractor:

1. The Contractor shall be a New York City licensed plumber.

2. The Contractor shall have at least five (5) years' experience in the installation of the Work specified.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited, to:

1. Action Submittals:

a. Manufacturer's literature, illustrations, specifications, and engineering data, including, but not limited to:

1) Dimensions.

2) Capacities.

3) Materials of construction.

4) Finishes, standard and custom color chart for Engineer's approval.

b. A complete wiring diagram shall be submitted indicating both factory and field connections.

c. Documentation from the factory substantiating painting systems in accordance with the specifications. Include types applied and dry film thicknesses.

d. Deviations from the Contract Documents.

e. Operations and Maintenance Manuals.

2. Information Submittals:

a. Special Tools List.

b. Spare Parts List.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. The cleaning, preservation and packing of the electric heaters for shipment shall be in accordance with the manufacturer's commercial.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. The electric heaters shall be handled in such a manner that they may be transported and unloaded without being over-stressed, deformed, or otherwise damaged.

2. The electric heaters shall be protected from corrosion and deterioration and shall be stored in a dry area.

a. Materials stored outdoors shall be supported above ground surfaces on wood runners and protected with effective and durable waterproof covers approved by the Engineer.

3. Interiors shall be kept free from dirt and foreign matter.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall provide spare parts and special tools necessary to service, disassemble, repair and adjust the equipment provided under this Section, and as per the requirements of the Contract Documents and/or as recommended by the manufacturer. In addition:

1. Provide one (1) motor for up to every four of same size motors for all heaters.

B. Tools: Provide standard and special tools and supplies necessary to service, disassemble, repair, and adjust the equipment.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Unit Heaters:

1. Electric Unit Heaters (Non-Corrosion Resistant):

a. Model LUH, as manufactured by Chromalox, Trane Co., Long Island City, NY;

b. Indeeco, St. Louis, MO:

c. Or approved equal

2. Electric Unit Heaters (Corrosion Resistant):

a. Model HD3D (Hose Down Electric Heater), as manufactured by Chromalox, Pittsburgh, PA;

b. Indeeco, St. Louis, MO:

c. Or approved equal.

3. Electric Duct Heaters:

a. Model Custom Duct Heater, as manufactured by Indeeco, St. Louis, MO:

b. Brasch Manufacturing Company

c. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. General:

1. All electric heaters shall be provided in accordance with the schedule shown on the Contract Drawings; capacity and electrical supply characteristics shall be as shown on the schedule.

2. Provide complete, factory-assembled and wired units.

B. Unit Heaters:

1. Electric Unit Heaters (Non-Corrosion Resistant):

a. Casing:

1) Shall be constructed of minimum 18 ga. steel.

2) Finished in high-gloss coating:

a) Each unit heater shall have a corrosion resistant coating.

b) The entire unit shall be coated internally and externally with a baked phenolic corrosion resistant coating.

3) Adjustable discharge louvers shall be provided to control the direction of air flow.

b. Heating Element:

1) High mass, all steel, tubular finned type.

c. Fan:

1) Axial flow type.

2) Statically and dynamically balanced at the speed at which the unit is scheduled to operate.

d. Motor:

1) Type: Single speed.

2) Enclosure: Totally enclosed.

3) Overload Protection: Internal thermal overload protection.

e. Controls:

1) Sub-divided circuits with individual fuse protection for all heaters with a total current draw of 48 A or greater.

2) Heavy duty magnetic contactors.

3) Thermal cutout with automatic reset.

4) Integral 120 VAC control transformer.

f. Room Thermostat:

1) Heavy duty line voltage SPDT, 120V, single phase.
2) 40° to 100°F range with 1°F differential.
3) Weatherproof NEMA 4X, corrosion resistant construction.
4) Shielded sensing bulb.
5) Neoprene gasket to seal out dust and moisture.
6) Adjustable knob for temperature setting.
7) Positive off by setting unit to low position.
8) For each electric unit heater, provide wall-mounted, field installed

g. Accessories:

1) Each unit heater shall be provided with mounting brackets.

2. Electric Unit Heaters (Corrosion Resistant):

a. Casing:

1) Shall be constructed of minimum 20 ga. steel.

b. Heating Element:

1) Type 316 stainless steel fin tubular elements.

c. Fans:

1) Aluminum spark resistant construction.
2) Attached with rubber vibration isolation.

d. Motor:

1) Enclosure: Totally enclosed
2) Bearings: Permanently lubricated ball bearings.
3) Integral thermal cutout.

e. Air Deflectors:

1) Adjustable louvered outlet grille, finish same as fan.
2) Heavy gauge rear wire grille, finish same as fan.
3) All hardware shall be stainless steel.

f. Built-in Controls:

1) Heating elements, motor and cutout to be factory prewired to junction terminal block for easy hook-up.
2) Furnish all controls (thermostat, relay, transformer etc.) for field installation as necessary for control operation.

3) Provide integral NEMA 4X junction box for the following unit mounted controls:

a) Two (2) power contactors, primary and backup.

b) One (1) motor contactor.

c) One (1) over temperature protection.

d) One (1) thermal fan delay switch.

4) Provide transformer for 120 V control circuit.

g. Coating:

1) All sheet metal parts shall be protected by zinc chromate primer and 2 coats of epoxy enamel, all factory painted in accordance with Section 09 91 00, Painting.

h. Accessories:

1) Each unit shall be provided with Type 316 stainless steel swivel bracket for wall mounting bracket and stainless steel hardware.

C. Electric Duct Heaters:

1. Frame:

a. Framing shall be flanged type suitable for externally insulated ductwork.

b. Frames, reinforcement, and terminal boxes shall be constructed from minimum 16-gauge corrosion resistant Type 316 stainless steel.

c. Terminal boxes shall be NEMA 4X construction with a hinged latching cover and multiple concentric knockouts for field wiring.

d. The backs of terminal boxes shall be insulated with minimum 1/2-inch fiberglass insulation for thermal and condensation protection.

2. Insulation:

a. Insulation of fiberglass at least ½in. thick shall be used between duct heater and control box for maximum condensation protection.

3. Heating Element:

a. Heaters shall be constructed per U.L. standards for zero clearance and shall meet NEC requirements.

b. Heating elements shall be finned tubular Type 301 or 304 stainless steel with internal resistance wire of 80% nickel and 20% chromium; steps shall be arranged to prevent stratification when operating at less than full capacity.

c. Provide insulated element terminals.

d. Terminal box shall be spot welded construction with solid, hinged cover, totally enclosed, without louvers or grilles per UL Standard 1096. NEMA 4X stainless steel.

e. Three phase heaters shall be furnished with balanced phases on each step.

f. Elements shall be rated approximately 50 W/in.^{2} of wire surface area.

4. Controls:

a. Air flow sensing tube for air flow proving switch shall indicate direction of air flow and be field reversible without removing heater from duct.

b. Disc type automatic reset thermal protection shall be provided as the primary protection and shall be mounted on the duct heater directly in the air stream to provide positive, fast response.

c. Provide secondary manual limit-type reset thermal protection in control circuit in series with automatic.

d. Discharge Air Temperature Sensor. Refer to Section 23 09 00, Instrumentation and Control for HVAC for sequence of operations.

5. Wiring Diagrams:

a. A wiring diagram shall be furnished for each type of heater. Diagram shall include recommended supply wire gauges in conformance to the NEC and fuse sizes. Typical wiring diagrams are not acceptable.

6. Duct Size: Shall be as indicated in the Electric Heater Schedule shown on the Contract Drawings.

7. Units shall have full modulation capacity controlled by a Silicon Controlled Rectifier (SCR). A 4-20 mA or 0-10 VDC heating control signal shall be provided to control the amount of heating.

8. Pilot Lights: Built-in, factory wired, transformer coupled, 6V lamped pilot lights shall indicate the following conditions:

a. Heater Energized.

b. Step Energized: 1 per step.

c. When built-in-air flow switch opened.

9. Proof of Air Flow Switch:

a. Provide in accordance with UL Standard 1096.

b. Type: Pressure differential switch.

c. Shall deactivate unit and de-energize heating element if proper air flow is not present.

10. Built-in Options:
    a. Non-mercury Control Contactors.
    b. Main Power Disconnect Switch.
    c. Interlock terminal strip for interlocking supply air fan.
    d. Control Transformers with Fused Primaries for 120 vac and 24 vac circuits.
11. Unit Mounted Control Enclosure:
    a. Standard control box shall be of the hinged, solid cover type, NEMA 4X stainless steel construction.
12. Protective Screens:
    a. Provide 3/8-inch stainless steel wire mesh screens on inlet both sides of heaters.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Identification:
1. Provide in accordance with Section 40 05 97, Identification for Process Equipment.
2. Each unit of equipment shall be identified with the equipment item numbers shown on the Contract Drawings.
3. A corrosion resistant tag and nameplate, securely affixed in a conspicuous place on each unit shall give the equipment item number, manufacturer's name or trademark and such other information as the manufacturer may consider necessary, or as specified, to complete identification.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. All electric heaters shall be as efficient as those have been tested to perform satisfactorily for at least two (2) years and providing equipment, which functions together as a system.

B. Electric Duct Heaters:
1. Heaters shall be electrically tested as follows:
    a. For electric duct heaters rated ≤ 250 V: Test at 1,000 V.
    b. For electric duct heaters rated > 250 V: Test at and 1,000 V plus twice the rated voltage.
2. All heaters shall be tested at manufacturing facilities for assurance of high quality standards and performance by trained personnel.
3. All components shall be tested for function following installation in the heater.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Inspection:

1. The Contractor shall not install damaged items until repairs are made in accordance with manufacturer's written instructions and approval by Engineer.

a. Only minor repair work will be permitted in the field.

b. All damaged items requiring remedial work shall be returned to the manufacturer for repair or replacement.

3.02 INSTALLATION

A. Install electric heaters in complete accordance with the manufacturer's printed installation instructions and the approved shop drawings. In addition:

1. Install cabinets level and plumb.

2. Coordinate with ceiling grid for ceiling recessed units installation.

3. Set air deflectors for proper air delivery.

4. Check room thermostat and wiring connections to heater

3.03 FIELD TESTING / QUALITY CONTROL

A. Furnish the services of a qualified manufacturer's representative to check and approve all installations before operation in accordance with the requirements of the Contract documents. In addition:

1. The Contractor shall verify that all work furnished and installed conforms to the requirements of the Contract Documents.

B. All tests shall be performed in accordance with Section 23 05 93, Testing, Adjusting, and Balancing for HVAC.

3.04 STARTUP / DEMONSTRATION

A. Furnish the service of a qualified manufacturer representative to assist and train the plant operations and maintenance staff in the care, operation, and maintenance of the electric heaters in accordance with the requirements of the Contract Documents. In addition:

1. The Contractor shall make all adjustments required to place Work in proper operating condition.

2. The Contractor shall include instruction on care and maintenance of the electric heaters in the training of plant personnel.

3. In the event of trouble with the equipment, the manufacturer's representative shall revisit the site as often as required until all troubles are corrected and the installation is entirely satisfactory.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting:

1. Upon completion of the installation, the Contractor shall adjust all the electric heaters for their intended use.

B. Protection:

1. Electric heaters shall be protected as per the requirements of the Contract Documents. The use of electric heaters shall not be permitted until permission is given by the Engineer.

a. When permission is given, the Contractor shall operate each electric heater to ensure their performance.

C. Cleaning:

1. In addition to the requirements of the Contract Documents, the Contractor shall thoroughly clean all surfaces of the installed electric heaters and remove all debris and waste materials resulting from installation.

2. Clean work as specified in the Contract Documents.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 26 05 11 – GENERAL ELECTRICAL REQUIREMENTS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials and equipment required to perform the Work in accordance with the general electrical requirements as specified under this Section and shown on the Contract Drawings.

B. The Work shall also include the following:

1. Inserts and other electrical items which shall be installed embedded in concrete, or built into walls, partitions, ceilings or panels constructed by other trades.

2. Installation procedures and schedules shall be reviewed and coordinated with other trades regarding the installation of electrical items that must be installed.

3. Keep informed of the construction so the electrical work shall be installed within such time periods as will not delay the work of the other trades.

4. Notify other trades in advance of the installation of the work included, so they shall have sufficient time for coordination and installation of interrelated items that are included in their contracts and that must be installed in conjunction with the Work included under this Contract.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 09 91 00 - Painting

1.04 REFERENCES

A. NYCEC - New York City Electrical Code

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. All equipment and devices provided shall be properly connected and interconnected with other equipment and devices so as to render the installations complete for successful operation, regardless of whether all the connections and interconnections are specifically mentioned in the Sections or shown on the Contract Drawings.

B. Similar products shall be by the same manufacturer for uniformity on the Contract.

C. Electrical material and equipment shall be new and shall bear the label of UL, or other nationally recognized, independent testing laboratory, wherever standards have been established and label service regularly applies.

D. Contractor shall make all necessary arrangements in advance with Con Edison in order for Con Edison to establish the new secondary service supplies for each of the two sites shown on the Contract Drawings.

E. Where execution of the work under this Contract requires certain systems and equipment to be modified, the Contractor shall perform the work with due regard to maintenance of operations and construction staging in accordance with the Specifications.

F. The modification work shall be coordinated in advance with the collections personnel and existing conditions. Contractor shall field determine and make such investigations as required to determine the functionality of each circuit and identify circuit terminations as required for the modifications intended to ensure the proper interface of all components for a complete functional system.

G. The Contractor shall retain the services of a wiring coordinator, to prepare the point-to-point field wiring diagrams. The wiring coordinator shall have experience in the development of the diagrams of the type specified and shall have served in a similar role on a project of similar size and complexity.

H. Area Classifications

1. Materials and equipment for all indoor areas shall conform to the area classifications shown on the Contract Drawings or stated in the Specifications.
2. Materials and equipment for all outdoor areas shall conform to corrosive requirements, unless shown otherwise on the Contract Drawings or stated in the Specifications.
3. The locations and requirements shall be in accordance with the following:
   a. Materials, equipment and incidentals installed in corrosive areas shall meet NYCEC and NEMA requirements for corrosive locations. Enclosures installed in corrosive locations shall meet NEMA 4X requirements.
   b. Materials, equipment and incidentals installed in hazardous locations shall meet NYCEC requirements for the Class, Division, and Group designated. Enclosures installed in hazardous locations shall be provided with stainless steel hardware and watertight gasketing.
   c. Materials, equipment and incidentals installed in dusty locations shall meet NYCEC and NEMA 12 requirements.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited, to:
   1. Point-to-point field wiring diagrams.
   2. Qualifications of proposed wiring coordinator who shall prepare the point-to-point field wiring diagrams.

B. Reports
   1. Demonstration of equipment report shall be submitted.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Secondary Service

1. Provide secondary service equipment in accordance with and as described by Con Edison Specifications for Electric Installations. The secondary service equipment that is required for each of the two sites includes the following:
    a. Property line box for underground service.
    b. Tran-S enclosure for current transformers and CT meter socket.

B. Point-To-Point Field Wiring Diagrams

1. The Contractor shall provide point-to-point field wiring diagrams for all equipment, including equipment provided by other trades.
2. The diagrams shall be developed for performance of the work and to document terminations. The diagrams shall be prepared based upon approved shop drawings and inspections as necessary to complete the diagrams. The diagrams shall include:
    a. External wiring for each piece of equipment, panel, instrument and other devices to control stations, lighting panels and motor controllers. The diagrams shall include control, status, signal and power wiring. Power diagrams shall include connections to switchgear, motor control centers, panelboards, panels and field devices.
    b. Numbered terminal block identification for each wire termination.
    c. Identification of the assigned wire numbers and color coding for all interconnections.
    d. Identification of all wiring by the conduit tag in which the wire is installed.
    e. Terminal, junction, and pull boxes through which wiring is routed.
    f. Identification of equipment with functional name and number to which wiring is to be connected.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Shop Finishes

1. Electrical equipment shall be shop painted in accordance with the requirements of Section 09 91 00- Painting.
2. Exposed ferrous metal surfaces except aluminum, bronze, brass and stainless steel components shall be cleaned with a commercial blast and primed with one coat of rust inhibitive primer.
3. Manufactured assemblies such as switchgear, substations, motor control centers, panelboards and motor controllers shall be shop painted in accordance with the requirements of Section 09 91 00 - Painting.

4. Other equipment shall be painted with the manufacturer's best grade finish paint system compatible with the finish coatings specified in Section 09 91 00 - Painting.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Maintenance of Operations

1. Where execution of the work under this Contract requires certain equipment to be taken out of service, the Contractor shall perform the work with due regard to maintenance of operations and construction staging in accordance with the Specifications.

2. The Contractor shall schedule the work in advance with the Engineer so as not to affect proper plant operations. When the work is scheduled, the Engineer shall be notified 48 hours prior to proceeding with the work to allow time for the collections personnel to perform load switching and alternation of equipment.

3. To the maximum extent possible at the end of the workday, all equipment shall be back in place and ready for its normal service use should a plant emergency arise. In addition, should an emergency condition occur during execution of the work, at the request of collections personnel, the equipment shall be placed back in service immediately and turned over to plant personnel.

4. In the event of accidental shutdown of plant equipment, the Contractor shall notify plant personnel immediately to allow for an orderly restart of affected equipment.

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. The Contractor shall demonstrate, in the presence of the Engineer that all electrical systems and electrically operated equipment operate as specified, designed and as required.

B. The Contractor shall coordinate the demonstration of the electrical systems which are part of other Contracts with the other Prime Contractors.

C. The demonstration of equipment shall include the following:

1. All power circuits shall be operated to verify proper connection and pump rotation of equipment. Mechanical key-interlocks for circuit breakers shall be operated to verify their proper operation. Power shall be removed and reapplied to automatic transfer switches to verify their operation.
2. Emergency power systems shall be activated to verify their automatic start-up, proper operation while running and proper deenergization and cool down upon availability of normal power.
3. All pushbuttons, indicating lights and similar devices shall be operated to verify proper connection and function. All devices, such as pressure and flow switches and similar devices shall be operated to verify that shut-downs and control sequences operate as required.
4. The Contractor, with coordination of the other Prime Contractors, shall operate the systems to verify wiring and adjust the controls, as required, to achieve proper operation. This shall include wiring, timing and switching functions.

D. The Contractor shall provide a demonstration of equipment report. The report shall include complete information on time, schedule, tasks performed, persons contacted, problems corrected, and all other pertinent information.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Restoration

1. The Contractor shall field paint after installation marred or scratched surfaces. All scratches, abrasions and other damage to equipment shall be touch-up painted in accordance with the requirements of Section 09 91 00 - Painting.

END OF SECTION

SECTION 26 05 20 – LOW-VOLTAGE WIRES, CABLES AND ACCESSORIES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing low-voltage electric wires, cables and accessories.

1. Low-voltage electric wires, cables, and accessories shall be provided in accordance with the requirements specified under this Section, the Specifications and the Contract Drawings.

B. Low-voltage electric wires and cables to be provided shall include all accessories.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 06 11 – Cable and Conduit Schedule

1.04 REFERENCES

A. Definitions

1. Low-voltage as used in this Section and the Specifications shall mean all equipment, conductors, insulation systems and accessories intended for operation within the 600 Volt Class.

2. Low-voltage wires and cables shall mean all insulated electric wires and cables intended for use for power, lighting, control, instrumentation, communication, security and alarm circuits.

3. Low-voltage wires and cable accessories shall mean all devices and items intended to provide mechanical protection, terminate, connect, splice, insulate, tag and manage low-voltage wires and cables.

4. Cable is an assembly of insulated wires combined with fillers and separators in an enclosing jacket of insulating material.

5. All references to the Electric Utility or Utility shall mean Consolidated Edison Company or the Local Electric Utility having jurisdiction.

B. Reference Standards

C. Low-voltage wires and cables shall comply with the latest applicable provisions and recommendations of the following:

1. ANSI/ICEA S-95-658/

2. NEMA WC70 - Power Cables Rated 2000 V or Less for the Distribution of Electrical Energy

3. ASTM B5 - Standard Specification for High Conductivity Tough-Pitch Copper Refinery Shapes

4. ASTM B8 - Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

5. ASTM D69 - Standard Test Methods for Friction Tape

6. ASTM D2301 - Standard Specification for Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape

7. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape

8. ICEA S-58-679 - Standard for Control, Instrumentation and Thermocouple Extension Conductor Identification

9. IEEE 1210 - Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable

10. NEMA WC 26/
EEMAC 201 - Binational Wire and Cable Packing Standard

11. NETA ATS - NETA Acceptance Testing Specifications

12. NYCEC - NYC Electrical Code

13. NYCCC - NYC Construction Code

14. UL Standard 486A-486B - Wire Connectors

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. General:

1. All low-voltage wires, cables and accessories shall be made by an approved manufacturer, and in their construction shall be employed the most improved commercial materials and processes of manufacture.

2. Only low-voltage wires, cables and accessories manufactured under high standards of production and meeting the approval of the Engineer shall be used.

3. Friction tape shall be in accordance with ASTM. D69.

4. All low-voltage wire and cable splicing and terminations shall be done by experienced cable splicers who have worked with similar wire and cable for a period of at least 5 years, using materials and procedures recommended by the wire and cable manufacturer. All splicing and terminations of low-voltage wire and cable shall be in accordance with the instructions of the low-voltage wire and cable manufacturer.

5. The low-voltage wire and cable manufacturer shall use a shop test facility that has recently calibrated testing apparatus and qualified, experienced technicians, for all shop tests. Calibration of testing apparatus shall be within one year.

6. All test equipment and instrument calibration shall be in accordance with the latest edition of the accuracy standard of the U.S. National Institute of Standards and Technology and the NETA acceptance testing specification.

7. Field testing of low-voltage wires and cables shall be in accordance with the requirements specified under this Section.

8. The Contractor shall retain the services of an independent testing firm who shall perform acceptance testing on the low-voltage wire and cable installation.

a. The testing firm shall have experience in the inspection and testing of wires and cables of the type specified and shall be a member company of NETA.

b. Provide proof of membership or demonstrate that the standards and experience required for membership are possessed, all to the satisfaction of the Engineer.

c. The testing shall be performed in accordance with the requirements specified under this Section.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. A list of proposed manufacturers shall be submitted with the products they produce proposed for the contract.

2. Manufacturer's Literature, specifications and engineering data for low-voltage wires, cables and accessories including but not limited to:

a. Manufacturer and type of wire or cable.

b. Minimum insulation resistance in megaohms per 1,000 ft. at 20 degrees C.

c. Material, number and size of strands composing each conductor.

d. Conductor insulation thickness in inches with material and voltage rating.

e. Jacket thickness in inches.

f. Average outside diameter of bare conductor.

g. Average outside diameter of finished wire or cable and jacket material.

h. Weight per 1,000 ft. of finished wire or cable.

i. Minimum bending radius, in inches.

j. Minimum pulling temperatures at which cable may be pulled without damage.

k. Maximum pulling tensions which may be applied to the cable without damage.

l. Literature identifying the methods and materials which Contractor proposes to use to make splices and terminations. Submittal shall consist of manufacturer's literature evidencing compatibility of the conductor insulation and jacket of the wire or cable with the splicing or terminating materials and methods which Contractor proposes to use.

m. Manufacturer recommended pulling lubricants.

n. Qualifications of splicing and termination personnel.

3. Description of shop and field testing methods, procedures and apparatus with calibration dates shall be submitted. Testing methods and procedures shall be submitted at least 45 days in advance prior to conformation of witness testing dates and actual testing.

4. Qualifications of proposed testing firm to perform acceptance testing shall be submitted. Submit firm experience records at least 45 days in advance to actual testing, five recent references with phone numbers shall be submitted.

B. Reports:

1. Shop and field test reports shall be submitted.

2. Acceptance testing report shall be submitted.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Low-voltage wires, and cables shall be delivered, stored and handled in accordance with the Specifications and the manufacturer's instructions.

B. Deliver low-voltage cables on factory reels conforming to NEMA WC26. Each end of each length of cable shall be hermetically sealed with the manufacturer's end caps and securely attached to the reel. Reels with unsealed ends will be rejected.

C. Inspect wire and cable protective coverings for evidence of damage during shipment.

D. Accomplish unloading without contacting cable surface or protective coverings or dropping cable reels from the delivering vehicle to the ground.

E. Store wires and cables on reels on elevated hard surfaces in a clean dry locations away from construction equipment, falling objects, sources high heat and chemicals or petroleum products.

F. Seal cut cable ends using properly sized heat shrink cap to prevent moisture ingress and wicking into the cable interior.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Low-voltage single conductor wires for installation in conduit shall be as manufactured by:

1. Southwire, Carrollton, GA;
2. General Cable, Highland Heights, KY;
3. Okonite Company, New York, NY;
4. Or approved equal.

B. Low-voltage cable shall be as manufactured by:

1. Southwire, Carrollton, GA;
2. General Cable, Highland Heights, KY;
3. Belden; Indianapolis, IN
4. Okonite Company, New York, NY;
5. Or approved equal.

C. Low-voltage welding cable shall be manufactured by:

1. General Cable, Highland Heights, KY;
2. Cole Wire and Cable, Lincolnshire, IL
3. Or approved equal.

D. Compression connectors ring tongue type shall be manufactured by:

1. Ideal Industries, Sycamore, IL;
2. Thomas and Betts, Memphis, TN;
3. Burndy, Manchester, NH;
4. Or approved equal.

E. Compression splices shall be manufactured by:

1. Ideal Industries, Sycamore, IL;
2. Thomas and Betts, Memphis, TN;
3. Burndy, Manchester, NH;
4. Or approved equal.

F. Waterproof compression splices shall be manufactured by

1. Ideal Industries, Sycamore, IL;
2. Thomas and Betts, Memphis, TN;
3. Burndy, Manchester, NH;
4. Or approved equal.

G. Spring connector splices shall be manufactured by:

1. Ideal Industries, Sycamore, IL;
2. Thomas and Betts, Memphis, TN;
3. Burndy, Manchester, NH;
4. Or approved equal.

H. Markers shall be as manufactured by:

1. Ideal Industries, Sycamore, IL;
2. Thomas and Betts, Memphis, TN;
3. Brady, Milwaukee, WI;
4. Or approved equal.

I. Pulling lubricant shall be as manufactured by:

1. American Polywater Corporation, Stillwater MN;
2. 3M – St. Paul, MN;
3. Ideal Industries, Sycamore, IL;
4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Low-voltage Voltage wire and cable

1. Low-voltage wire and cable shall be used for all power, lighting, control instrumentation, alarm and security system circuits. The size and quantity of low-voltage wires and cables shall be as indicated in the conduit and cable schedule. The conductor jacket shall be in accordance with color identification requirements specified under this Section.
2. Low-voltage single conductor wires for installation in conduit shall be in accordance with the following:
   a. Conductors shall be stranded, copper, single conductor wire conforming to ASTM B8, and B33 No. 12 AWG minimum size.
   b. Conductor insulation shall be flame-retardant, moisture and heat resistant thermoset rated 90 degrees C in wet and dry locations and listed by UL as type XHHW-2.
3. Low-voltage cable for installation in conduit shall be in accordance with the following:
   a. Conductors shall be stranded, copper conforming to ASTM B8 and B33, No. 12 AWG minimum size.
   b. Conductor insulation shall be moisture and flame resistant cross-linked polyethylene rated 90 degrees C in wet and dry locations and listed by UL as type XHHW-2.

c. Cable conductors shall be assembled together with flame and moisture resistant filters and tape to make round.

d. Cable shall include an overall protective jacket of polyethylene compound, 45 mils minimum thickness.

4. Variable frequency drive power cable shall be used for motor circuits operated from variable frequency drives. Variable frequency drive power cables sahll be in accordance with the following:

a. Cable shall be VFD type power cable, three-conductors rated 600 Volts, 90 Degrees Celsius Wet or Dry.

b. Conductors shall be stranded, copper with cross-linked polyethylene insulation.

c. Cable shall include three symmetrically placed copper ground conductors and a five-mil copper tape shield.

5. Low-voltage welding cable shall be used for the connection of the portable generator output supply receptacles to the docking station receptacles.

a. Cable shall be Class M welding type, extra flexible, size as indicated on the Contract Drawings.

b. Conductors shall be stranded bare copper conforming to ASTM B172.

c. Conductor insulation shall be moisture and oil resistant thermoset, rated 90 degrees C in wet and dry locations and listed by UL as type RHH/RHW. Color orange.

d. Provide welding cable in five equal lengths of 50 feet per each cable, one cable for each of the 3 phases, one for neutral as required and one for ground. When multiple sets are indicated on the Contract Drawings provide the additional phase, neutral and ground cables for each parallel set.

e. Prepare cables for installation as described under Part 3 of this Section. Provide storage box as indicated on the Contract Drawings for on-site storage of cables.

6. Instrumentation cable shall in addition comply with the following:

a. Conductors shall No 16 AWG minimum size

b. All conductors shall be polyethylene insulated and twisted in pairs with aluminum-mylar shield overlap.

c. Cable jacket shall be low halogen

7. Communication cable shall in addition comply with the following:

a. Conductors shall be No 24 AWG minimum size.

b. Conductor twist and shielding shall be as shown on the Contract Drawings or as stated in this Specification.

c. Cable jacket shall be low halogen

8. Fire Alarm cable shall in addition comply with the following:

a. Conductors shall 18 AWG minimum size

b. Cables shall be UL listed for the intended service

c. Cables intended for use in the installation shall be approved for the intended use by the New York City Building Department, Material and Equipment Acceptance Division.

9. Security system cable shall in addition comply with the following:

a. Conductors shall be No 22, AWG minimum size.

b. Conductor twist and shielding shall be as shown on the Contract Drawings or as stated in this Specification.

c. Coaxial cable shall be as shown on the Contract Drawings or as stated in this Specification.

10. Category 6e Ethernet cable shall be provided where shown on the Contract Drawings. Ethernet cable shall be in accordance with the following:

a. UL 444, flame tested to UL 910 and UL rated type CMP and MMP meeting ANSI/TIA/EIA-568-A.

b. 4 pair, 24 AWG solid copper conductors with FEP insulation, shielded pairs and PVC overall jacket.

c. Characteristic impedance: 100+/-15 ohms.

d. DC resistance: 7 ohms maximum.

e. DC resistance unbalance: 2.5% maximum.

f. Mutual capacitance: 5.6nF/100 meters maximum.

g. Pair to pair capacitance unbalance: 100pF/100 meters maximum.

B. Low-voltage wire and cable accessories

1. Cable connectors shall be provided for terminating low-voltage wire and cable. Connectors shall be solder less type and properly sized to fit fastening device and wire size. Connectors shall be in accordance with the following:

a. For wire sizes up to and including No. 6 AWG, compression type with UL 486A listing shall be used. All cable terminations for conductors No. 10 AWG and smaller shall be terminated using UL listed terminals, nylon insulated connectors, at each terminal board.

b. For wire sizes No. 4 AWG and above, either compression type or bolted type with tin-plated contact faces shall be used.

c. For wire sizes No. 250 kcmil and larger, connectors with at least 2 cable clamping elements or compression indents and provision for at least 2 bolts for joining to apparatus terminal shall be used.

2. Splicing for low-voltage wire and cable shall be performed when terminals are not provided. Splicing shall be in accordance with the following:

   a. For wire sizes No. 8 AWG and larger, splices shall be made up with compression type copper splice fittings with UL 486A listing. Splices shall be taped and covered with materials recommended by the cable manufacturers, to provide insulation equal to that on the conductors.

   b. For wire sizes No. 10 AWG and smaller, splices shall be made up with preinsulated, spring connectors. Connectors shall be flame retardant with UL listing. Spring connectors shall be Twister type.

   c. For wet locations, splices shall be waterproofed. Compression type splices shall be waterproofed by a sealant-filled, thick wall, heat shrinkable, thermosetting tubing or by pouring a thermosetting resin into a mold that surrounds the joined conductor. Waterproof compression splices shall be UL listed, heavy wall type. Spring connector splices shall be UL listed and waterproofed with a sealant-filler. Spring connectors shall be Twister DB type.

3. Compression connectors shall be UL listed terminals.

4. Cable markers shall be provided for the identification of low-voltage wire and cable. Markers shall be in accordance with the following:

   a. Markers shall be vinyl type, moisture, heat and abrasion resistant with adhesive back. Cable identification shall be clearly marked.

5. Low-voltage wire and cable pulling lubricant shall be used to reduce wire and cable tension and side wall pressure and aid in minimizing damage during low-voltage wire and cable installation. Pulling lubricant shall be in accordance with the following:

   a. UL Listed, compatible with the wire insulation or cable jacket, the raceway involved and acceptable to the wire and cable manufacturer. When wire and cable manufacturer shall be provided.

   b. Pulling lubricant shall be water based, with a 0.17 average coefficient of friction and a temperature range of 20 to 120 degrees F.

   c. Pulling lubricant shall confirm to IEEE 1210

   d. Pulling lubricant shall not support combustion.

   e. Pulling lubricant shall not cause residue to cement insulation or jackets to the inside of conduit or ducts.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Certified Shop Tests:

1. Shop testing shall be performed on the low-voltage wire and cable at the manufacturer's plant prior to shipment. Shop test shall be in accordance with the latest revisions of ICEA and UL and shall demonstrate that the wire and cable tested conforms to the requirements specified.

2. The Contractor shall provide a shop test report. The report shall identify the tests performed and the results obtained.

3. All low-voltage wire and cable shall be shop tested in accordance with the requirements of this Specification.

B. Witnessed Shop Tests:

1. The Contractor shall perform witnessed shop tests in accordance with this Specification.

2. The Engineer shall have access during working hours for inspection purposes to all parts of the works where material and cable are being manufactured, and all reasonable inspection and testing facilities shall be provided to him without increase in price. The Engineer may request that dielectric strength tests and measurements be made to verify the cable data furnished by the Contractor. For this purpose the Contractor shall furnish without increase in price, a length of cable, not to exceed 3 feet for each size to be cut from one or more reels as directed by the Engineer. Each sample shall be marked with a tag bearing full description of cable insulation and number of reel from which it is cut.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. All low-voltage wires and cables, with the exception of the welding cables shall be installed within the raceways as shown on the Contract Drawings. They shall be carefully handled so as to avoid twists or kinks in the conductors or damage to the insulation.

B. The Contractor shall ensure that the manufacturer's recommended cable bending radii and pulling are not exceeded and that the number of conductors permitted in a conduit are in accordance with the latest applicable section of the NYCEC.

C. No splices shall be permitted between terminals except at approved junction or terminal boxes. Boxes shall be provided as shown on the Contract Drawings or as required by Code for the pull lengths. No more than two terminations shall be made at each terminal point. Cable and wire runs shall be looped through pull boxes without cutting and splicing where possible. All splices below grade, in manholes, hand holes and wet locations shall be waterproofed.

D. No splicing of instrument wiring shall be permitted. Instrument wiring shall be extended by use of field termination boxes employing labeled terminal strips. Shield continuity shall be maintained. Ultimate shield termination (ground) shall be at one end only.

3.02 INSTALLATION

A. Wire and Cables

1. Cables shall be installed complete with proper terminations at both ends. For each motor circuit, Contractor shall ensure proper phasing, phase sequence and motor rotation.

2. Wire and cable contained within a single conduit shall be pulled simultaneously using insulating pulling compounds containing no mineral oil.

3. Pulling tension on wires and cables shall be continuously monitored using a calibrated Dynamometer type device, having a calibration label within six months of its use.

4. Cables shall be installed with maximum slack at all terminal points, boxes, handholes and manholes.

5. Low-voltage cables located within manholes, handholes and boxes shall be wrapped with fireproofing tape for their entire length on an individual cable basis.

   a. Tape shall be 30 mills thick of self-extinguishing material which will not support combustion.

   b. Tape shall not deteriorate when subjected to water, salt, sewage or fungus and shall be secured with glass cloth tape.

   c. Low-voltage cables shall be fireproofed in accordance with the cable manufacturer's recommendations and then covered with tape extending at least one inch into any duct.

6. Prepare welding cable for connection of the portable generator and docking station, one for each set of the 3 phases, one for neutral as required and one for ground. Connect the generator and docking station furnished Posi-Lok plugs one plug on each end of each welding cable. Color band each cable on each end with color that matches the conductor identification tabulation specified under this section.

B. Conductor Identification

1. Each conductor shall be labeled at each termination point and all splice locations. Carry individual conductor or circuit identification throughout, with circuit numbers or other identification stamped on terminal boards when provided or the cable so it is visible around the cable's circumference.

2. Each conductor shall be identified in junction boxes, cabinets, and terminal boxes. Where no termination is made, use a plastic-coated, self-adhesive,

wire marker. Where termination is made, use a plastic, pre-printed sleeve wire marker. Paper, self-adhesive wire markers shall not be used.

3. In manholes and handholes, each power conductor shall be identified by a laminated plastic tag located so that it can be seen from center of manhole without moving adjoining wires. Bundle and mark control wires as listed in conduit and cable schedule.

4. Multi-conductor control cables shall be color coded in accordance with ICEA S-58-679, Method 1, Table E

5. The following identification scheme shall be used for all low-voltage power circuits:

	Colors				
Voltage	Neutral Conductor	Phase A Conductor	Phase B Conductor	Phase C Conductor	Ground Conductor
208/120V	White	Black	Red	Light Blue	Green
240/120V	White-Gray Strip	Black-Blue Strip	Red-Blue Strip	None	Green
480/277V	Gray	Brown	Orange	Yellow	Green

3.03 FIELD TESTING / QUALITY CONTROL

A. After installation, all low-voltage wire and cable shall be field acceptance tested. The field tests shall be performed by the testing firm who shall furnish all testing equipment. The field tests shall be witnessed by the Engineer and certified by the Contractor. The Contractor shall provide a report identifying the tests performed and the results obtained.

B. Each electrical circuit shall be tested after permanent wires and cables are in place to demonstrate that the circuit and equipment are connected properly and will perform satisfactorily, as required, as intended, and that they are free from improper grounds and short circuits. The tests shall consist of the following:

1. Low-voltage wire and cable mechanical connections shall be individually tested after installation and before they are put in service with a calibrated torque wrench. Values shall be in accordance with manufacturer's recommendations.

2. Low-voltage wires and cables shall be individually acceptance tested for continuity between the required termination points for each ungrounded and grounded conductor. Test wire and cable after installation and before first energization or before they are put in service with an approved continuity tester. Test results shall be as recommended by the wire and cable manufacturer or in accordance with NETA ATS, NEMA, ICEA Standards.

3. Low-voltage wires and cables shall be individually acceptance tested for insulation resistance between ungrounded and grounded conductors, and

from each ungrounded and grounded conductor to ground. Test wire and cable after installation and before first energization or before they are put in service with an approved insulation resistance tester, for one minute at a voltage rating recommended by the cable manufacturer or in accordance with NETA ATS, NEMA, and ICEA Standards.

4. The insulation resistance for any given conductor shall not be less than the value recommended by the cable manufacturer or in accordance with NETA ATS, NEMA and ICEA Standards. Any cable not meeting the recommended value or which fails when tested under full load conditions shall be replaced with a new cable for the full length.

5. Shielded instrumentation cable shields shall be tested with an ohmmeter for continuity along the full length of the cable and for shield continuity to ground.

6. Connect Shielded instrumentation cables shall be connected to a calibrated 4-20 milliamp DC signal transmitter and receiver. Test at 4, 12, and 20 milliamp transmitter settings.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 26 05 27 – GROUNDING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing grounding.

1. Grounding shall be provided in accordance with the requirements specified under this Section, the Specifications and the Contract Drawings.

2. The grounding Work shall be a complete system for the electrical and instrumentation systems, structures and equipment. The Work shall include grounding of all electrical equipment, transformer neutrals, equipment enclosures, grounding electrodes, fences, and gates.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 05 20 – Low -Voltage Wires, Cables and Accessories

B. Section 26 05 33 – Raceways and Boxes for Electrical Systems

1.04 REFERENCES

A. Definitions

1. Grounding

a. Grounding and grounding system shall be used interchangeable in this Section and the Specifications to mean, the means and methods by which all electrical and instrumentation systems are grounded for the purposes of attaining safety grounding, equalization of ground potential, reducing ground potential rises during fault events and the grounding of the ungrounded conductor as required by the NYCEC and Electric Utility Standards

2. Electric Utility

a. All references to the Electric Utility shall mean the Consolidated Edison Company or the Local Electric Utility having jurisdiction.

B. Reference Standards

1.	ASTM B8	-	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard or Soft
2.	NYCEC	-	New York City Electrical Code
3.	Electric Utility	-	Standards and Guidelines
4.	UL 467	-	Electrical Grounding and Bonding Equipment

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. The grounding system maximum resistance shall not exceed 5 ohms under normally dry conditions. All structures and metal equipment containing electrical apparatus shall be connected to ground.

B. All grounding associated with the service feeders shall be in accordance with the requirements of the Electric Utility.

C. Retain the service of an independent testing firm who shall perform field acceptance testing of the grounding systems. The testing firm shall have experience in the inspection and testing of the grounding systems and shall be a member company of NETA.

D. Acceptance testing shall be in accordance with the requirements specified under this Section.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. A list of proposed manufacturers with the products they produce proposed for the contract.
2. Manufacturer's catalog cuts for the grounding materials proposed for use.
3. Scaled Plan Drawings showing proposed routing and layout of the grounding system.

B. Field test report shall be submitted.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The grounding equipment shall be delivered, stored and handled in accordance with this Section, the Specifications and the manufacturer's recommendations.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Ground cable shall be as manufactured by:

1. Erico, Solon, OH;
2. Harger, Grayslake, IL;
3. General Cable, KY;
4. Or approved equal.

B. Ground rods shall be as manufactured by:

1. Erico, Solon, OH;
2. Harger, Grayslake, IL;
3. Blackburn/Thomas and Betts, MN;
4. Thompson Lightning Protection Inc, MN;
5. Or approved equal.

C. Bolted or compression grounding connectors shall be as manufactured by:

1. Burndy, Manchester, NH;
2. Harger, Grayslake, IL;

3. Thomas and Betts, Memphis, TN;
4. Or approved equal.

D. Welded grounding connections shall be as manufactured by:
1. Cadwell, Solon OH;
2. Harger, Grayslake, IL;
3. Or approved equal.

E. Ground Resistance Tester shall be as manufactured by:
1. Fluke, Everett, WA.
   a. Model 1625-2 GEO or approved equal.
2. Megger, Dallas, TX.
   a. Model DET 2/3 or approved equal.
3. AEMC Instrument, Dover, NH.
   a. Model 6471 or approved equal
4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Ground Cable
1. The ground cable shall be soft drawn bare stranded copper conforming to ASTM B8, No. 8 AWG minimum size.
2. The insulated cable for equipment grounding shall conform to the requirements of Section 26 05 20 – Low-Voltage Wires, Cables and Accessories.

B. Ground Rods
1. Ground rods shall be stainless steel, 3/4-inch diameter and 10 feet long.
2. Ground rods shall have a drive point at the lower ends. The upper end of each rod shall be equipped with bronze, clamp type connectors with not less than four bolts.

C. Grounding Bus Bars
1. Bare, copper bars of rectangular cross section complying with ASTM B187. Grounding bus size and number of predrilled holes shall be as required with provisions for 25 percent future expansion and secured to wall with insulated stand-off supports.
2. Bus bar stand-off supports shall be fiberglass reinforced polyester insulators rated 2500 Volt with threaded holes at both ends for bus installation and 304 stainless steel brackets and hardware.

D. Grounding Connectors.

1. Compression connectors shall be heavy duty copper. Bolted connectors shall be copper alloy castings, designed specifically for the items to be connected, and assembled with Durium or silicone bronze bolts, nuts and washers.
2. Welded connections shall be by exothermic process utilizing molds, cartridges and hardware designed specifically for the connection to be made.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. A complete ground grid system shall be installed as shown on the Contract Drawings.

B. Ground cable shall be installed around perimeter of structures at a minimum of 2 feet-6-inches below grade.

C. Ground rods shall be installed 2 feet below grade, 2 feet from foundation walls and shall extend 10 feet vertically into the earth or horizontally not less than 36 inches below grade.

D. Test points shall be installed at locations and in accordance with the details shown on the Contract Drawings.

E. Equipment shall be connected in accordance with the details shown on the Contract Drawings. All steel column and underground connections shall be welded except for test points.

F. Metal casings or supporting frames of electrical equipment, such as transformers, panel boards, control panels, motor control centers, and individual motor controllers shall be grounded. The equipment shall be thoroughly grounded to the facility grounding system. All metal conduits leaving all electrical equipment shall be grounded. Grounding type fittings shall be installed on flexible conduits.

G. An insulated cable for equipment grounding shall be installed with the phase conductors within the conduit for the nominal 120 volt and higher power, lighting and control circuits.

3.03 FIELD TESTING / QUALITY CONTROL

A. After installation, the completed ground system shall be field acceptance tested for operation and conformance. The field acceptance tests shall be witnessed by the

Engineer and certified by the Contractor. The Contractor shall provide testing consisting of the following:

1. Resistance testing shall be made using approve Earth Ground Resistance Testers not less than 48 hours after rainfall.
    a. Resistance values above 5 ohms shall be brought to the Engineer's attention with remedial recommendations.
2. Grounded cables and metal parts shall be continuity tested. The conduit system shall be ground tested in accordance with the requirements of Section 26 05 33 – Raceway and Boxes for Electrical Systems.

B. The Contractor shall provide a Field Test Report, the report shall identify the testing performed and the results obtained.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 26 05 29 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing supporting devices.

1. Supporting devices shall be provided in accordance with the requirements specified under this Section, the Specifications and the Contract Drawings.

2. The supporting devices shall be a complete system for the equipment.

3. The Work shall include providing all required support devices to properly mount and secure all equipment furnished under this Contract.

B. This Section also includes equipment anchorage and restraints suitable to meet the specified seismic requirements.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 05 33 - Raceways and Boxes for Electrical Systems

1.04 REFERENCES

A. Supporting devices shall comply with the latest applicable provisions and recommendations of the following:

1. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength, Low- Alloy, High-Strength, Low-Alloy with Improved Formability, and Ultra-High Strength
2. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
3. MFMA 103 - Guidelines for the Use of Metal Framing
4. MFMA 4 - Metal Framing Standards Publication
5. ASTM A123 and A153 – Hot Dipped Galvanized Finish
6. ASTM B117 – Salt Fog Spray Test
7. ASTM A1046 and 1059 - Defender Finish

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. General

1. All channels, fittings and hardware used in the supporting system shall be in accordance with MFMA 4 and MFA 103.
2. The design of the support system shall be the responsibility of the Contractor. The Contractor shall provide the proper sized rods, channels, fittings, brackets and appurtenances necessary to adequately support the equipment.
3. The Contractor shall retain the services of a licensed Professional Engineer, registered in the State of New York, to prepare support details for equipment exceeding 50 pounds in weight. The Professional Engineer shall stamp the support system design details.

B. Seismic Requirements

1. Equipment assemblies such as secondary unit substations, switchgear, transformers, motor control centers and panelboards shall be certified to meet seismic requirements of the New York City Building Code.
2. The Contractor shall provide equipment anchorage details for all equipment certified to meet seismic requirements. The details shall be coordinated with the manufacturer’s equipment mounting provisions.

3. The Contractor shall retain the services of a licensed Professional Engineer, registered in the State of New York, to prepare the seismic anchorage and restraint details. The Professional Engineer shall stamp the seismic anchorage and restraint details.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for approval by the Engineer.

B. Submittals shall include, but not be limited to the following:

1. Manufacturer's catalog cuts for the supporting devices proposed for use with specifications and other data required to demonstrate compliance with the specified requirements.

2. Scaled Shop drawings showing dimensions and locations of all items and clearance requirements.

3. Support design details and equipment seismic anchorage and restraint details, stamped by a Licensed Engineer as required.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The supporting devices shall be delivered, stored and handled in accordance with this Section, the Specifications and the manufacturer's recommendations.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Supporting devices shall be manufactured by:

1. B-Line, Highland, IL;

2. Atkore Unistrut/Power Strut, Harvey, IL;

3. Thomas and Betts Kindorf, Memphis, TN;

4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Channels, Fittings and Brackets

1. The Contractor shall provide channels, fittings, brackets and related hardware for mounting and supporting the electrical equipment. Anchor bolts, concrete inserts and related hardware for proper support of equipment

shall also be provided. All equipment necessary to meet the seismic requirements specified shall be provided.

2. Channels shall conform to ASTM A1011/A1011M. Channels shall have a minimum thickness of 12 gauge. The cross sectional width dimension shall be 1-1/2 inch minimum. The depth shall be as required to satisfy load requirements.

3. Attachment holes, when required, shall be factory punched on hole centers approximately equal to the cross sectional width and shall be 9/16 inch diameter.

4. Fittings and brackets shall have 9/16 inch diameter holes on centers identical to the channel or as required to align with the channel holes. Fittings and brackets shall have the same width as the channel and shall be 1/4 inch thick minimum. Fittings and brackets shall mate properly with the channel.

5. All channels, fittings, brackets and related hardware shall be steel and have an electro-plated zinc; for wet areas, outdoor locations, roofs or vents use hot dipped galvanized or defender with self-healing properties finish according to ASTM B633, ASTM A123 and A153, ASTM B117, ASTM A1046 and ASTM A1059.

6. In corrosive and classified areas, channels, fittings, brackets and related hardware shall be type 316 stainless steel. Dissimilar metals shall be avoided when installing stainless steel channels.

B. Conduit Hangers, Supports and Inserts

1. The Contractor shall provide channels, rods, straps, anchors and related hardware for support of the exposed electric conduit system.

2. The Contractor shall also provide anchor bolts, concrete inserts and related hardware for proper support of equipment. All equipment necessary to meet the seismic requirements specified shall be provided.

3. Conduit hangers, supports and inserts shall be in accordance with Section 26 05 33 – Raceway and Boxes for Electrical Systems.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. All supporting devices shall be installed level, parallel and perpendicular to building walls and floors, such that the support system is installed in a neat and professional manner.

B. All holes in hung ceilings for support rods and other equipment shall be made adjacent to bars where possible, to facilitate removal of ceiling panels.

C. The channels, fittings and brackets shall be rigidly bolted together and braced to make a substantial supporting framework support system.

D. Where motor control centers, switchgear, unit substations and other electrical equipment is being installed on concrete pads, the Contractor shall furnish leveling channels and shall install the leveling channel in the concrete pads. Seismic certified equipment shall be anchored in accordance with the seismic anchorage details.

E. All equipment fastenings to steel columns, beams and trusses shall be by beam clamps. In lieu of beam clamps, equipment may be welded to steel structures, subject to Engineer approval.

F. No holes shall be drilled in any steel columns, beams and trusses.

G. Hanger rod supports shall be installed such that threaded rod is parallel to building walls and perpendicular to floors.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 26 05 33 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing conduit system.

1. The conduit system shall be provided in accordance with the requirements specified under this Section, the Specifications and the Contract Drawings.

2. The conduit system required shall be provided with all rigid and flexible conduits, boxes, fittings, supports, hangers and inserts and other conduit accessories as required for the installation of the electric wire and cable.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 05 23.02 - Miscellaneous Metal Fastening

B. Section 09 91 00 - Painting

C. Section 26 05 29 - Hangers and Supports for Electrical Systems

D. Section 40 05 07 - Hangers and Supports for Process Piping

1.04 REFERENCES

A. Definitions

1. Conduit System: Shall mean a complete installation comprising all rigid conduit and flexible connections, boxes, fittings, supports, hangers, inserts and other conduit accessories as required for the installation of electric wires and cables.

2. Conduit Accessories: Shall mean all fittings required to ensure a complete conduit system installation. Conduit accessories shall include, but is not limited to, expansion, deflection, seal and drain fittings, hubs, bushings, duct seal, tags, markers, thruwall seals and bushings.

B. References

1. Electric conduit system shall comply with the latest applicable provisions and recommendations of the following:

2. NYCEC - New York City Electrical Code

3. UL 6 - Electrical Rigid Metal Conduit - Steel

4. UL 360 - Standard for Liquid-Tight Flexible Metal Conduit

5. UL 514A - Metallic Outlet Boxes

6. UL 514B - Conduit, Tubing and Cable Fittings

7. ANSI C80.1 - Electric Rigid Steel Conduit

8. ASTM D870 - Standard Practice for Testing Water Resistance of Coatings Using Water Immersion

9. ASTM D1735 - Standard Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus

10. NEMA RN-1 - PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit

11. ASTM-2247 - Standard Practice for Testing Water Resistant Coating Using 100% Relative Humidity

12. ETL-PVC 001 - PVC Externally Coated Galvanized Conduit PVC Coating Verified for Adhesion

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. A list of proposed manufacturers with the products they produce proposed for the Contract.
2. Manufacturer's catalog cuts for the conduit, boxes, fittings and supports proposed for use.
3. Construction details of conduit racks and other conduit support systems with seismic restraint details and calculations signed by a licensed Professional Engineer, registered in the State on New York.
4. Scaled Shop Drawings showing proposed routing of all conduits, inclusive of conduits embedded in structural concrete and conduits directly buried in earth.
5. Scaled Shop Drawings showing locations of pull and junction boxes and all penetrations in walls and floor slabs.
6. Field test report.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Electric conduit system shall be delivered, stored and handled in accordance with the Specifications, the manufacturer's instructions and the following:

1. Conduit shall be delivered to the Site in standard bundles having each length suitably marked with the manufacturer's name or trademark and bearing the label of the Underwriters' Laboratories, Incorporated inspection service.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Rigid steel conduit shall be as manufactured by:
   1. Atkore/Allied Tube and Conduit Corporation, Harvey, IL;
   2. Wheatland Tube Company, Sharon, PA;
   3. Republic Conduit, Louisville, KY;
   4. Or approved equal.

B. PVC coated rigid steel conduit shall be as manufactured by:
   1. Robroy Industries, Gilmer, TX;
   2. OCAL by Thomas & Betts, Memphis, TN;
   3. Atkore/Calbond, Harvey, IL;
   4. Or approved equal.

C. Hangers, Supports and Inserts shall be as manufactured by:
   1. B-Line, Highland, IL;
   2. Atkore Unistrut / Power Strut Harvey, IL
   3. Kindorf, Harahan, LA;
   4. Or approved equal.

D. Flexible conduit shall be as manufactured by:
   1. Anaconda American Brass Company, Rolling Meadows, IL;
   2. Atkore AFC Cable New Bedford MA
   3. Electric-Flex Company, Roselle, IL;
   4. Or approved equal.

E. Hazardous area flexible conduit shall be as manufactured by:
   1. Crouse Hinds Company, Syracuse, NY;
   2. Appleton Electric Company, Rosemont, IL;
   3. Or approved equal.

F. Unions in hazardous locations shall be as manufactured by:
   1. Crouse-Hinds Syracuse, NY;
   2. Atkore/Calbond/Calbrite, Harvey, IL;
   3. Or approved equal.

G. Unions in non-hazardous areas shall be as manufactured by:
   1. Thomas & Betts, Memphis, TN;

2. Or approved equal.

H. Expansion and deflection fittings shall be as manufactured by:

1. Crouse-Hinds, Syracuse, NY;
2. Atkore/Calbond, Harvey, IL;
3. Appleton Electric, Rosemont, IL;
4. Or approved equal.

I. Sealing fittings shall be as manufactured by:

1. Crouse-Hinds, Syracuse, NY;
2. Appleton Electric, Rosemont, IL;
3. Or approved equal.

J. Drain fittings shall be as manufactured by:

1. Crouse-Hinds, Syracuse, NY;
2. Atkore Calbrite, Harvey, IL;
3. Appleton Electric, Rosemont, IL;
4. Or approved equal.

K. Conduit hubs shall be as manufactured by:

1. O-Z/Gedney Rosemont, IL;
2. Atkore/Calbond, Harvey, IL;
3. Thomas and Betts, Memphis, TN;
4. Or approved equal.

L. Conduit bushings and locknuts shall be as manufactured by:

1. a. O-Z/Gedney, Rosemont, IL;
2. b. Thomas and Betts, Memphis, TN;
3. c. Or approved equal.

M. Duct seal shall be as manufactured by:

1. American Polywater Corp, Stillwater, MN;
2. O-Z/Gedney, Rosemont, IL;
3. Ideal Industries, Sycamore, IL;
4. Or approved equal.

N. Thruwall seals shall be as manufactured by:

1. O-Z/Gedney Rosemont, IL;
2. Or approved equal.

O. Floor seals shall be as manufactured by:

1. O-Z/Gedney, Rosemont, IL.;
2. Or approved equal.

P. Sealing bushings shall be as manufactured by:

1. O-Z/Gedney, Rosemont, IL;
2. Or approved equal.

Q. Fire stop fittings shall be as manufactured by:

1. O-Z/Gedney, Rosemont, IL;
2. Or approved equal.

R. Thru-wall barriers shall be as manufactured by:

1. Crouse-Hinds, Syracuse, NY;
2. Or approved equal.

S. Conduit tags shall be as manufactured by:

1. Seton Nameplate Corporation, Branford, CT;
2. Or approved equal.

T. Conduit markers shall be as manufactured by:

1. Thomas and Betts, Memphis, TN;
2. Or approved equal.

U. Terminal blocks shall be as manufactured by:

1. Allen-Bradley Company, Milwaukee, WI;
2. General Electric Company, Fairfield, CT;
3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Rigid Steel Conduit

1. The Contractor shall provide PVC coated rigid steel conduit for all exposed runs and direct buried underground runs. All steel conduit shall comply with the requirements of ANSI C80.1, and UL 6.
2. Both the inside and outside surfaces of the rigid steel conduit shall be protected against corrosion by a coating of zinc applied by the hot-dip galvanizing process.
3. Conduits, elbows and couplings shall be rigid, heavy wall, mild steel, hot dip galvanized. Conduits, elbows and couplings shall have a smooth interior with tapered threads and carefully reamed ends. Conduit size shall be 3/4-inch minimum and shall conform to UL 6.

4. Conduits, elbows and couplings shall include a PVC coating for all areas.

5. PVC coating of conduit shall be factory applied and shall include a smooth 2 mil thick urethane interior coating and 40 mil thick polyvinyl chloride exterior coating. PVC coated conduit shall conform to NEMA RN-1, ASTM D870, ASTM D1735, ETL-PVC 001, and UL 6. The exterior PVC coating color shall be gray and listed UL DYJC. The threads of conduits that have been cut in the field to size shall have the same PVC coating applied.

B. Hangers, Supports and Inserts

1. The Contractor shall provide hangers, supports and inserts for support of the electric conduit system. The supports shall securely attach the electric conduit system to the channel and structure.

2. When indicated on the Contract Drawings the electric conduit system shall be designed, constructed and installed suitable for earthquake regulations in accordance with the seismic requirements of the New York City Building Code and the Uniform Building Code for Zone 2A application.

3. Transverse and longitudinal bracing shall be provided as required to brace the electric conduit for the seismic requirements specified.

4. All drilled in type concrete inserts shall be expansion shields or anchors conforming to Section 05 05 23.02 – Miscellaneous Metal Fastenings and 40 05 07 - Hangers and Supports for Process Piping. In corrosive and Class 1 and Division 1 locations, concrete inserts shall be 316 stainless steel.

5. Hangers and supports shall be in accordance with the requirements of Section 26 05 29 Hangers and Supports for Electrical Systems and Section 40 05 07 - Hangers and Supports for Process Piping except beam clamps, hanger rods and hardware shall be steel with electro-plated zinc finish, hot dipped galvanized or defender finish. This shall also include bolts, nuts and washers. In corrosive locations, hangers and support hardware shall be type 316 stainless steel.

C. Flexible Metallic Conduit

1. The Contractor shall provide flexible metallic conduit where required to permit movement of connected devices and where it is impracticable to complete runs with rigid conduit subject to the limitations imposed by the NYCEC.

2. Flexible conduit used indoor in non-hazardous dry dusty areas shall be non-liquid-tight, with a steel core.

3. Flexible conduit used indoors/outdoors and in non-hazardous, wet and corrosive areas shall be UL Listed and include a hot dipped galvanized steel core with a liquid-tight, polyvinyl chloride cover and shall include a built-in copper ground for sizes 3/4-inch through 1-1/4 inch.

4. For hazardous areas flexible conduit shall include a brass inner core with a bronze outer braid and protective neoprene plastic coating. End fittings shall be stainless steel.

D. Outlet Boxes and Fittings

1. The Contractor shall provide outlet boxes and fittings for rigid and flexible conduit. The outlet boxes and fittings required for the work which constitutes a part of the conduit system, shall be of approved types.

2. Fittings, bodies and boxes installed on PVC coated conduits shall be stainless steel. Dissimilar metals shall be avoided.

3. For outdoor, wet and corrosive areas, conduit fittings and outlet bodies shall be stainless steel NEMA 4X bodies and covers. All units shall be gasketed, watertight, and threaded with five full threads and shall have rust-proofing in accordance with the requirements of this Section.

4. Stainless steel NEMA 4X hub type outlet boxes shall be used throughout, except in the interior walls of superstructures and in roof slabs protected by built-up roofing where pressed steel boxes shall be installed. Cast iron or alloy outlet boxes of the proper size and depths for the application, complete with watertight gaskets and covers secured by brass screws, shall be furnished and installed as indicated on the Contract Drawings or as required by the conduit run. Outlet boxes, furnished and installed for the installation of lighting fixtures, switches and receptacles in a future contract, shall be furnished with watertight gaskets and blank covers.

5. For non-hazardous, indoor dry dusty areas pressed steel boxes of the proper size and depths for the application shall be provided. Boxes shall be rated NEMA 12, not less than No. 14 U.S. Standard Gauge (0.078 inch). The conduit openings shall be provided with oil-resistant gaskets. Conduits shall be fastened to these boxes with locknuts and bushings, and all unused outlets or holes shall be left sealed.

6. All outlet boxes intended for the support of fixtures shall be provided with approved fixture studs.

7. For concealed conduit runs in outside walls and all exposed conduit work, connections to boxes and fittings shall be made through threaded holes, unless otherwise approved by the Engineer. For concealed conduit work in non-hazardous areas in other than outside walls, connections between conduit and boxes may be made with drilled holes, using locknuts and bushings.

8. Where necessary unions may be used.

   a. In non-hazardous locations unions shall be universal or Erickson

   b. In hazardous locations unions shall be type UNF, UNL or YNY.

9. All boxes installed for concealed conduit, shall be provided with extension rings or plaster rings and covers as required. For non-hazardous, dry indoor areas stainless 316, satin beveled steel cover and device plates for surface mounted boxes shall be used. For corrosive locations, stainless steel 316 metal cover and device plates with neoprene gaskets shall be used.

E. Conduit Accessories

1. The Contractor shall provide conduit accessories for use with the conduit system. The conduit accessories shall be of approved types.

2. Expansion and Deflection Fittings:

   a. Expansion and deflection fittings shall be made up of non-corrodible parts and shall provide for ample longitudinal and lateral movement. A suitable bond shall provide a low resistance, continuous longitudinal path for ground currents.

   b. Expansion and deflection fittings shall be watertight stainless steel. Fittings shall be corrosion-resistant, UL listed and compatible with the conduit system.

   c. Expansion /deflection fittings shall be stainless steel and provide both expansion and deflection in a single fitting in accordance with the following:

      1) Axial expansion or contraction up to 3/4-inch.

      2) Angular misalignment up to 30 degrees.

      3) Parallel misalignment up to 3/4-inch.

      4) Expansion fittings shall provide expansion /contraction with eight-inch total movement.

3. Sealing Fittings:

   a. Sealing fittings shall be stainless steel.

   b. Sealing fittings shall have an ample opening with threaded closure for access to conduit hub for making dam. Sealing fiber and compound shall be suitable for use with the fitting and shall be the products of the fitting manufacturer.

4. Drain Fittings:

   a. Drain fittings shall be a combination device designed to provide ventilation to minimize condensation and drains accumulated condensate.

   b. The combination drain/breather fitting shall be 3/8 inch male thread size with stainless steel body.

5. Conduit Hubs:

a. Conduit hubs shall be threaded, insulated throat type with bonding screw locknut.

b. The conduit hub and locknut shall be stainless steel malleable iron or zinc and shall include a 90-degree C insulating surface and a sealing ring for a water tight and dust tight connection. Dissimilar metals shall be avoided.

6. Conduit Bushings:

a. Conduit bushings shall be insulated, grounding type with lay-in-lug connection. Two locknuts shall be provided for each bushing.

b. The conduit bushing and locknuts shall be stainless steel. The bushing shall include a 90 degrees C insulating surface.

7. Duct Seal:

a. Duct seal shall be a suitable for forming a water and gas tight seal between cables and conduits.

b. Completed seal shall be resistant to gasoline, oils, dilute acids and bases.

c. The completed seal shall be capable of blocking water pressure of at least 10 psi.

8. Thruwall Seals and Bushings:

a. New Construction

1) WSK and WCSC type thruwall seals shall be used for conduits and cables passing through exterior subsurface walls and exterior concrete walls.

2) CSMI type seal bushings at the inside and CSMC type seal bushings at the outside of the structure in the same core bit-drilled hole shall be used for conduits passing through interior concrete wall, interior floors, interior block walls, exterior block walls, exterior subsurface walls, exterior concrete walls, floor slabs.

3) CFS and or CFSI type fire stop fittings shall be used for conduits passing through fire rated floors and walls.

4) TW type thru wall type barriers shall be use for multiple conduit runs passing through interior or exterior and fire rated walls.

b. Existing Construction

1) SK and FSCS type seals shall be used for conduits and cables passing through concrete floors and floor slabs.

2) CSMI type seal bushings at the inside and CSMC type seal bushings at the outside of the structure in the same core bit-drilled hole shall be used for conduits passing through interior concrete wall, interior floors, interior block walls, exterior block walls, exterior subsurface walls, exterior concrete walls, floor slabs.

3) CFS and or CFSI type fire stop fittings shall be used for conduits passing through fire rated floors and walls.

4) TW type thru wall type barriers shall be use for multiple conduit runs passing through interior or exterior and fire rated walls.

9. Conduit Tags:

a. Conduit tags shall be 19 gauge, 1-1/2-inch diameter round brass which shall be secured to the conduit with annealed brass wire.

b. Conduit tags shall be clearly stamped with the conduit number in conformity with the Contract Drawings or as directed by the Engineer.

10. Conduit Markers:

a. Conduit identification markers shall be self-sticking color-coded tape. Identification tape shall be two inches wide and colored in accordance with the color banding specified under this Section.

F. Terminal, Junction and Pull Boxes.

1. The Contractor shall provide terminal, junction and pull boxes as shown on the Contract Drawings and where otherwise required, or as directed by the Engineer.

2. Boxes located indoor in dry, dusty areas shall be NEMA Type 12, constructed of welded and galvanized sheet steel. Boxes of dimensions 24 inches and less shall be 14 USS standard gauge metal. Boxes of dimensions greater than 24 shall be 12 USS standard gauge metal, except 10 USS standard gauge shall be used for boxes with any dimension of 36 inches or more. Boxes located in other areas shall conform to the following area classifications:

a. For wet locations boxes shall be watertight NEMA Type 4X. Boxes shall be constructed of 316 stainless steel and shall include gasketed, bolt on covers, with tapped holes in bosses or hubs for conduit entrance. Boxes shall be provided with cast mounting lugs for installation in concrete.

b. For hazardous locations boxes shall be explosion proof NEMA Type 7. Boxes shall be constructed of cast iron and shall include threaded connections and ground joint surfaces.

c. For corrosive locations boxes shall be corrosion resistant, NEMA Type 4X. Boxes shall be constructed of 316 stainless steel material with sealed seams.

3. Pull and junction boxes shall be provided with covers held in place by brass screws. Terminal boxes shall be provided with terminal block supports and approved hinged covers fitted tightly against a gasket and secured by lug bolts and wing nuts. Hinges, lug bolts, wing nuts and other fittings shall be made of an approved, non-ferrous, non-corrodible metal. All boxes shall be provided with rabbeted gaskets or flange gaskets securely held in place.

4. Tapping for threaded connections to outlet boxes, junction boxes, pull boxes and conduit fittings in non-explosion proof construction shall conform to the following:

   a. All threads shall be tapered.

   b. If threads for connection of conduit are tapped all the way through a hole in an enclosure, or if an equivalent construction is employed, there shall be not less than 3-1/2 threads in the metal and the construction of the enclosure shall be such that a suitable conduit bushing can be properly attached.

   c. If threads for connections of conduit are not all the way through a hole in a box wall, conduit hub or the like, there shall be not less than five full threads in the metal and there shall be a smooth, well rounded inlet hole for the conductors, which shall afford protection to the conductors equivalent to that provided by a standard conduit bushing and which shall have an internal diameter approximately the same as that of the corresponding trade size of rigid conduit. The threaded hole shall be provided with a conduit end stop.

   d. Tapping for threaded connections for explosion proof construction shall conform to the requirements of the NYCEC for construction in Class I, Division 1, and hazardous locations.

5. Cast iron or cast ferrous alloy outlet boxes, junction boxes, pull boxes, conduit fittings and conduit accessories such as box covers shall be rust-proofed by zinc coating applied by the "hot-dip" process or shall be given a rust protective coating applied by either of the following methods:

   a. Method A:

      1) Castings shall be given a mechanical and chemical cleaning.

      2) Castings shall be given a phosphoric acid type dip.

      3) Then a coating of zinc chromate primer shall be applied, and finally

      4) A coating of baked enamel finish shall be applied over the outside and inside surfaces of the castings.

b. Method B:

1) Castings shall be given a mechanical and chemical cleaning.

2) Then a coating of cadmium shall be deposited electrolytically.

3) Then a coating of zinc shall be applied by electroplating.

4) Then a vinyl resin base aluminum lacquer shall be applied.

6. Stamped steel outlet boxes, junction boxes and box covers shall be rust-proofed by a zinc coating applied by an electro-galvanizing or sherardizing process. Fabricated sheet steel boxes shall be formed from galvanized sheet steel. Welded joints shall be touched up with aluminum lacquer and boxes and covers shall be given a shop priming coat of zinc chromate rust inhibiting paint.

7. Terminal blocks shall be used within terminal boxes for termination of prepared conductors No. 10 AWG and smaller. Terminal blocks shall be in accordance with the following:

a. Terminal blocks shall be high density, screw terminal type suitable for rail mounting with quantities sufficient for the conductors to be terminated plus 20 percent spare.

b. Terminal blocks shall be NEMA rated, 600 volt, 35 ampere suitable for 85 degrees C.

c. Terminal block components shall have stainless steel and tin plated copper alloy components, backed out captive screws and marking surface.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. All conduits shall be installed in accordance with the requirements specified under this Section and in conformity with the sizes stated in the Specifications or shown on the Contract Drawings. They shall be installed complete with all accessories, fittings and boxes, in an approved and workmanlike manner so as to provide proper raceways for electrical conductors.

B. The Contractor's attention is called to the fact that all conduit runs indicated on the Contract Drawings are shown diagrammatically for the purpose of outlining the general method of routing the conduits to avoid interference. Where conduit runs

are not shown, it shall be the responsibility of the Contractor to establish the runs required based upon the various systems shown on the Contract Drawings.

C. Should any structural difficulties prevent the setting of cabinets, boxes, conduits, etc., at points shown on the plans, deviations therefrom as determined by the Engineer will be permitted and shall be made without additional cost.

D. All exposed steel conduits, fittings, boxes, straps, racks and hangers shall be painted in conformity with Section 09 91 00 - Painting. PVC coated conduit systems shall not be painted. Paint shall match the gray color of the PVC coated conduits.

E. Conduits shall be tagged using conduit tags. Conduit tags shall be installed where conduits terminate in equipment and enclosures.

F. Exposed conduits shall be color banded using conduit markers. Markers shall also include operating voltage when over 600 volts. Conduit markers shall be installed 360 degrees, double wrap around conduit exterior. Conduit markers shall be installed where conduits enter equipment, boxes, within each room, at wall penetrations and 50 feet on centers in each area. When exposed conduits are to be painted, markers shall be installed after the conduits are painted. Color banding shall be in accordance with to the extent applicable the following:

1. 120/208 volt AC: Gray.
2. 277/480 volt or 480 volt AC: Sand.
3. 4160 volt AC: Silver.
4. 13800 volt AC: Brown.
5. Fire Detection and Alarm: Red.
6. Telephone: Blue.
7. Intercommunication: Yellow.
8. Security System: Rust.
9. Low Voltage Switching, Instrumentation and Controls System: Black.

G. All enclosing cases, including condulets, boxes and conduit bodies, for fire, sprinkler, smoke detection, and associated systems alarm apparatus and equipment shall be painted or colored Fire Department “RED”, in accordance with New York City Building Code, unless otherwise required by the local Authority Having Jurisdiction (AHJ).

3.02 INSTALLATION

A. Installation of Raceways

1. The Contractor shall install all exposed raceways parallel or at right angles to walls and ceiling beams. Changes in directions shall be made with bends, elbows and pull boxes. All parallel runs shall be spaced uniformly throughout and secured in place with hangers and fasteners. Brace raceways

to satisfy the specified seismic requirements in accordance with the restraint details.

2. Conduits, where exposed, shall in all cases be substantially supported in an approved manner, but they shall not be fastened to or come in contact with any other pipes, ducts or other work of a similar nature. In all exposed work, approved channel or angle iron hangers, racks, one-hole straps or a combination thereof shall be provided to support the conduits. Where conduits are supported with one-hole straps, spacers shall be used to provide 1/4-inch minimum clearance between the conduits and walls or ceilings.

3. Hanger rods for trapeze type hangers shall be not less than 3/8 inch diameter. Conduit supports shall be located at intervals not exceeding 8 feet. Conduits shall be securely fastened to each support with U-bolts, straps or clamps.

4. All concealed conduits shall be placed in walls, floors, ceilings or slabs at the proper time in accordance with the progress of the structural Work. The Contractor shall cooperate in every respect in meeting schedules and shall not delay the structural Work unnecessarily.

5. Conduits embedded in concrete shall be blocked and braced in place by use of adequate conduit separators to prevent displacement during the pouring of concrete. The Contractor will be held responsible for proper position of conduits and shall rearrange any conduit that may be displaced while concrete is poured, without additional cost.

6. Where conduit runs are to be concealed and the Contractor fails to place such conduit in sufficient time to be included in the structures and the structures are completed without such conduit, the Contractor shall install such runs either concealed or exposed as directed by the Engineer, with no extra payment for additional work or for more conduit than the original lengths.

7. Embedded conduit shall be run in structural concrete in the center of slabs and walls and above waterstops. Conduit connections shall be made watertight. Contractor shall confirm that concrete thickness is sufficient for embedding the quantity of conduits intended. Unless specifically shown otherwise on the Contract Drawings or stated in this Specification or the Specifications, embedded conduits shall be in accordance with the following criteria:

   a. Minimum concrete thickness shall be as follows:

      1) For concrete 16 inches thick and less, the minimum concrete thickness shall be 11.5 inches plus the depth of the largest conduit assembly. The conduit assembly depth shall be from the top of the uppermost conduit to the bottom of the lowest conduit.

2) For concrete greater than 16 inches thick, the minimum concrete thickness shall be 13.5 inches plus the depth of the largest conduit assembly.

3) For concrete at foundation slabs, an additional inch shall be added to the minimum concrete thicknesses previously stated.

b. Conduit spacing shall be as follows:

1) Conduits shall be separated three times outer diameter of larger conduit center to center.

2) For multiple conduit layer assemblies, conduits shall be separated vertically three times outer diameter of larger conduit center to center.

3) When conduits cross at a given point, the conduits may be in direct contact and the angle of cross shall be 45 degrees or greater. Conduits may also cross within the vertical spacing of a multi-conduit layer assembly.

4) When conduits cross a structural expansion joint, conduits shall be separated three times outer diameter of larger conduit fitting center to center.

8. A run of conduit between outlet and outlet, between fitting and fitting or between outlet and fitting shall not contain more than the equivalent of three quarter bends, including those bends located immediately at the outlet or fitting.

9. Factory-made conduit bends or elbows shall be used wherever possible in making necessary changes in direction. Field bends shall be carefully made so as to prevent conduit damage or reduction in the internal areas. The radius shall not be less than six times the nominal diameters for the conduit with carefully matched bends on parallel runs so as to present a neat appearance.

10. All conduits, where cut, shall be carefully reamed to remove burrs. No running threads will be permitted. All screw joints shall be watertight. Conduits shall be fitted in an approved manner to all devices and boxes. The ends of all conduits shall be equipped with suitable approved conduit fittings. The ends of all empty conduits shall stub up six inches above the slab and shall be capped.

11. As far as practicable, conduits shall be pitched to drain to outlet boxes or otherwise so installed as to avoid trapping moisture. Trapped conduits in concealed construction shall be provided with outlet boxes for drainage. Where necessary drainage in outlet boxes or where dips are unavoidable in exposed conduits, a drain fitting shall be installed at the low point.

12. Thruwall type seals and conduit sealing bushings shall be installed for all conduits passing through concrete slabs, floors, walls or block walls.

13. Conduit runs shall be installed so as to avoid flues, heat sources, and steam or hot water pipes. A minimum separation of 12 inches shall be maintained where conduit crosses or parallels hot water, steam pipes or heat sources.

14. Where conduit enter or leave equipment located within electrical and control rooms the conduit shall be sealed and packed with a suitable duct seal compound.

15. A 250 pound tested polyethylene pull tape shall be provided in all empty conduits, with a minimum 8 inch of slack, double backed into the conduit. Conduit shall be protected immediately after installation by installing flat non-corrosive metallic discs and steel bushings designed for this purpose at each end. Discs shall not be removed until it is necessary to clean the conduit.

16. All conduit that is cut on the job shall be cut square and taper reamed to remove burrs before installation. Where steel conduit is cut and threaded on the site, it shall be coated before and after making connections.

17. PVC coated conduit shall be installed in compliance with the latest version of the National Electrical Code and other applicable codes and standards as indicated in these specifications.

18. PVC coated conduit shall be installed in accordance with NECA National Electrical Installation Standards (NEIS) 101. Standards for installing steel conduit.

19. Conduits embedded in concrete shall stub up 6 inches above the slab. A three inch high curb extending three inches from the outer surface of the conduit penetrating the floor shall be provided to prevent corrosion. Conduit stub-ups shall be terminated in couplings, slightly above the finished concrete curb.

B. Conduit Connections to Equipment.

1. At each motor, limit switch, solenoid valve, electrical control device or other electrically controlled or operated equipment, the Contractor shall install a complete conduit connection between the conduit system and the terminal box of the motor or the conduit connection point of the equipment.

2. Conduits installed in the conduit system shall be terminated in such locations as to permit direct connections to motors, devices or equipment.

3. Connections shall be made with rigid conduit if equipment is fixed and not subject to adjustment, mechanical movement or vibration. Rigid connections shall be provided with union fittings to permit removal of equipment without cutting, breaking or burning conduit.

4. Motors, transformers and equipment subject to adjustment, mechanical movement or vibration shall be connected with flexible metallic conduit.

5. Devices such as solenoid valves, small limit switches, etc., shall be connected with flexible metallic conduit arranged to prevent strain and distortion.

6. Flexible conduit connections shall be watertight unless the area of installation requires explosion-proof construction.

C. Installation of Boxes and Fittings.

1. All concealed outlet boxes shall be set in such a manner that they will be plumb and flush with the finished surface.

2. Boxes shall be installed rigidly and securely to the structure. Independent supports shall be provided where no walls or other structural surface exists.

3. Expansion and expansion/deflection fittings shall be installed where conduits cross structural expansion joints and at locations shown on the Contract Drawings. Fittings shall be installed on each conduit and incorporated into the expansion joints of structures, at right angles to the joint, to insure their proper functioning and preservation.

4. Expansion fittings shall be installed on exposed conduit runs exceeding 200 feet. Unless specifically shown otherwise on the Contract Drawings or stated in this Specification or the Specifications, when crossing structural expansion joints larger than one inch, an expansion fitting shall also be installed together with an expansion/deflection fitting. The fittings shall be installed on each conduit run in accordance with manufacture's recommendations to provide the additional movement necessary.

5. All conduit connections in wet and corrosive locations shall be made up watertight and shall terminate at enclosures with an approved conduit hubs.

6. All conduit connections in dry and dusty locations shall terminate at enclosures with bushings and lock nuts. Terminations shall include one bushing and two lock nuts at each location. Lock nuts shall be installed one inside and one lock nut outside the enclosure. All conduit shall be bonded to the safety ground.

7. At pull and junction boxes having any box dimension in excess of 18 inches, jumper type grounding bushings shall be installed on conduit ends and jumper wires shall be installed to bond all conduits and to bond conduits to boxes.

8. All insulated grounding bushings shall be bonded together and to the structure of the enclosure by a continuous, copper bonding wire.

9. Removable, flame-retardant, insulating cable supports shall be provided in all boxes with any dimension exceeding 3 feet.

10. Scratched PVC coated boxes and fittings damaged as a result of installation work shall be touched up by field applying PVC coatings. All touch up work shall be in strict conformance with manufacturer's recommendations.

D. Installation within Hazardous Areas.

1. Explosion-proof boxes and fittings shall be of a type approved by the Engineer. Boxes and fittings shall be of cast iron with finish as specified hereinbefore or of an aluminum alloy specially developed for use in hazardous areas.

2. Explosion-proof boxes shall be suitable for the installation of explosion-proof switches, receptacles, lighting fixtures or other devices as indicated. All conduit connections to such boxes shall be made with threaded fittings. Bushings and locknut connections shall not be used.

3. Conduits terminating at explosion-proof boxes, enclosing circuit opening equipment, shall be sealed at the entrance to the box with an approved compound-filled sealing fitting to prevent passage of explosive or combustible gases through the conduit. Where construction prevents the use of sealing fittings, the ends of the conduits shall be properly sealed with sealing compound.

4. Sealing fittings shall be installed to seal each conduit leading from or entering into hazardous locations. Exposed conduits passing through hazardous locations shall be sealed at point of exit and entrance.

5. The installation of explosion-proof boxes, fittings and all conduits in connection therewith shall conform to the hazardous location requirements of the NYCEC for Class , Division and Group D locations shown on the Contract Drawings.

3.03 FIELD TESTING / QUALITY CONTROL

A. After installation, the electric conduit system shall be field tested. The field tests shall be witnessed by the Engineer and certified by the Contractor. The Contractor shall provide testing consisting of the following:

1. Each conduit shall be tested by pulling through a cylindrical mandrel as specified under this Section. Maintain a record of all conduits testing clear.

2. Conduit systems shall be ground tested in the presence of the Engineer, who will inspect all enclosures, pull and junction boxes for bonding to the safety green conductor pulled with the nominal 120 volt and higher power and control circuits, and for bonding of the conduit grounding bushing to this safety ground.

3. The separation of above safety grounding system from the instrumentation signal grounding shall be verified.

4. The Contractor shall provide a Field Test Report. The Report shall identify the testing performed and the results obtained.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. All conduits shall be carefully cleaned before and after installation and all inside surfaces shall be free from all imperfections likely to injure the cable. Conduits shall be cleaned in accordance with the following:

1. After erection of complete conduit runs, conduits shall be snaked with a suitable swab to which shall be attached an approved tube cleaner equipped with an approved cylindrical mandrel of a diameter not less than 85 percent of the nominal diameter of the conduit.
2. All conduits through which the mandrel will not pass shall be removed and replaced by the Contractor at its own expense.
3. After snaking, the ends of the dead-ended conduits shall be protected with standard malleable iron caps to prevent the entrance of water or other foreign matter.
4. Conduit ends shall be protected after cleaning with caps to prevent entrance of water, concrete, debris or other foreign substance.

END OF SECTION

SECTION 26 05 43 – UNDERGROUND DUCTS, MANHOLES AND RACEWAYS FOR ELECTRICAL SYSTEMS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing underground ducts, electric manholes and raceways for electrical systems.

1. This Section also includes requirements for providing electric handholes.

2. Underground ducts, electric manholes, electric handholes and raceways shall be provided in accordance with the requirements specified under this Section, the Specifications and the Contract Drawings.

3. Underground ducts shall be concrete encased. The Contractor shall provide reinforced concrete encasement for the duct system.

B. The Contractor shall perform all excavations, complete all forms, and do backfilling and tamping, as required, unless specifically shown otherwise on the Contract Drawings or stated in the Specifications.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 03 30 10 – Low Carbon Cast-In-Place Concrete

B. Section 03 21 00 - Reinforcing Steel

C. Section 05 05 23 - Miscellaneous Metal Castings

D. Section 26 05 27 - Grounding

E. Section 26 05 33 - Raceways and Boxes for Electrical Systems.

F. Section 31 23 16 - Excavation

G. Section 31 23 25 - Fill

1.04 REFERENCES

A. Definitions

1. All references to the Utility or Electric Utility shall refer Consolidated Edison Company of New York or the Local Electric Utility Having Jurisdiction.

B. Reference Standards

1. Underground ducts, electric manholes, handholes and raceways shall comply with the latest applicable provisions and recommendations of the following:

a.	NEMA TC2	-	Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
b.	NESC	-	National Electrical Safety Code
c.	NYCEC	-	New York City Electrical Code
d.	UL 651	-	UL Standard for Safety Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings.
e.	UL 2420	-	UL Standard for Safety Below ground Reinforced Thermosetting Resin conduit (RTRC) and Fittings.

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited, to:

1. A list of proposed manufacturers with the products they produce proposed for the contract.

2. Manufacturer's technical information with name, designation and catalog number for all products for the underground ducts systems, manholes, handholes, raceways and accessories proposed for use.

3. Drawings showing interior and exterior dimensions and details of openings, jointing, inserts and reinforcing.

4. Scaled Shop Drawings showing the routing of the duct banks and the location of manholes, handholes and the principal outline of buildings and structures. Reference duct banks dimensionally from fixed objects or structures. Include profiles of duct banks showing crossings with piping and other underground systems.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Underground ducts, manhole, handholes and raceways shall be delivered, stored and handled in accordance with this Section, the Specifications and the manufacturer's instructions.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Rigid Steel Conduit: See Section 26 05 33 - Raceway and Boxes for Electrical Systems.

B. Warning tape shall be as manufactured by:

1. Seton, Branford, CT.

2. Ideal Industries, Sycamore, IL.

3. Or approved equal.

C. Duct Seal: See Section 26 05 33 - Raceway and Boxes for Electrical Systems.

D. Reinforced Concrete: See Section 03 30 10 – Low Carbon Cast-in-Place Concrete and Section 03 21 00 – Reinforcing Steel.

E. Expansion and Deflection Fittings: See Section 26 05 33 - Raceway and Boxes for Electrical Systems.

F. Conduit Bushings: See Section 26 05 33 - Raceway and Boxes for Electrical Systems.

2.02 MATERIALS / EQUIPMENT

A. Rigid Steel Conduit

1. Rigid Steel conduit without a PVC coating shall be used for all ducts. Rigid Steel Conduit Rigid Steel Conduit shall be in accordance with the requirements of Section 26 05 33 - Raceway and Boxes for Electrical Systems.

B. Underground Duct Accessories and Fittings

1. Conduit Spacers

a. Factory fabricated conduit spacers shall be nonmetallic, vertical and horizontal interlocking type to maintain spacing between conduits. Spacers shall be suitable for all types of conduit in multiple sizes.

2. Warning Ribbon

a. Warning ribbon shall be a three inch wide, four mil polyethylene or polyvinyl chloride detectable tape. The tape shall red color and be permanently imprinted in black color, “CAUTION BURIED ELECTRIC LINE BELOW.”

3. Duct Seal

a. Duct seal for conduits shall be in accordance with the requirements of Section 26 05 33 - Raceway and Boxes for Electrical Systems.

4. Reinforced Concrete

a. Concrete for envelope shall be in accordance with the requirements of Section 03 30 10 – Low Carbon Cast-in-Place Concrete. Steel reinforcement shall be in accordance with the requirements of Section 05 12 00 - Structural Steel Framing.

5. Expansion and Deflection Fittings

a. Where specifically shown on the Contract Drawings, expansion and deflection fittings shall be provided at the structural joints of the underground duct system.

b. Expansion and deflection fittings shall be in accordance with Section 26 05 33 - Raceway and Boxes for Electrical Systems.

6. Conduit Bushings

a. Conduit bushings shall be provided for the termination of rigid steel conduits at each manhole.

b. Conduit bushings shall be in accordance with Section 26 05 33 - Raceway and Boxes for Electrical Systems.

C. Manholes and Handholes

1. Manholes and handholes shall be cast-in-place type of reinforced concrete. Where specifically shown on the Contract Drawings or stated in the Specifications, the use of precast type manholes and handholes shall be permitted.

2. Manholes associated with service feeders shall be in accordance with the requirements of the Utility.

3. Concrete for manholes and handholes shall be in accordance with the requirements of Section 03 30 10 – Low Carbon Cast-in-Place Concrete. Manholes and handholes shall be constructed to withstand ground water pressure when completely submerged by rising water table.

4. Steel reinforcement shall be as shown on the details on the Contract Drawings and shall be in accordance with the requirements of 05 12 00 - Structural Framing.

5. Manholes and handholes shall have dimensions as shown on the Contract Drawings and shall be provided with all duct entrances sized and located to suit duct banks.

6. Concrete floor shall be sloped towards the drain sump at the center of each manhole and handhole.

7. All manhole and handhole hardware shall be hot dipped galvanized steel.

D. Manhole and Handhole Accessories

1. Frames and Covers

a. Each manhole and handhole shall be provided with a cast-iron watertight manhole frame with inside and outside covers.

b. All frames and covers shall be in accordance with the requirements of Section 05 05 23 - Miscellaneous Metal Castings. Frames and covers shall be annealed, high quality, gray cast iron, free from blowholes, sandholes, scabs, fins, scales and other defects. They shall be uniform in form and dimensions, and shall be as approved by the Engineer.

c. The frames shall be so set that the completed installation will provide a proper alignment of the outside covers with the roadways or other surrounding areas. Manhole and handhole covers shall fit the frame without undue play.

d. The following words shall be cast in the top of all manhole and hand hole covers, as appropriate.

1) "ELECTRIC POWER, LOW VOLTAGE"

2) "ELECTRIC POWER, MEDIUM VOLTAGE"

3) "COMMUNICATIONS / INSTRUMENTATION"

2. Cable Supports

a. Manholes shall be furnished with cable racks, cable hooks and insulators to effectively support all cables indicated for present and future installation.

1) Cable racks shall be made from steel channel with ample strength to support cables. Racks shall be firmly anchored to walls.

2) Cable hooks shall be made from malleable iron.

3) Racks and hooks shall have hot-dipped galvanized finish.

4) Insulators shall be made of high-grade dry-process porcelain with smooth glazed surfaces and shall fit hooks in such manner as to prevent wobbling and insure minimum movement.

3. Pulling Irons

a. Galvanized steel pulling irons shall be provided for each manhole and handhole. Pulling irons shall be cast in the wall opposite to the centerline of each incoming duct bank and 12 inches below centerline of bottom line of ducts.

4. Grounding

a. Each manhole shall be provided with a grounding system. The grounding system shall consists of ground rods and cable in accordance with the details shown on the Contract Drawings.

b. Ground rods and cable shall be in accordance with the requirements of Section 26 05 27 - Grounding.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Duct Banks

1. The duct system shall be installed to avoid interferences with structures, piping and other underground systems. Conduit duct banks shall be sized, arranged and installed in a reinforced concrete envelope as shown on the Contract Drawings.

2. Trenches for duct banks shall be in accordance with the requirements of Section 31 23 15 - Excavation. Duct bank trenches shall have the bottom tamped firm and even, and suitably braced side forms shall be employed in forming the envelope.

3. Duct banks shall follow straight lines as far as possible. Where deviation from a straight line becomes necessary, offsets shall be made using 5 degree angle coupling or make bend with sweeps. The sweep radius shall be 48 inch for 90 and 45 degree bends and 36 inch for 30 degree bends. Where directed by the Engineer, bends shall be made up with standard factory bends or other approved curved sections.

4. Duct bank installations and penetrations through foundation walls shall be made watertight.

5. Duct banks shall be assembled using non-magnetic saddles, spacers and separators. Separators shall be positioned to provide 3-inch minimum concrete separation between the outer surfaces of the ducts.

6. Concrete covering shall be provided on both sides, top and bottom of the concrete envelopes around conduits. Concrete covering shall be in accordance with the detail shown on the Contract Drawings. Top of concrete encasement shall not be less than thirty inches below finish grade. Add red dye to concrete used for envelopes or trowel a coloring on the concrete for easy identification during subsequent excavation.

7. Before pouring concrete, written approval shall be obtained from the inspecting engineer.

8. Ducts shall be firmly fixed in place during pouring of concrete. Concrete shall be carefully spaded and vibrated to insure filling of all spaces between ducts.

9. A transition shall be made from rigid steel conduit where duct banks enter structures or turn upward for continuation above grade. Rigid steel ducts shall be terminated using insulated grounding bushings. Ducts inside buildings shall be continued using PVC coated rigid steel conduits.

10. Rigid steel ducts shall be terminated using insulated grounding bushings.

11. Backfilling for duct banks shall be in accordance with the requirements of Section 31 23 25 - Fill. Backfilling shall be permitted when directed by the engineer to proceed. Backfilling shall not be with material containing large rock, paving materials, cinders, large or sharply angular substances, corrosive material or other materials which can damage or contribute to corrosion of ducts or cables or prevent adequate compaction of fill.

12. Duct runs shall be sloped for drainage toward manholes and away from buildings with a slope of approximately 3 inches per 100 feet.

13. Where specifically shown on the Contract Drawings, a ground cable shall be installed in each duct bank envelope. Cable shall be in accordance with the requirements of Section 26 05 27 - Grounding. The ground shall be made electrically continuous throughout the entire duct bank system. Ground cable shall be connected to the building, station ground grid, equipment ground buses and to each conduit grounding bushing of the underground duct system. The ground cable shall be terminated at the last manhole or handhole for outlying structures.

14. A warning ribbon shall be installed approximately 12 inches below finished grade over all underground duct banks carrying cables of 480 volts and higher.

15. All ducts entering buildings and structures shall be sealed. All empty spare ducts shall be sealed and plugged.

16. An expansion and deflection fitting shall be installed on each conduit at each of the structural expansion joints when shown on the Contract Drawings. Joints shall be located as defined by the criteria noted on the Contract Drawings.

B. Manholes and Handholes

1. Manholes and handholes shall be installed where shown on the Contract Drawings. Place each manhole and handhole on a 12-inch crushed-stone base and make level.

2. Manhole and handhole excavation shall be in accordance with the requirements of Section 31 25 15 - Excavation. Backfilling for manholes and handholes shall be in accordance with the requirements of Section 31 23 25 - Fill.

3. Manhole and handhole installation shall be completed so that structure is watertight. All penetrations through manhole walls and bottoms to facilitate equipment such as ground rods shall be made through cast in place sleeves. Sleeves shall be made watertight after the installation of equipment. Two coats of bituminous waterproofing material shall be applied to exterior surface of each manhole and handhole. A waterproof gasket shall be provided all around removable precast manhole cap.

4. Cable racks shall be installed within each manhole for the support of cables. Cable racks shall be in accordance with the following:

   a. Attach racks with 3-inch by 3/8-inch diameter tamp-in studs mounted in 1-inch holes drilled into walls of manholes in the absence of inserts. Apply PVC coating to all racks.

   b. Provide cable hooks to support each cable on each rack along the cable run within the manholes. Apply PVC coating to all hooks.

   c. Individually support each cable at each hook on porcelain insulators. Provide sufficient slack for each cable.

   d. In the manhole securely tie each cable in place at each insulator block to prevent excessive movement of insulators, cables, or fireproof tape. Tie cables with non-metallic 3/4-inch strapping tape as manufactured by 3M or tie down with nylon straps.

5. A grounding system shall be installed for each manhole. All exposed metal, manhole frame and cover, accessories and the concrete reinforcing rods shall be bonded with No. 4 AWG minimum bare copper wire and connected to the duct bank ground in accordance with the details shown on the Contract Drawings.

6. Concrete curb shall be provided for manholes when required to adjust manhole cover to proper grade. Curb shall be constructed on the roof slab or cone section on which the manhole frame and cover shall be placed. The height of the curb shall be such as is necessary to bring the manhole frame to the proper grade.

7. For cast in place type manholes and handholes, pulling irons shall be set and other built-in items shall be in place before placing concrete.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Cleaning and Protection

1. After installation each conduit in each duct bank shall be cleaned and cleared of obstructions and foreign matter by rodding and by the passage of cleaning brushes or cutting mandrels.
2. After cleaning, the clearance of each conduit shall be checked by passing a 12 inch long mandrel, of diameter 1/2 inch less than the nominal duct diameter, through the entire length of duct run. Ducts which do not permit passage of the mandrel shall be cleared, cut out and replaced or sealed and replaced by additional construction. The duct bank conduit cleaning shall be included in the electric conduit system field test report specified in Section 26 05 33 - Raceways and Boxes for Electrical Systems.

END OF SECTION

SECTION 26 05 53 – IDENTIFICATION FOR ELECTRICAL SYSTEMS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing labeling and identification.

1. Labeling and identification shall be provided in accordance with the requirements specified under this Section, the Specifications and the Contract Drawings.

2. Labeling and identification shall be provided for the identification of electrical equipment.

B. The work shall include providing all voltage signs, equipment nameplates, markers, tags and arc flash labels for all electrical equipment furnished under this Contract.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 05 20 - Low-Voltage Wires, Cables and Accessories

B. Section 26 05 33 - Raceways and Boxes for Electrical Systems

C. Section 26 05 73 – Power System Studies

D. Section 26 05 73 – Shock Hazard and Arc Flash Studies

E. Section 40 05 97 - Identification for Process Equipment

1.04 REFERENCES

A.	NYCEC	-	New York City Electrical Code
B.	NFPA 70E	-	Standard for Electrical Safety in the Workplace
C.	ANSI Z535.4	-	American National Standard for Product Safety Signs and Labels
D.	BWT Arc Flash	-	Arc Flash Personal Protective Equipment BWT Guidelines
E.	OSHA 1910 Subpart S	-	Electrical

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. All labeling and identification signs and nameplates shall be provided in accordance with the NYCEC, NFPA 70E and OSHA 1910 Subpart S.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include but not be limited to:

1. Submit signs, nameplates and other labeling and identification devices proposed for use with specifications and other data required to demonstrate compliance with the specified requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The labeling and identification devices shall be delivered, stored and handled in accordance with the Specifications and the manufacturer's recommendations.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Labels shall be as manufactured by:

1. Brady, Milwaukee, WI;
2. Seton Nameplate Corporation, North Branford, CT;
3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Equipment Nameplates

1. Equipment nameplates shall be provided in addition to the manufacturer's nameplate, to identify the equipment number and the item's function and the equipment to which it serves.
2. Equipment nameplates shall be provided in accordance with the requirements specified under this Section and Section 40 05 97 – Identification for Process Equipment.
3. Equipment nameplates shall be laminated plastic with black letters on a white background.
4. Nameplates for equipment identification shall have 1/2-inch high letter engravings.
5. Nameplates for pilot device identification shall have 1/4-inch high letter engravings.
6. Nameplates for distribution equipment shall have the following information:
    a. Equipment name and number.
    b. Voltage.
    c. Phases and number of wires.
7. Pull boxes, junction boxes and control stations shall have a nameplate identifying the equipment name and number.
8. All feeders and branch circuit devices shall have nameplates identifying the served equipment name and number.
9. Where execution of the Work under this Contract requires certain feeders and branch circuit devices to be modified, the Contractor shall provide new nameplates reflecting the modifications. The nameplates shall identify the served equipment name and number.
10. All control and indicating devices shall have individual nameplates identifying device function.
11. Nameplate mounting screws shall be 3/16 inch diameter, round-head, stainless steel and self-tapping type. Adhesives shall not be used.

B. Conduit Markers and Tags

1. Conduit markers and tags shall be provided for the identification of the electric conduit system.

2. Conduit markers and tags shall be in accordance with Section 26 05 33 - Raceways and Boxes for Electrical Systems.

C. Cable and Wire Markers

1. Cable and wire markers shall be provided for the identification of the electric wire and cable.

2. Cable and wire markers shall be in accordance with Section 26 05 20 - Low-Voltage Wires, Cables and Accessories.

D. Arc Flash Labels

1. Labels shall be provided in addition to the manufacturers nameplate and equipment nameplate, to identify equipment name, and system information such as bolted fault and arcing fault current levels, flash protection boundary distances, working distances, personal-protective equipment classes and AFIE (Arc Flash Incident Energy) levels. System information shall be a determined by the specified studies under Section 26 05 73 Power System Studies and Section 26 05 75 Shock Hazard and Arc Flash Studies.

2. Labels shall be able to withstand their usage environment, the print shall not fade, and adhesive should be aggressive enough to avoid peeling.

3. Arc flash labels shall be printed on a durable polyester base over-laminated to protect the text and graphics.

4. The back of the labels shall employ an acrylic adhesive, which allows the labels to be securely and permanently affixed to a wide range of surfaces.

5. Labels shall include no field markings.

6. Labels shall be generally in accordance with ANSI Z535.4.

7. Labels shall include at a minimum the following information based on the Arc Flash Hazard Analysis performed:

a. Nominal Voltage of the Equipment

b. Flash Protection Boundary

c. Arc Flash Incident Energy Value (cal/cm^2) at the working distance

d. Limited and Restricted Boundaries

e. Study Report Number and Issue Date

f. Location of Study Report.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Signs and Nameplates

1. All signs, nameplates and tags shall be installed neatly, properly and as recommended by the manufacturers.

2. Signs and nameplates shall be mounted with screws.

a. Where mounting of signs or nameplates with screws is impractical, the Contractor shall alert the Engineer.

B. Signal Wire and Cable

1. Control, signal and status wire and cable shall be identified by a unique number. The numbering system shall reflect the actual identification used in the Work and shall be documented on the point-to-point wiring diagrams.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing Power System Studies and field testing. The Contractor shall provide Power System Studies and field testing in accordance with the requirements specified under this Section, the Specifications and the Contract Drawings.

B. The Power System Studies shall include a load flow study, a short circuit study, a protective device evaluation study and a protective device coordination study for a completely coordinated power distribution system.

C. Three separate and distinct power system studies shall be provided, one for each of the three site locations shown on the Contract Drawings.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not used

1.04 REFERENCES

A. Definitions

1. Power System as used in this Section shall mean all of the electrical distribution network from the Utility connection to all loads. This includes all on site generating sources, all branches and all nodes.
2. Low-Voltage as used in this Section and the Specifications shall mean all equipment, conductors, insulation systems and accessories intended for operation at less than 1000 volts and within the 600 V Class.
3. Medium-voltage as used in this Section and the Specifications shall mean all equipment, conductors, insulation systems and accessories intended for operation above 1000 volts and below 99000 volts.
4. Node as used in this Section shall mean any point in the Power System where two or more pieces of electrical equipment connect.
5. Branch as used in this Section shall mean any element of the Power System connecting any two nodes.
6. Major Node as used in this Section shall mean any node representing actual real world connection points of branches of the Power System such as busses in switchgears, MCCs or panelboards or the connection points of cables to load and equipment.
7. Dummy Node as used in this Section shall mean any fictitious node created within the modelling software to facilitate modelling of the Power System.
8. Major Branch as used in this Section shall mean any branch representing actual real world elements of the Power System such as feeders, breakers, transformers, and cables.
9. Dummy Branch as used in this Section shall mean any fictitious branches created within the modelling software to facilitate modelling of the Power System.
10. All references to the Electric Utility or Utility shall mean the Local Electric Utility having jurisdiction as defined in this Section.
11. The Electric Utility is Con Edison.

B. Reference Standards

1.	NYCEC	-	New York City Electrical Code
2.	IEEE 141	-	IEEE Recommended Practice for Electric Power Distribution in Industrial Plants
3.	IEEE 399	-	IEEE Recommended Practice for Industrial and Commercial Power System Analysis

4.	IEEE 1015	-	IEEE Recommended Practice for Applying Low-Voltage Breakers Used in Industrial and Commercial Power Systems
5.	IEEE 3002.2	-	IEEE Recommended Practice for Conducting Load-Flow Studies and Analysis of Industrial and Commercial Power Systems
6.	IEEE 3002.3	-	IEEE Recommended Practice for Conducting Short-Circuit Studies and Analysis of Industrial and Commercial Power Systems
7.	NETA ATS	-	NETA Acceptance Testing Specification

1.05 DESCRIPTION

A. Power Systems Studies shall be completed to the extent applicable by modelling the entire low-voltage and medium-voltage equipment of the Power System in the software detailed in this Section. The studies shall encompass existing systems and the proposed systems.

B. The model shall comprise all major nodes and major branches of the Power System.

C. The model shall also comprise dummy nodes and dummy branches to attain a level of connectivity similar to the Single Line Diagram representation of the Power System.

D. The model shall completely facilitate the examination of normal operations, and alternate operations of the Power System which could result in deviations from the normal operating values at major nodes and in major branches of the Power System.

1.06 QUALITY ASSURANCE

A. Modelling:

1. The Power System studies shall be performed in accordance with the latest applicable provisions and recommendations of the Reference Standards in this Section.

2. The Contractor shall retain the services of a licensed Professional Engineer, registered in the State of New York, to perform the Power System Studies.

3. The licensed Professional Engineer shall be from an independent consulting firm or the equipment manufacturer and shall have a minimum of 5 years of experience in performing Industrial Power System Studies.

4. It shall be the responsibility of the licensed Professional Engineer to:

a. Evaluate all devices.

b. Evaluate all equipment.

c. Establish the settings of all protection functions.

d. Establish the settings required to secure selective coordination among protective devices.

5. Power System Studies shall be completed using the software program listed in this Section.

6. The Contractor shall coordinate with the licensed Professional Engineer performing the studies and assist the Professional Engineer in the collection of all information necessary to complete the studies specified.

7. All test equipment and instrument calibration shall be in accordance with the latest edition of the accuracy standard of the NIST and NETA ATS.

8. The Contractor is responsible to coordinate with and obtain from utility company of the available minimum and maximum three phase and line to ground fault current with associated X/R ratios and voltage.

B. Field Testing:

1. The Power System shall be field tested. The field testing shall be performed in accordance with the requirements specified under this Section.

2. The Contractor shall retain the service of an independent testing firm who shall perform field testing of the Power System. The testing firm shall have experience in the inspection and testing of the system equipment and shall be a member company of NETA. Provide proof of membership, or demonstrate that the standards and experience required for membership are possessed, all to the satisfaction of the Engineer

1.07 SUBMITTALS

A. Submittals

1. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

a. Experience of the licensed Professional Engineer who will perform the Power Systems Studies

b. Version of the software to be used to conduct Power Systems Studies

c. Calculations and results of the Power System Studies shall be submitted. The submission of calculation and results shall consist of:

1) A report detailing all the findings, recommendations and settings arising from the studies. The report shall be stamped and signed by the licensed Professional Engineer.

2) The complete software files produced by the study software, and corresponding to the findings, recommendations and settings contained in the report. Two copies of the software files shall be submitted, one copy shall be write protected and the other shall not.

2. The Power System Studies shall be submitted for approval prior to receiving the final approval of the Power System equipment and/or prior to the release of equipment drawings for manufacturing.

3. Power System Studies shall be submitted for approval prior to the Engineer giving approval for drawings to be submitted for review by the Utility.

4. In the event that formal completion of the Power System Studies may cause delay in the approval of equipment or Utility drawings then a preliminary submission of the Power System Studies shall be made. The Engineer will determine whether the preliminary submission is sufficient to allow approval of equipment and Utility drawings.

5. Work sequence for the field testing shall be submitted. The sequence shall indicate the schedule of Work, time frame and downtime for the equipment. The work sequence shall be submitted at least 60 days in advance prior to conformation of field testing dates.

6. Qualifications of proposed testing firm to perform field testing shall be submitted. Submit firm experience records at least 60 days in advance to actual testing along with five recent references with phone numbers.

B. Reports

1. Field test report shall be submitted.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Studies shall be performed using the latest version of commercially available computer software as manufactured by

1. SKM.

2. Easy Power.

3. ETAP

4. Or Approved Equal.

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Load Flow Study:

1. The load flow study shall be preliminary to all the other studies and for all proposed operating conditions of the Power System. The load flow study shall be used to

a. Preset the study parameters as applicable for each of the studies listed under this Section.

b. Confirm the layout and balance of the power flows across the major branches

c. Establish the voltage profiles at all major nodes.

d. Identify real and reactive power flows into nodes and across the branches of the Power System.

e. Determine real and reactive power losses in the Power System.

f. Identify proposed transformer tap settings.

g. Problem areas or equipment capacity inadequacies shall be promptly brought to the Engineer's attention.

B. Short Circuit Study:

1. Short-circuit momentary duties and interrupting duties shall be calculated on the basis of maximum available fault current at each major node and through major branches and other significant locations through the system.

2. The short circuit tabulations shall include symmetrical fault currents, and X/R ratios.

3. For each fault location, the total duty on the major nodes, as well as the individual contribution from each connected branch, including motor back EMF current contributions shall be listed with its respective X/R ratio.

C. Protective Device Evaluation Study:

1. The protective device evaluation study shall be performed to determine the adequacy of circuit breakers, controllers, surge arresters, busways, switches, and fuses by tabulating and comparing the short-circuit ratings of these devices with the prospective fault currents.

2. Appropriate multiplying factors based upon system X/R ratios and protective device rating standards shall be applied.

D. Protective Device Coordination Study:

1. The protective device coordination study shall be performed to select or to check the selections of the power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated voltage and current transformers, and low-voltage breaker trip characteristics and setting.

2. The device settings computed in the coordination study shall provide complete selectivity.
   a. The system shall be selectively coordinated such that only the device nearest a fault will operate to remove a faulted circuit.
   b. System selectively shall be based on both the magnitude and the duration of a fault current.
3. The coordination study shall include all voltage classes of equipment starting at the utility's incoming feeder protective device down to and including each of the medium and low voltage load. The phase and ground overcurrent and ground fault protection shall be included, as well as settings for all other adjustable protective devices.
4. The time-current characteristics of the installed protective devices shall be plotted on the appropriate log-log paper. Reasonable coordination intervals and separation of characteristic curves shall be maintained. The coordination plots for phase and ground protective devices shall be provided on a complete system basis. Sufficient curves shall be used to clearly indicate selective coordination achieved to the utility main breaker, power distribution feeder breakers, and the overcurrent devices at each major load center.
5. There shall be a maximum of six protective devices per plot. Each plot shall be appropriately titled. Plots shall include the following information as required for the circuits shown:
   a. Representative one-line diagram, legend and types of protective devices selected.
   b. Utility’s relays or fuse characteristics.
   c. Significant motor starting characteristics.
   d. Parameters of transformers, ANSI magnetizing inrush and withstand curves.
   e. Operating bands of low voltage circuit breaker trip curves, and fuse curves.
   f. Relay taps, time dial and instantaneous trip settings.
   g. Cable damage curves.
   h. Symmetrical and asymmetrical fault currents.
6. The selection and settings of the protective devices shall be provided separately in a tabulated form listing circuit identification, IEEE device number, current transformer ratios, manufacturer, type, range of adjustment, and recommended settings. A tabulation of the recommended power fuse selection shall be provided for all fuses in the system.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Study Input

1. The Contractor shall be responsible to ensure that all data to complete the Power System Studies is provided and is input to the software model including but not limited to:

a. Selection of suitable base MVA, base voltage and base current.

b. Utility and on site generation, single and three phase fault current contributions including X/R ratios.

c. Motor contributions and sequence impedances including X/R ratios.

d. Sequence resistance and reactance of all major branches.

e. Transformer impedance, X/R ratios, winding connection, tap ranges and base ratings.

f. Models, test results or characterization of Harmonic Sources.

g. All other circuit parameter to permit the complete and accurate modelling of the Power System.

3.02 INSTALLATION

A. Study Report

B. The results of the Power System Studies shall be summarized in a final typewritten report. Three separate reports are required, one for each of the three site locations. Each report shall include the following Sections:

1. Executive Summary, Description, purpose, basis, written scope

2. Load Flow

a. Tabulations of load flow study results inclusive of normal, minimum and maximum branch loadings along with normal, minimum and maximum voltages at nodes.

b. Tabulations of power losses for the Power System elements and the total power loss for the Power System.

3. Short Circuit

a. Tabulations of short circuit study results including a definition of terms and guide for interpretation.

4. Protective Device Evaluation

a. Tabulations of circuit breaker, fuses, and other equipment ratings versus calculated short-circuit duties, and commentary regarding same.

5. Protective Device Coordination

a. Protective device time versus current coordination curves.

b. Tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.

c. Tabulation of appropriate tap settings for relay seal-in units.

6. Diagrams

a. Single line diagram along with suitable and relevant back annotation shall be included for each alternative of the Power System studied.

b. An impedance diagram along with suitable and relevant back annotation shall be included for each alternative of the Power System studied.

7. Software Model Files

a. The contractor shall provide two copies of the software files used to provide the Power System Studies

1) One copy of the software file shall be write protected and shall be capable of all its elements being viewed in the software program stated in this Section.

2) The second copy of the software file shall not be write protected and shall be capable of all its elements being modified by the software program stated in this Section.

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Testing

1. The Contractor shall provide field testing of each Power System.

2. All field testing shall be performed by the testing firm, after the completion and approval of the Power System Studies.

3. The field testing shall be witnessed by the Engineer and certified by the Contractor.

4. The testing firm shall adjust, set, calibrate and test all protective devices. All protective relays and meters in the medium and low voltage equipment shall be set, adjusted, calibrated and tested in accordance with the manufacturer's recommendations, the coordination study and best industry practice.

5. Proper operation of all equipment associated with the device under test and its compartment, shall be verified, as well as complete resistance, continuity and polarity tests of power, protective and metering circuits. Any minor adjustments, repairs and/or lubrication necessary to achieve proper operation shall be considered part of this Contract.

6. All solid state trip devices shall be checked and tested for setting and operation.

7. Circuit breakers and/or contactors associated with the trip devices shall be tested for trip and close function with their protective device.

8. All tests shall be in accordance with the manufacturer's recommendations and NETA, ATS.

9. The Contractor shall provide a field testing report. The report shall be in accordance with NETA, ATS.

3.04 STARTUP / DEMONSTRATION

A. Maintenance of Operations

1. Where the field testing Work specified requires equipment be taken out of service, the Contractor shall perform field testing with due regard to maintenance of operations and construction staging in accordance with this Section and the Specifications.

2. All testing procedures and schedules must be scheduled in advance prior to any work beginning.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 26 05 75 – SHOCK HAZARD AND ARC FLASH STUDIES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing Shock Hazard and Arc Flash studies: Studies for determining Shock Hazard Boundaries and Arc Flash Incident Energies, in and around all electrical equipment, and notifying all personnel of boundaries and energies, shall be provided in accordance with the requirements of the Contract Drawings and the Specifications and this Section.

B. Three separate and distinct Arc Flash studies shall be provided, one for each of the three site locations shown on the Contract Drawings.

C. The Shock Hazard and Arc Flash Studies shall include a short circuit study and a protective device coordination study. Approval shall be obtained for the use of information from existing short circuit and protective device coordination studies.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 05 53 - Identification for Electrical Systems

B. Section 26 05 73 - Power System Studies

1.04 REFERENCES

A. Definitions

1. AC - Alternating Current
2. DC - Direct Current
3. Electric Utility or Utility - Consolidated Edison Company of New York
4. Arc Flash Studies - Shock Hazard and Arc Flash Studies
5. AFIE - Arc Flash Incident Energy
6. SHB - Shock Hazard Boundary
7. PE or Professional Engineer or Licensed Engineer - Licensed Professional Engineer in the State of New York

B. Reference Standards. The Shock Hazard and Arc Flash Studies shall comply with the latest applicable provisions and recommendations of the following:

1. ANSI Z535.4 - Product Safety Signs and Labels
2. BWT Arc Flash - Arc Flash Personal Protective Equipment BWT Guidelines.
3. IEEE 141 - IEEE Recommended Practice for Electric Power Distribution for Industrial Plants
4. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
5. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power System Analysis
6. IEEE 1015 - IEEE Recommended Practice for Applying Low-Voltage Breakers Used in Industrial and Commercial Power Systems
7. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations
8. NFPA 70E - Standard for Electrical Safety in the Workplace
9. NYCEC - New York City Electrical Code
10. OSHA 1910 Subpart S - Electrical

1.05 DESCRIPTION

A. AC Arc Flash Study Outline. The AC arc flash study shall be conducted on all electrical equipment powered by AC sources. The equipment to be studied shall include all electrical equipment from the Electric Utility Point of Service (POS) to the electrical energy utilization point. This includes but is not limited to:

1. All sources of energy including the electric utility, alternative energy sources, emergency generators, legally required generators, optional standby generators and motors.
2. All medium and low-voltage equipment inclusive of equipment of nominal operating voltage less than 120 VAC.
3. All medium and low-voltage electric distribution equipment including but not limited to switchgears, current limiting reactors, motor control centers (MCC), distribution and lighting panelboards, automatic transfer switches (ATS) and control panels.
4. All feeder and branch circuits.
5. All protective devices.

B. Arc Flash Study Modes

C. The arc flash study shall be conducted for different modes of electric equipment operation and the modes producing the most severe arc flash incident energy and the most restrictive shock hazard boundary shall be selected for the display on the required labels. Modes will be as directed by the Engineer but at a minimum shall be as listed below:

1. Mode 1 – All electric utilization equipment which are normally operated, are in the ON STATE and connected in their normal configurations to the normal sources. In the normal configuration, devices such as tie breakers which are normally in the open state remain in the open state for this mode.
2. Mode 2 – As Mode 1 but with all electric utilization equipment in the OFF STATE.
3. Mode 3 – All emergency and standby electric utilization equipment are in the ON STATE and connected to sources activated by the loss of the normal sources.
4. Mode 4 – As Mode 3 but with all emergency and standby electric utilization equipment in the OFF STATE.

1.06 QUALITY ASSURANCE

A. General:

1. Arc Flash Studies shall be completed using the approved computer software programs detailed in this Section.
2. Arc Flash Studies completed manually will not be accepted.
3. The Arc Flash Studies shall be performed in accordance with the latest applicable provisions and recommendations of the Reference Standards listed in this Section.
4. The Contractor shall retain the services of a Licensed Professional Engineer to perform Arc Flash Studies. The Licensed Engineer shall be from an independent engineering firm, or as directed by the Engineer. The

Licensed Engineer shall have at least five (5) years' experience in conducting Industrial Power System Studies inclusive of Arc Flash Studies for projects of similar scope.

5. The Contractor shall coordinate with the Licensed Engineer performing the studies whether or not the Licensed Engineer has been selected by the Contractor, and assist the Licensed Engineer in the collection of all information necessary to complete the studies specified.

1.07 SUBMITTALS

A. Submittals General

1. Contractor shall submit working drawings, shop drawings and material specifications for the approval of the Engineer in accordance with the requirements of this Section and the Specifications.

a. Qualifications of proposed Licensed Professional Engineers/ Engineering firms that will conduct arc flash studies shall be submitted.

1) Submit firm experience records demonstrating at least five (5) years conducting power system studies inclusive of shock hazard and arc flash studies along with the contact information of five (5) references for installations where arc flash studies have been completed.

2) The contact information shall include name, phone numbers, email and address of the references.

3) The contacts shall be able to speak about the work done at the reference locations.

b. Confirmation of the name and version of the approved software package that will be used in the Arc Flash Studies. The software package shall be capable of producing samples of all equipment labels recommended even if final labels will be produced by a third party vendor.

c. Calculations and results of the arc flash studies shall be submitted. The arc flash studies shall be submitted in a report format. The report shall contain recommended samples of the labels required for each type of equipment where personnel shall be required to interface with electrical equipment for operation, adjustment, repair or modification. The report shall be stamped and signed by the Licensed Engineer.

d. Electronic copies of the results of the arc flash studies shall be submitted in addition to the above report. The format of the electronic submissions files shall permit and allow the following:

1) The review of all submittals in the approved software program detailed in this Section.

2) The review of all submittals by common readers such as Adobe Acrobat.

e. Work sequence for the application of equipment labels shall be submitted. The sequence shall indicate the schedule of work, time frame and downtime if any for the equipment. The work sequence shall be submitted at least 45 days in advance prior to confirmation of field labeling dates.

B. Preliminary Arc Flash Studies

1. Preliminary Arc Flash Studies shall be submitted to the Engineer prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If completion of the preliminary study may cause delays in equipment shipments, approval from the Engineer shall be obtained for a preliminary submittal of data to ensure that the selection of device ratings and characteristics will be satisfactory to properly select the distribution equipment. Final formal arc flash studies shall be provided to verify preliminary findings.

C. Label Application Reports

1. A report shall be submitted detailing the equipment labeled and whether it was not possible to accomplish the labeling of specific pieces of equipment and the reasons for this.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Arc Flash Study shall be performed using the latest version of commercially available computer software as manufactured by

1. SKM.

2. Easy Power.

3. ETAP

4. Or Approved Equal.

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Shock Hazard Study

1. For each piece of equipment a shock hazard analysis complying with the requirements of NFPA70E shall be completed and shall detail the following as minimum:

a. Equipment and subpart if applicable

b. Nominal voltage

c. Restricted approach boundary

d. Limited approach boundary

e. Flash protection boundary

f. Short Circuit Amps

g. Protective Device clearing time.

B. Arc Flash Study

1. The Arc Flash analysis shall cover the Modes of operation detailed in this Section, ensuring that each node is studied for each of maximum and minimum short circuit contribution of the energy sources connected to the system. The following shall be completed:

a. Confirm the results of Section 26 05 73 - Power System Studies

b. Extend the results of Section 26 05 73 - Power System Studies as required to complete the arc-flash study

c. Calculate the arc fault currents

d. Determine the protective device operating times

e. Determine the incident energies

f. Determine the flash protection boundaries

g. Determine the incident energies at the boundaries determined in the shock hazard analysis and at the working distance.

h. Determine the Hazard/Risk categories at the boundaries determined in this Section.

i. Recommend the appropriate required level of PPE for workers within the flash protection boundaries, the shock hazard boundaries and the working distance.

C. Reports

1. A report shall be submitted detailing the results of this study, and color copies of labels that will be prepared for each piece of equipment. Three

separate reports are required, one for each of the three site locations. Each report shall contain at the minimum the following information:

a. Executive Summary including Introduction, Scope of Work and Results/Recommendations

b. All raw data collected and organized by common category

c. Study One Line Diagrams for each configuration

d. Impedance Diagrams for each configuration

e. Complete Fault and Protective Device Coordination Study

f. Shock Hazard/Arc Flash Analysis results, inclusive of tabular listing showing for each piece of equipment the following minimum information:

1) Equipment and Subpart

2) Nominal Operating Voltage

3) Restricted Approach Boundary

4) Limited Approach Boundary

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Approval Data Sources

1. The Contractor shall ensure that all other provisions of the Contract are satisfied inclusive of all vendors of electrical equipment has been approved, all working drawings and as built data relating to all equipment submitted and approved.

2. The Contractor shall ensure that the results of Section 26 05 73 – Power System Studies have been submitted and the settings of all protective devices have been approved.

3. The Contractor shall not commence the arc flash study until all prior studies and submittals to be reused in the arc flash study has been submitted and approved.

4. Arc Flash studies based on equipment or equipment data and settings which have not been approved, as required in an earlier stage of the project, will be rejected outright.

B. Data Collection and Modelling

1. The Contractor shall ensure that the collection of all data required to support studies under Section 26 05 73 – Power System Studies and

Studies under this Section are input into a comprehensive and accurate software model of the electrical distribution system.

2. Data shall include but not be limited to:

   a. Maximum and minimum short circuit infeed data of all sources including current magnitudes, X/R ratios and sequence values.

   b. Information on all installed equipment such as cable lengths, cable sizes, and cable impedance per unit length.

   c. All data to determine clearing times of protective devices.

3. An accurate and comprehensive model of the electrical distribution system shall permit the evaluation of the short circuit currents at all nodes in the system. The model shall also permit the coordination of protection devices installed at nodes upstream and downstream of a specific node.

4. All nodes incorporated in the model shall be approved before any analyses are commenced.

3.02 INSTALLATION

A. Arc Flash Labels

1. Arc Flash labels shall be provided in accordance with Section 26 05 53 - Identification for Electrical Systems.

2. The Contractor shall affix arc flash labels to each piece of equipment.

3. The arc flash labels shall contain the results of this Section.

4. The label content and the schedule governing the placement of labels shall be approved by the Engineer before affixing the labels to the equipment.

5. Each label shall indicate location in the facility of a copy of the studies generating the labels.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Training

1. The Contractor shall conduct training of the owner's qualified electrical personnel on the potential arc flash hazards associated with the working of the energized equipment.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing low-voltage electric motors. Low-voltage electric motors shall be provided in accordance with the requirements specified under this Section and the Contract Drawings.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 40 05 97 – Identification for Process Equipment.

1.04 REFERENCES

A. Definitions

1. Low-voltage as used in this Section and the Specifications shall mean all equipment, conductors, insulation systems and accessories intended for operation within the 600 Volt Class.

B. Reference Standards

1.	AFBMA Standard 9	-	Load Ratings and Fatigue Life for Ball Bearings.
2.	AFBMA Standard 11	-	Load Ratings and Fatigue Life for Roller Bearings.
3.	API Standard 541	-	Form-Wound Squirrel-Cage Induction Motors 375 kW (500 HP) and Larger
4.	EPAct 1992	-	Energy Policy and Conservation Act of 1992
5.	EISA 2007	-	Energy Independence and Security Act of 2007
6.	IEEE 112	-	IEEE Standard Test Procedure for Polyphase Induction Testing Motors and Generators.
7.	IEEE 841	-	Premium-Efficiency, Severe Duty Totally Enclosed Fan-Cooled Squirrel-Cage Induction Motors.
8.	NEMA MG1	-	Motors and Generators.
9.	NEMA MG 10	-	Energy Management Guide for Selection and Use of Fixed Frequency Medium AC Squirrel-Cage Polyphase Induction Motors.
10.	NETA ATS	-	Acceptance Testing Specifications.
11.	NIST	-	US National Institute of Standards and Technology
12.	NYCEC	-	New York City Electrical Code.
13.	NYC EPPR	-	New York City Environmentally Preferable Purchasing Rule.
14.	UL Standard 674	-	Low-voltage electric motors and Generators for use in Hazardous Locations.
15.	UL Standard 1004	-	Low-voltage electric motors.

1.05 DESCRIPTION

A. Motor Data

1. Motor data is specified under the Section of the Specification detailing the requirements of the driven equipment with which the motor is supplied. These data include voltage, rpm, HP and enclosure types.

B. Motor Types

1. The motor types specified under this Section shall include:

a. Single Phase, alternating current, fractional horsepower induction motors.

b. Three Phase, alternating current, NEMA frame, squirrel cage, induction motors.

c. Three Phase, alternating current, above NEMA frame, squirrel cage, induction motors.

d. Three Phase, alternating current, submersible, squirrel cage, induction motors.

e. Three Phase, alternating current, wound-rotor, squirrel cage, induction motors.

f. Direct current, small motors.

1.06 QUALITY ASSURANCE

A. Electric Motors shall comply with the requirements of NYC EPPR.

B. The motor manufacturer shall maintain a documented Quality Assurance Program implementing suitable procedures and controls to monitor all aspects of production and testing.

C. The Quality Assurance Program shall be the manufacturer's standard program specifically dedicated to ensure each motor is designed, assembled and tested in accordance with the requirements specified in this Section, the Specifications and the Contract Drawings,

D. Motor manufacturer shall use a shop test facility that has calibrated testing apparatus, inclusive of a calibrated dynamometer and qualified experienced technicians for all shop tests. Calibration of all testing apparatus shall be within one year.

E. All test equipment, instrument calibration and test reports shall be in accordance with the latest edition of the accuracy standard of The U.S. NIST and NETA ATS.

F. Nameplates shall be provided for each motor. Nameplates shall clearly indicate information in accordance with NEMA requirements. Nameplates shall be engraved or embossed on stainless steel and fastened to the motor frame with stainless steel screws or drive pins.

G. Field Tests:

1. The motors shall be field tested.

2. Field testing shall be performed in accordance with the requirements specified under this Section and the Specifications.

3. Retain the services of the motor manufacturer for field service.

4. Field service shall be in accordance with the requirements specified under this Section and the Specifications.

5. For motors larger than 200 horsepower an independent testing firm shall be retained to perform acceptance testing of the motors.

   a. The testing firm shall have experience in the inspection and testing of motors and shall be a member company of NETA.

   b. Provide proof of membership or demonstrate that the standards and experience required for membership are possessed, all to the satisfaction of the Engineer.

   c. Acceptance testing shall be in accordance with the requirements specified under this Section.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. A list of proposed manufacturers with the products they produce proposed for the contract.

2. For fractional horsepower motors, data sheets showing nameplate data shall be submitted.

3. For motors rated one horsepower or greater, Motor Test Data Sheets shall be submitted. All values shall be from tests of previously manufactured, electrically duplicate motors or calculated data. Sheets shall be marked to indicate motor application location, manufacturer, type, frame size, bearing type, lubrication medium and enclosure type. Data Sheets shall at a minimum include:

   a. Winding resistances.

   b. Torques.

   c. Efficiencies.

   d. Power factors.

   e. Slip.

   f. Full load.

   g. Locked rotor and no load amperes.

   h. Rotor voltage and amperes for wound rotor units.

   i. Nameplates temperature and results of dielectric tests.

4. An outline drawing or an outline data sheet showing complete motor dimensions shall be submitted to cover every motor rated greater than 1/3 horsepower. Several motors of the same type and rating for the same application may be covered by a single drawing or outline sheet. Drawings or sheets shall bear complete identifying data including frame size, speed, horsepower ratings and application for each particular unit.

5. Description of proposed shop and field testing methods, procedures and apparatus with calibration dates shall be submitted. Testing methods and procedures shall be submitted in advance prior to conformation of witness testing dates and actual testing as follows:

   a. At least 60 days in advance for test locations in the US.

   b. At least 90 days in advance for test location outside of the US.

6. Qualifications of proposed testing firm to perform acceptance testing shall be submitted. Submit firm experience records at least 60 days in advance to actual testing, five recent references with phone numbers shall be submitted.

7. All motor accessories, heaters, detectors, etc., shall be submitted.

8. Bill of Materials for the proposed motors shall be submitted.

B. Certificates of Compliance:

1. Certified copies of motor characteristic curves and all other data necessary for establishing control and protective equipment settings shall be submitted.

2. Results of shop tests shall be certified. When routine tests are made in conjunction with complete initial tests, unwitnessed results shall be certified and copies shall be submitted. Results shall be included for each test.

3. Data and results of witness tests shall be submitted with copies of certified initial tests, accompanied by a certificate of authenticity sworn to before a notary public by an officer of the manufacturing company. Upon approval, release for shipment to site shall proceed and the Engineer shall be notified of the arrival date.

C. Reports:

1. Shop test and field test reports shall be submitted.

2. Manufacturer’s site visit and acceptance testing reports shall be submitted.

D. Operation and Maintenance Manuals.

1. Operation and Maintenance Manuals shall be submitted in accordance with this Section and the Specifications.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Low-voltage electric motors shall be delivered, stored and handled in accordance with this Section, the Specifications, the motor manufacturer's instructions and the following:

1. Motors shall be inspected for shipping damage when received.

2. All sleeve or oil lubricated bearings motors shall be identified and the bearing reservoirs filled to normal level.

3. Motors shall be handled using motor base lifting lugs. Avoid pounding or bumping of motor which may damage motor. A hoist and spreader bar arrangement shall be used to avoid damage.

4. Motors shall be stored indoors in clean, dry heated areas.

5. Motor space heaters shall be energized to prevent moisture condensation throughout the storage and construction period.

6. Motors shall not be stored in areas subject to continuous vibration. A small quantity of grease shall be injected into each bearing on a monthly basis. Purged grease shall be inspected for water or rust. Motor shaft shall be rotated by hand to check for binding.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Spare Parts

1. The Contractor shall furnish and deliver to the Engineer, at that part of the site and at such time as the Engineer may direct, spare parts for the low-voltage electric motors in accordance with this Section and the Specifications.

2. The spare parts shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the manufacturer's part number with complete information for use and reordering.

3. Spare parts shall be furnished in accordance with the manufacturer's recommendations for the motor size and type. Spare parts shall include at a minimum the following:

a. One complete set of bearing linings, or renewable ball or roller bearings shall be provided for each three (or less) of each type and size of motor. Spare bearings shall be furnished for all motor types. When sleeve bearing motors are provided, spare oil rings shall be furnished for those motors.

b. One set of brushes shall be provided for each DC type motor and wound rotor type motor requiring them.

c. One complete assembly of brush holders and supports shall be provided for each size of DC type motor and wound rotor type motor requiring them.

d. One complete assembly of collector rings shall be provided for each size of wound rotor type motor requiring them.

e. One complete set of fans and guards shall be provided (per each set of three or less) for each size totally enclosed fan cooled type motor.

f. One set of bearing temperature detectors shall be provided (per each set of three, or less) of each type of motor 250 horsepower and larger.

g. One set of upper and outer seal assemblies shall be provided (per each set of three or less) for each size submersible type motor.

h. One set of O ring kit shall be provided (per each set of three or less) for each size submersible type motor.

i. One set of wear rings shall be provided (per each set of three or less) for each size submersible type motor.

B. Lubricants

1. The Contractor shall furnish as part of the bulk lubricant order the quantity of lubricants required to operate and maintain the motors furnished under this section for a period of one year after acceptance. As a minimum, there shall be provided sufficient oil and grease to make a least one lubricant change for each motor as applicable.

2. Replace all lubricants used during startup and testing prior to acceptance of equipment. Furnish this replacement lubricant in addition to the lubricants included in the bulk order.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Driven Equipment

1. The motor manufacturers are as shown on the Contract Drawings or stated in the Sections detailing the driven equipment.

2.02 MATERIALS / EQUIPMENT

A. Design Requirements

1. Motors shall be designed, built, and tested in accordance with the latest applicable editions of ANSI/IEEE, NEMA, UL and NYCEC. The

classifications, ratings, performance and testing of all motors shall be in accordance with the latest edition of NEMA MG1.

2. Motor winding shall be copper.

3. Motors shall be premium efficiency type and shall have nominal efficiencies in accordance with NEMA MG1. Motors with horsepower or rpm's not listed by NEMA shall conform to comparable standards of construction and materials as those for listed NEMA motors.

4. Motors shall be of sufficient capacity to operate the driven equipment under all conditions of operation without loading the motors beyond their rated nameplates current and power under all operating conditions imposed by the driven equipment.

5. The rating of the motors offered shall in no case be less than the horsepower shown on the Contract Drawings or stated in the Specifications. Both the rating and the characteristics of the motor shall be suitable for the successful operation of the driven equipment, under load conditions, within nameplates values of service factor and ambient temperatures.

6. Motors shall be of three phase construction for ratings above 1/3 horsepower and single phase construction for 1/3 horsepower or less.

7. Low-voltage motors shall be of a type approved for starting characteristics and ruggedness as may be required under the actual conditions of operation.

8. Low-voltage motors shall be designed for full voltage starting.

9. Reduced voltage starters, shall ensure that the motor develops ample torque and is able to accelerate and attain its operating speed under the load conditions imposed by the driven equipment.

10. Multi-speed motors shall have a separate winding for each speed.

11. Portable devices shall have totally enclosed motors and approved cord with provisions for grounding. They shall be suitable for the available power supply.

12. All motors shall be continuous time rated suitable for operation in a 40 degrees C ambient.

13. Motors shall comply with the EPAct 1992 and EISA 2007.

14. Variable-speed motors shall comply with NEMA MG1.

15. Variable-speed motors operated from variable frequency drives shall comply with NEMA MG1 and shall be inverter duty rated.

B. Single Phase Motors

1. Single phase motors shall be rated 115 or 230 volt, capacitor start. Small fan motors may be split-phase or shaded pole type if such are standard for the equipment.

2. Bearings for single phase, open, enclosed and explosion-proof motors shall be grease-lubricated ball type with grease fittings or with lubrication for 10 years of normal operation.

3. Motors shall be totally-enclosed except small fan motors may be open type if suitably protected from moisture, dripping water, and lint accumulation. Motor features shall be in accordance with the following:

   a. Open motors shall be split phase or capacitor start in accordance with torque requirements, 1.35 Service Factor, 40 degrees C Ambient Class B Insulation.

   b. Enclosed motors shall be capacitor start, fan cooled 1.15 service factor, 40 degrees C ambient, Class F, treated insulation. Enclosed motors shall be totally enclosed fan cooled, or non-ventilated. Enclosed motors shall be designed to withstand chemical corrosion and shall be severe duty type equipped with cast iron end shields, neoprene gaskets, stainless steel shaft, heavy pressed steel fan cover and provision for threaded conduit connection.

   c. Explosion-proof motors shall be fan cooled, split phase or capacitor start in accordance with torque requirements, 1.0 service factor, 40 degrees C ambient, equipped with swivel conduit connector and long leads for external connection.

   d. Direct drive fan motors shall be shaded pole or permanent split capacitor, 1.35 service factor, 40 degrees C ambient.

C. Three Phase Motors

1. General

   a. Three phase motors shall be squirrel cage induction type, designed for operation on a 3 phase, 60 hertz alternating current system.

   b. Three phase squirrel cage motors shall be severe duty and shall conform to the requirements of IEEE 841

   c. Motor voltage shall be as shown on the Contract Drawings.

   d. Motors used with adjustable frequency controllers shall be as stated in this Section, the Specifications and the Contract Drawings.

   e. Unless otherwise required by the load, all motors shall be NEMA Design B, normal starting torque. Locked rotor KVA/HP shall not exceed NEMA Code Letter G for 20 HP motors and larger.

   f. The design of the stator, rotor and shaft shall be in accordance with the approved practice of leading manufacturers. The motor frame shall be a rigid structure, designed to maintain the lamination in correct alignment and shall not be dependent on the lamination or bolts for rigidity.

g. Motors having considerable core length shall be provided with approved means for taking up shrinkage in length.

h. Motor rotors shall be of cast or fabricated aluminum or fabricated copper or copper alloy as required to meet the motor performance characteristics of slip, torque, and efficiency.

2. Bearings

a. Horizontal motors shall be provided with either the rolling element (anti-friction) or sliding element (sleeve) type bearings. Anti-friction type bearings shall be used for all NEMA frame motors. Where greater power and speeds are required by the driven equipment, sleeve type bearings shall be used. The bearings for all motors larger than 200 horsepower shall be insulated to prevent shaft currents and related bearing damage.

b. Bearings for 3 phase drip-proof, enclosed and explosion-proof motors shall be grease lubricated, ball type. Bearings shall be fitted with inlet fittings and outlet plugs. Motor bearings and grease reservoirs shall be protected from the entry of contaminants.

c. Bearings for direct drive fan motor shall be of the oil lubricated sleeve type.

d. When anti-friction bearings are furnished on horizontal motors for ratings to 500 horsepower and speeds to 3600 RPM they shall have a minimum bearing life of 100,000 hours as defined by AFBMA. Suitable fittings shall be provided to permit convenient positive purging of old grease during regreasing operation. Close running shaft seals shall prevent leakage of grease as well as prevent the entrance of foreign materials such as water and dirt into the bearing area. Motors equipped with anti-friction bearings shall have the appropriate AFBMA number stamped on a nameplate attached to the motor.

e. When furnished, sleeve bearings shall be ring-oiled with an adequate, integral self-cooled oil reservoir. The bearing sleeves shall be lined with a high tin content babbitt to minimize oil contamination. Close running shaft seals shall prevent oil leakage as well as prevent entrance of foreign material such as water and dirt into the bearing area. Oil level sight gages with permanently marked easily discernible oil level shall be provided. In addition, inspection openings to observe the oil rings shall also be provided.

f. When required by motor speed and bearing size, provision shall be made for forced lubrication. The oil supply shall be supplied with motor. In addition, oil rings and an adequate oil reservoir in the bearing housings shall be provided to permit orderly shutdown of the motor in the event of failure of the formed feed lubrication system.

g. Vertical motors shall be provided with thrust bearings adequate for all thrusts to which they can be subjected. The rated minimum life of the thrust bearings shall be at least 15,000 hours when operated at rated speed and full load thrust. The driven equipment manufacturer shall supply the motor manufacturer with the speed and thrust conditions required by the driven equipment.

h. Submersible motor bearings shall be permanently sealed and lubricated. Anti-friction guide and thrust bearings shall be replaceable. Bearings shall have a rated minimum life of 15,000 hours.

3. Insulation

a. The insulation system for three phase AC motors shall be rated Class F, with a service factor of 1.15 times the nameplate horsepower rating when operated on a sine wave supply and a service factor of 1.0 on an adjustable frequency supply. Temperature rise shall be limited to Class B insulation system when motor is operated continuously at rated horsepower with an ambient temperature not exceeding 40 degrees C.

b. Windings shall be epoxy coated. The windings shall be thoroughly treated with approved insulating compound suitable for protection against moisture, salt air and slightly acid or alkaline conditions. The insulation system for enclosed motors shall be upgraded by additional dips and bakes to increase moisture resistance.

c. Motors for outdoor service and all motors larger than 200 horsepower shall have vacuum/pressure impregnated epoxy insulation (VPI) for moisture resistance. Motors shall be preheated before VPI and baked in a temperature-controlled oven.

d. Motors applied in speed varying service and operated from variable frequency controllers shall have an inverter grade insulation system designed and built in accordance with NEMA MG1 Part 31.

e. The stator windings and end turn connections shall be fully brazed to withstand full voltage starting regardless of the starting method indicated in this Section, the Specifications and the Contract Drawings. The bracing system shall essentially eliminate coil vibration under the high current conditions of starting as well as during normal operation. If a tied system is used, it shall be such that no tie depends on the integrity of any other tie within the system.

f. Motors larger than 200 horsepower shall be form wound. Form wound coils with a micaceous ground wall insulation is required with additional insulation similar to Mica 5 and hot pressed to make a sealed system. Coils shall be form wound with mica

insulation and each separate coil shall be vacuum pressure impregnated before inserting into slots.

4. Enclosures

a. Wound rotor motors shall be drip-proof, except for crane and hoist installations and where specified otherwise.

b. Motors shall have a steel or cast iron frame and a cast iron or steel conduit box. For wound rotor motors separate boxes for stator and rotor connections shall be provided. For NEMA frame size motors cast aluminum frames and terminal boxes may be used.

c. Motor enclosures shall conform to the NEMA classifications specified and to the following:

1) Open Drip proof: Motors shall have a steel or cast iron frame, cast iron end brackets and steel conduit box. Vertical motors of the open type shall be provided with drip hoods of approved shape and construction. When the drip hood is too heavy to be easily removed, provision shall be made for access for testing. Open motors shall be provided with corrosion resistant screens over the air openings in accordance with NEMA requirements for guarded machines.

2) Totally enclosed fan cooled and non-ventilated motors shall have a cast iron frame, cast iron end brackets and cast iron conduit box. Drain holes shall be provided on each end of motor.

3) Explosion proof motors shall have a cast iron frame, cast iron end brackets and cast iron conduit box. Unless shown otherwise on the Contract Drawings or stated in the Detailed Specifications, explosion proof motors shall be UL listed for Class 1, Division 1, Group D hazardous areas.

4) Severe duty motors shall include a corrosion resistant treatment. Severe duty motors shall have a cast iron frame, cast iron end brackets, cast iron conduit box, stainless steel "T" drains in both end brackets, corrosion resistant fan, and stainless steel hardware.

5) Submersible motors shall be hermetically sealed, watertight with tandem mechanical seals suitable for continuous submergence and listed for Class 1, Division 1, Group D locations.

d. Conduit Boxes

1) Motor conduit box shall be split from top to bottom and shall be capable of being rotated to four positions. Motor conduit box shall be in accordance with the following:

a) Conduit box shall be gasketed and shall include rubber-like gaskets between the frame and the conduit box and between the conduit box and its cover.

b) Conduit boxes or openings in motor housings shall be provided with conduit hub type fittings to permit threaded conduit connections. Single phase, explosion-proof and direct drive fan motors shall be provided with conduit fittings and leads to permit external connection.

c) Conduit box sizes shall be in accordance with code requirements. This shall include appropriate terminations for the rated voltages.

d) Protective and auxiliary devices, shall terminate in auxiliary conduit boxes.

e) Terminal leads shall be flexible and shall be of sufficient length to extend for a distance of not less than ten inches beyond the face of the terminal box. Terminal leads shall be fitted with solder less lugs suitable for attachment to lugs installed on external wiring. Leads shall be sealed with a non-wicking, non-hygroscopic insulating material or an insulating "wrap-cap".

f) Provisions for terminal box size, length of leads, size of conduit openings and type of terminal lugs shall be complied with irrespective of any other standards or practice.

g) A motor frame grounding stud shall be provided inside the conduit box. A drilled and tapped hole shall be included.

D. DC Motors

1. General

a. DC motors shall be designed and built in accordance with NEMA Standard MG1-12 for use on a full wave, single phase, rectified power supply.

b. DC motors shall be heavy duty, industrial SCR drive type, direct current. Motor construction shall be shunt-wound or permanent-magnet type as stated in this Section, the Specifications and the Contract Drawings.

c. DC motors shall provide a constant torque output over the operating speed range, with fixed shunt excitation and variable DC armature voltage.

2. Bearings shall be grease lubricated, double shielded, with shaft seals.

3. Insulation

   a. The insulation system for DC motors shall be Class F, with a service factor of 1.15 times the nameplate horsepower rating.

   b. The windings shall be epoxy coated and include a thermostat protector. Thermostat shall be in accordance with the requirements specified under this Section.

4. Enclosures

   a. DC motor enclosure shall be totally enclosed fan cooled, or non-ventilated. The frame size shall be selected by the manufacturer to prevent overheating when continuously operated at low speeds.

   b. Motor enclosures shall be severe duty type, designed to withstand chemical corrosion, and shall utilize corrosion resistant materials for special finishes in their construction. Motors shall be equipped with cast iron end shield, neoprene gaskets, stainless steel shaft, heavy pressed steel fan cover and provisions for threaded conduit connection.

   c. When stated in this Sections, the Specification and the Contract Drawings, the motor enclosure shall be fitted with a factory mounted tachometer generator. The generator shall be C-face or flange mounted construction.

E. Accessories

1. General

   a. Motor accessories shall be provided in accordance with the requirements specified under this Section, the Specifications and the Contract Drawings.

2. Rotor Grounding

   a. An approved rotor grounding means or mechanism shall be provided to drain induced currents, parasitic and static charges to ground.

3. Space Heaters

   a. Each outdoor motor 5 horsepower and larger shall be provided with space heaters.

   b. Each motor 5 horsepower and larger enclosed motors installed indoors, in damp unheated spaces, shall also be provided with space heaters.

4. Each motor 250 horsepower and larger shall be provided with space heaters.

5. Space heaters for condensation prevention shall be rated 120 volt. Wattage shall be suitable for the particular frame size and type in accordance with the manufacturer's recommendation.

6. Space heater wire leads shall be brought out to an auxiliary conduit box on the motor. Box construction shall match main power conduit box.

F. Winding Protection

1. Winding Protective Devices:

a. Thermostat type protection shall be provided for each motor in accordance with the following:

1) Submersible motors and explosion proof motors.

2) Variable speed motors up to 25 horsepower.

b. Thermistor type protection shall be provided for each motor in accordance with the following:

1) Constant speed motors 50 horsepower and larger up to 200 horsepower.

2) Variable speed motors 30 horsepower and larger up to 200 horsepower.

c. Resistance temperature detectors shall be 100-ohm precision type with calibrated resistance-temperature characteristics. Detectors, two per phase, shall be positioned to detect highest winding temperature and located between coil sides in stator slots. Detector leads shall be wired to a separate NEMA 4X terminal box.

2. Thermostats shall be bi-metal disk or rod type embedded in the stator windings. Thermostat contacts shall be automatic reset type, rated 120-volt AC, 5 amps minimum opening on excessive temperature.

3. Thermistors embedded in each stator phase winding shall be in direct contact with the winding conductors. Each thermistor circuit shall be factory wired to 120-volt solid state control module mounted at the motor in a NEMA 4X box. The control module contacts shall be automatic reset type, rated 120-volt AC, 5 amps minimum opening on excessive temperature.

G. Bearing Temperature Protection

a. Bearing temperature detectors, RTD type similar to the winding detectors specified under this Section shall be provided on each bearing for horizontal motors and on the thrust bearing for vertical motors.

b. Each motor 250 horsepower and larger shall be provided with stator and bearing temperature detectors.

H. Special Application

1. Cranes, elevators, hoists, and other devices complying with special safety codes shall be furnished complete with their control equipment, and with all accessories and safety devices for approved safe and efficient operation.

I. Single Phase Motors

1. Single phase motors requiring auxiliary starting resistors, capacitors or reactors and switching devices shall be furnished as combination units with such auxiliaries either incorporated within motor housings or housed in suitable enclosures, mounted upon motor frames. Each combination unit shall be mounted upon a single base and shall be provided with a single conduit box.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Painting

1. External Surfaces:

a. All severe duty motors shall have all external surfaces pretreated, primed and painted. External surfaces shall be pretreated so the surface is clean and free of contaminants. After pretreatment, the surface shall be primed with an oxide primer and then spray painted with a minimum of 0.003-inch thick epoxy polyamide and semi-gloss coating that is chemical, solvent, salt water, and acid resistant.

b. All other motors shall have external surfaces pretreated, primed and painted in accordance with the manufacturer's standard treatment.

2. Internal Surfaces:

a. All severe duty motors shall have all internal surfaces pretreated, primed and painted. Internal surfaces shall be pretreated so the surface is clean and free of contaminants. After pretreatment, the surface shall be primed with an oxide primer and then painted with an epoxy paint. Machined joints and threaded parts shall be coated with rust inhibiting compound.

b. All other motors shall have internal surfaces pretreated and primed in accordance with the manufacturer's standard treatment.

B. Hardware

1. All machined bolts and screws and other hardware shall be of the hex head type and shall be zinc plated.

2. Stainless steel hardware shall be used on severe duty motors.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Certified Shop Tests:

1. Shop testing shall be performed on the motors at the manufacturer's plant prior to shipment. Shop test shall be in accordance with the latest revisions of IEEE 112 and NEMA MG1 and shall demonstrate that the equipment tested conforms to the requirements specified inclusive of the efficiency requirements stated in this Section.
2. The Contractor shall provide a shop test report. The report shall identify the tests performed and the results obtained.
3. Every motor rated less than 200 horsepower shall be given a routine test at the manufacturer's factory. The routine test shall consist of:
    a. No Load Speed, Voltage and Current at rated frequency.
    b. Locked Rotor Current.
    c. Winding Resistance.
    d. High Potential.
    e. Bearing Inspection.
    f. Measurement of Secondary Volts at standstill for wound-rotor units.
4. Motors rated at 200 horsepower or greater shall be given complete initial tests consisting of:
    a. Full-load Heat Run.
    b. Percent Slip.
    c. No Load Speed, Voltage, Current and losses at rated frequency.
    d. Full Load Current.
    e. Locked rotor Torque.
    f. Locked-rotor Current.
    g. Breakdown Torque (Calculated).
    h. Starting Torque (squirrel-cage).
    i. Winding Resistance.
    j. High Potential.
    k. Sound.
    l. Vibration.
    m. Efficiencies at 125, 100, 75 and 50 percent of full load.
    n. Power Factors at 125, 100, 75 and 50 percent of full load.
    o. Bearing Inspection.
    p. Measurement of Secondary Volts at collector rings for wound-rotor units.

B. Witnessed Shop Tests:

1. The Contractor shall perform witnessed shop tests in accordance with this Section and the Specifications.

2. When stated in this Section and the Specifications, motors shall be witness tested. Motors shall be given a complete test two weeks before and then retested in the presence of the witness.

3. When complete initial or witness tests are required for a group of the same type, rating and horsepower for the same application, all units of the group shall be subjected to the complete test, unless specifically stated otherwise in this Section or the Specifications.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Motors

1. Motors shall be installed in accordance with manufacturer's instructions and recommendations.

2. Each motor shall be carefully and properly aligned with the driven equipment.

3. Equipment shall be secured to mounting surface with anchor bolts. Anchor bolts shall be provided meeting manufacturer's recommendations and of sufficient size and number to secure equipment.

4. Motor nameplates shall be installed for identification of equipment. Nameplates shall be provided in accordance with the requirements of Section 40 05 97- Identification for Process Equipment.

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Tests

1. After installation, motors shall be field tested for operation and conformance. The Contractor shall perform field tests in accordance with this Section, the Specifications and the Contract Drawings. The field tests shall be witnessed by the Engineer and certified by the Contractor.

2. Motor testing shall be performed by the manufacturer's representative, prior to energizing equipment.

3. Equipment shall not be energized without the permission of the Engineer.

4. The testing shall be in accordance with the recommendations of the manufacturer's representative and shall include at a minimum the following:

a. Motors shall be checked to determine that they have been properly installed, lubricated and connected.

b. Motors shall be checked to determine they are not overloading, overheating or defective.

c. Motors shall be phase sequence tested to ensure motor rotation is correct.

d. Motors shall be checked to determine they comply with performance and design parameters.

A. Manufacturer's Field Services

1. A qualified manufacturer's service representative shall assist in the installation of the motors, check the motor installation before it is placed into operation, assist in the performance of field tests, observe and assist initial operations and train the plant operations and maintenance staff in the care, operation and maintenance of the motors.

2. The Contractor shall provide equipment start-up services and training in accordance with this Section, the Specifications and the Contract Drawings.

3. The Contractor shall provide a field report from the manufacturer's representative for each visit to the site. The report shall include complete information on time, schedule, tasks performed, persons contacted, problems corrected, tests results, training, instruction and all other pertinent information.

4. The service representative shall sign in with the Engineer on each day they are at the site.

3.04 STARTUP / DEMONSTRATION

A. Acceptance Testing

1. The Contractor shall provide acceptance testing of the motors. All acceptance testing shall be performed by the testing firm, after the completion of the Field Tests specified under this Section. The acceptance testing shall be witnessed by the Engineer and certified by the Contractor.

2. Acceptance inspection shall be performed on each motor larger than 200 horsepower. Inspection shall include the following:

a. Electrical and grounding connections shall be inspected.

b. Shaft alignment, proper mounting and lubrication shall be inspected.

c. Ventilating air passageways shall be inspected for blockage.

d. Excessive noise shall be inspected.

e. Any overheating shall be inspected.

f. Correct rotation shall be inspected.

g. Protective detectors operation shall be checked.

h. Any excessive vibration shall be checked.

i. Space heater operation shall be checked.

3. Acceptance electrical testing shall be performed on each motor larger than 200 horsepower. Testing shall include the following:

a. Insulation resistance tests shall be performed.

b. Surge comparison testing shall be performed.

c. Vibration tests shall be performed.

d. Bearing insulation resistant tests on insulated bearings shall be performed.

e. Running current and voltage shall be measured and evaluated relative to load conditions and nameplate full-load amperes.

f. High-potential tests shall be performed.

g. For wound rotor motors, additional electrical testing at minimum and normal operating load points and at ring short shall be performed.

h. Motors shall be operated with driven equipment for a minimum of 48 continuous hours and rechecked for overheating and vibration.

4. All tests and values for AC and DC motors shall be in accordance with the manufacturer's recommendations and NETA ATS.

5. The Contractor shall provide an acceptance testing report. The report shall be in accordance with NETA ATS.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 26 06 11 – CABLE AND CONDUIT SCHEDULE
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install wires, cables, and conduit complete and operational.

B. All wiring, cable and conduit shall be furnished and installed under this Contract, unless specifically noted otherwise.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 05 20 – Low-Voltage Wires, Cables and Accessories

B. Section 26 05 53 – Identification for Electrical Systems

1.04 REFERENCES

A. Definitions

1. Conduit shall include all types of raceways provided under this Contract.
2. Install or Installed, as applicable to Conduit, shall mean install all Conduit, raceways, fittings, boxes and accessories required to achieve a complete and functional conduit system.
3. Install or Installed, as applicable to Conduit, shall also include cleaning and swabbing, grounding and bonding of the conduit system and the provision of drag lines in each conduit on completion of the conduit system
4. Installed or Installed, as applicable to wire and cable, shall mean the pulling in of wires or cable, testing wire or cable insulation resistance, continuity and absence from grounds as well as terminating of all conductors and testing for proper connection.

B. Reference Standards

1. NYCEC - New York City Electrical Code

1.05 DESCRIPTION

A. The Wire, Cable, and Conduit Schedule, shown on the Contract Drawings, lists the following information:

1. Conduit number
2. Conduit size
3. Point of origination
4. Point of termination
5. Enclosed wire or cable size and the number and types
6. Purpose of the wire or cable contained in the conduit such as power, control, ground, etc.

B. The Conduit numbering system consists of two parts separated by a hyphen.

1. The first part is the equipment identification number.
2. The second part is the individual conduit identification number which may be presented.

C. In general, the Wire, Cable and Conduit Schedules do not indicate lighting and receptacle circuits, as well as some other wire, cable, and conduit to be provided under this Contract.

D. The Contractor shall refer to Section 26 05 20 - Low Voltage Wires Cables and Accessories, Section 26 05 53 - Identification for Electrical Systems and the Contract Drawings for additional wire, cable, and conduit requirements.

1.06 QUALITY ASSURANCE

A. All Conduits shall contain a separate equipment grounding conductor sized according to the NYCEC.

1.07 SUBMITTALS

A. Cable and Conduit Schedules shall be submitted for approval.

B. Cable and Conduit Schedules shall show all the details of all wires, cables, and conduit to be installed under this Contract, including at a minimum the following information on each Conduit run:

1. Conduit Number
2. Conduit Size
3. Point of origination
4. Point of termination
5. Enclosed wire or cable size and the number and types
6. Purpose of the wire or cable contained in the conduit such as power, control, ground etc.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 26 08 11 – GENERAL ELECTRICAL TESTING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Electrical testing shall be provided in accordance with this Section, the Specifications and the Contract Drawings.

1. The Contractor shall provide all labor, materials, tools, instruments, power and all services necessary to provide the tests specified for all electrical materials, equipment and systems provided under this Contract.

2. The Contractor shall engage the services of an Independent Testing Company (ITC) to perform specific tests as detailed in this Section and the Specifications.

B. The following index of this Section is presented for convenience:

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3.05	Adjusting / Protection / Cleanup	7

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Definitions

1. Plant refers to facilities used for the processing and conveyance of water or wastewater and includes pump stations, water and wastewater processing or treatment facilities.

2. Low-voltage as used in this Section and the Specifications shall mean all equipment, conductors, insulation systems and accessories intended for operation within the 600 Volt Class.

3. Medium-voltage as used in this Section and the Specifications shall mean all equipment, conductors, insulation systems and accessories intended for operation at above 1000 volts and below 99000 volts.

4. All references to the Electric Utility or Utility shall mean Consolidated Edison Company or the Local Electric Utility having jurisdiction.

B. Reference Standards

1.	NETA ATS	-	Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems
2.	Infraspection Institute	-	Standard for Infrared Inspection of Electrical Systems & Rotating Equipment

1.05 DESCRIPTION

A. Upon completion of the electrical installation, the Contractor shall perform tests to demonstrate that the entire electrical system is in proper working condition and is in accordance with the Contract Drawings and the Specifications.

1. Tests shall be as outlined in this Section and those of the individual Sections.

2. Field tests shall be in addition to the factory tests on individual items previously performed at the manufacturer's plant.

3. Perform insulation integrity tests and ground resistance tests before operating tests.

4. Determine proper rotation of motors before permanent connections are made.

1.06 QUALITY ASSURANCE

A. ITCs conducting Electrical Testing shall

a. Have a minimum of 10 years conducting tests as detailed in NETA ATS

b. Be a first tier Subcontractor.

c. Be a firm independent of any Other Contractor.

d. Be a firm independent of the Engineer or the Designer.

e. Be a NETA Accredited Company deploying NETA certified personnel.

B. ITCs conducting Thermographic Testing shall

a. Have a minimum of 10 years conducting tests as detailed by the Infraspection Institute.

b. Be a first tier Subcontractor.

c. Be a firm independent of any Other Contractor.

d. Be a firm independent of the Engineer or the Designer

e. Deploy Infraspection Institute certified personnel.

C. Calibration of Equipment

1. All test instruments and test equipment shall have been calibrated within the 12-month period immediately preceding the dates when they will be used on this Contract.

2. All test instruments and test equipment shall bear the calibration marks, stamps or seals of an approved testing body or agency with reference standards directly traceable to those held by the National Institute of Standards and Technology (NIST).

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer.

B. Submittals shall include, but not be limited to, the following:

1. Organization of the Testing Companies inclusive of details of the specific personnel that will be utilized on specific tests.

2. Documentation detailing firm accreditation

3. Qualifications of testing personnel

4. Proposed testing methods and schedules, test setup and sample data sheets

5. Calibration Reports of test equipment

6. All field test reports.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Factory Tests

1. Factory and witnessed shop testing requirements shall be as detailed in the individual equipment Sections.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Schedules/Scheduling

1. Written notice of the intent to proceed with any scheduled and approved tests shall be given to the Engineer at least two (2) weeks in advance of the commencement of the testing.
2. When testing requires that certain pieces of equipment be taken out of service, all testing procedures and schedules must be submitted to the Engineer for review and approval 45 days prior to the two (2) week notice above.
3. When testing has been scheduled as above, the Plant Superintendent must be notified 48 hours prior to any Work to allow time for load switching and/or alternation of equipment.
4. All testing that requires temporary shutdown of Plant equipment must be coordinated with Plant Superintendent so as not to affect proper Plant operations.
5. At the end of the each workday, all equipment shall be back in place and ready for immediate use should a plant emergency arise.
6. In addition, should an emergency condition occur during testing, at the request of either the Plant Superintendent or the Engineer or the Engineer's designated representative attending the testing, the equipment shall be placed back in service immediately and turned over to Plant.

7. In the event of accidental shutdown of Plant equipment the Contractor shall notify Plant personnel or the Engineer or the Engineer's designated representative immediately to allow for an orderly restart of affected equipment.

3.02 IMPLEMENTATION

A. Test Personnel/Test Equipment

1. The Contractor, and where applicable in conjunction with the ITC, shall furnish all instruments and qualified personnel for all tests.

B. Attendance at Tests

1. All tests shall be made in the presence of the Engineer or a duly authorized representative of the Engineer.

2. A manufacturer's representative in accordance with the requirements of the specific equipment Section shall be present at all equipment tests

3. When the presence of the Engineer or the Engineer's representative is waived, sworn statements, in duplicate, of the tests made and the results thereof shall be furnished to the Engineer by the Contractor.

4. A manufacturer' representative

C. Tests/Testing by Others

1. The Contractor shall make available the electrical system and personnel when required by other trades to test their respective equipment.

2. The Contractor shall coordinate their resources with the other Contractors.

3.03 FIELD TESTING / QUALITY CONTROL

A. Non ITC Testing

1. The Contractor shall complete all testing not required to be completed by an ITC including:

a. All low-voltage equipment testing.

b. All raceway testing not requiring the use of medium-voltage test methods.

c. All low-voltage cable testing utilizing low-voltage or extra-low voltage methods.

d. All phasing verifications utilizing low-voltage or extra-low voltage methods.

e. All continuity testing utilizing low-voltage or extra-low voltage methods

f. All ground system bonding and continuity testing utilizing low-voltage or extra-low voltage methods.

g. All low-voltage voltage and potential testing and verifications.

B. ITC Testing

1. An independent testing company comprised of NETA certified test personnel and project administrators shall be retained by the Contractor to complete to the extent applicable the following:

   a. All medium-voltage equipment testing.

   b. All medium-voltage cable testing.

   c. All dielectric tests.

   d. All low-voltage and medium-voltage protective device testing and setting related to Arc Flash Studies.

   e. All low-voltage and medium-voltage Protective Device testing and calibration.

   f. All potential and current transformer testing and determination of performance curves.

   g. All Primary and Secondary injection tests of protective device systems.

   h. All ground systems testing.

2. Thermographic Testing and Imaging

   a. An independent testing company comprised of Infraspeciton Institute certified test personnel and project administrators shall be retained by the Contractor to complete the following:

      1) All thermographic testing of electrical equipment.

      2) As required by specific Sections.

   b. The level of plant loading of equipment subject to Thermographic Testing shall be as specified in the equipment Section but shall not less than 60 percent of the rated equipment load.

C. Final Field Testing

1. The Contractor shall complete the installation and testing of the electrical installation at least two (2) months prior to the startup and testing of all other Work of the Contract.

2. During the period between the completion of electrical installation and the startup and testing of all other Work, the Contractor shall make all completed and serviceable components of the electrical installation available to the other trades for their use in performing Preliminary and Final Field Tests.

3. Before each test commences, the Contractor shall submit a detailed test procedure and also provide manpower and scheduling for the approval of the Engineer.

4. The Contractor shall furnish detailed test procedures for any of his equipment required as part of the field tests of systems by other contractors.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish, install, test and place into satisfactory operation Switchboards (SWBDs) as shown on the Contract Drawings and as specified in this Section.

B. Furnish and install the SWBDs with all auxiliary equipment and accessories as shown, specified and /or required.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 05 11 - General Electrical Requirements.

B. Section 26 05 27 - Grounding.

C.	Section 25 05 53	-	Identification for Electrical Systems.
D.	Section 26 05 73	-	Power System Studies.
E.	Section 26 05 75	-	Shock Hazard and Arc Flash Studies.
F.	Section 26 06 11	-	Cable and Conduit Schedule.
G.	Section 26 43 13	-	Low-Voltage Surge Protective Devices.

1.04 REFERENCES

A. Definitions

1. SWBD as used in this Section and the Specifications shall mean a large single panel, frame, or assembly of panels on which are mounted on the face, back or both, switches, overcurrent and other protective devices, buses, and usually instruments. These assemblies are completely accessible from the front only and are not intended to be installed in cabinets.
2. Low-voltage as used in this Section and the Specifications shall mean all equipment, conductors, insulation systems and accessories intended for operation at less than 1000 volt and within the 600 VAC Class.
3. NIST as used in this Section and the Specifications shall mean the National Institute of Standards and Technology.

B. Reference Standards

1.	IEEE C57.13	-	Instrument Transformers
2.	NEMA PB2	-	Dead-Front Distribution Switchboards
3.	NYCBC	-	New York City Building Code.
4.	NYCEC	-	New York City Electrical Code.
5.	NETA ATS	-	NETA Acceptance Testing Specifications.
6.	UL 98	-	Enclosed and Dead-Front Switchboards.
7.	UL 489	-	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures.
8.	UL 891	-	Dead-Front Switchboards.
9.	UL 1449	-	Surge Protective Devices

1.05 DESCRIPTION

A. SWBDs installed under this Contract shall be free-standing, dead-front, front-accessible only, low-voltage types intended to serve as marshalling points for the distribution of power within the facilities being constructed under this Contract.

B. SWBDs shall be complete with all accessories and instrumentation and only require installation, connection of source and outgoing circuits and testing to be brought into service

C. The SWBD arrangement shall be as shown on the Contract Drawings.

1.06 QUALITY ASSURANCE

A. SWBD equipment shall be designed, built and tested in accordance with the latest applicable standard editions of IEEE, NEMA, UL, the Utility and NYCEC.

B. The SWBD manufacturer shall be the manufacturer of all the major components of the SWBDs as specified in this Section, the Specifications and as shown on the Contract Drawings.

C. All SWBD equipment shall be new within 6 months of manufacture and complying with the requirements of this Section, the Specifications and the Contract Drawings.

D. The manufacturer of the SWBD equipment shall have produced SWBDs for a minimum period of the last continuous fifteen (15) years.

E. The SWBD manufacturer shall maintain a documented Quality Assurance Program implementing suitable procedures and controls to monitor all aspects of production and testing.

1. The Quality Assurance Program shall be the manufacturer’s standard program specifically dedicated to ensure that each SWBD and its components are designed, assembled and tested in accordance with the requirements specified in this Section, the Specifications and the Contract Drawings.

F. SWBDs shall be UL listed.

G. All cable and wire terminations at the SWBD equipment terminations shall be done by experienced installers who have worked with similar SWBD equipment for a period of at least 5 years, using materials and procedures recommended by the SWBD manufacturer.

H. The Contractor shall provide list of at least five (5) installations with similar SWBD equipment, to that which will provided under this Contract, and demonstrating compliance with these requirements.

1. The Contractor will provide the name, address, telephone number and email of the Company representative who can speak to enquires in the relation to the procurement, installation, commissioning and operation of the SWBD equipment at the above listed five installations.

I. The Contractor shall retain the services of the SWBD manufacturer's representative to certify that the SWBD installation is in accordance with the manufacturer's requirements.

J. Seismic Requirements

1. The Contractor shall provide SWBDs designed, constructed and installed suitable for earthquake regulations in accordance with the seismic requirements of the NYCBC.

K. Testing

1. The SWBD manufacturer shall use a shop test facility that has calibrated testing apparatus and qualified experienced technicians for all shop tests.
2. Calibration of all testing apparatus shall be within one year.
3. Shop testing shall comply with the requirements in this Section, the Specifications and the Contract Drawings.
4. Field testing shall comply with the requirements in this Section, the Specifications and the Contract Drawings.
5. All test equipment, instrument calibration and test reports shall be in accordance with the latest edition of the accuracy standard of NIST and NETA ATS.

1.07 SUBMITTALS

A. Contractor shall submit shop drawings and material specifications for approval by the Engineer.

B. Submittals shall include, but not be limited to, the following:

1. Certified copy of the manufacturer's Design Tests made in accordance with UL-891 Guide: The Switchboard Standard & Requirements, and conducted on SWBD models and type that is being offered for this contract.
2. Certified dimensioned outline drawings showing equipment layouts, front view and floor plan in sufficient detail to define space required for dismantling and maintenance, exact location of and space available for conduit entrance and the interrelationship of the various components.
3. Cross sections and details, as required, to satisfy the Engineer, that all components conform with specification requirements, including design and physical arrangement.
4. Weight of the SWBD.
5. Single-line diagrams
6. Separate customized drawings for each SWBD shall be supplied including individual point-to-point wiring diagram.
7. Complete Bill of Material.
8. Details of special features.
9. Instruction manuals of all protective relays for the equipment.
10. Nameplate schedules.
11. Recommended spare parts list with pricing.
12. List of Special Tools.
13. Painting Procedures.

14. Testing Submittals
    a. Description of shop and field testing methods, procedures and apparatus with calibration dates shall be submitted.
    b. Testing methods and procedures shall be submitted at least 90 days in advance prior to conformation of witness testing dates and actual testing.
    c. Qualifications of proposed testing firm to perform acceptance testing shall be submitted. Submit firm experience records at least 90 days in advance of actual testing., Five recent references with phone numbers shall be submitted.
15. Seismic Criteria
    a. SWBD anchorage details with design calculations signed by NYS Licensed Engineer.
16. Operation and Maintenance Manuals
    a. Preliminary Operation and Maintenance manuals.
    b. Finalized Operation and Maintenance manuals.
17. Certificates of Compliance/Manufacture.
    a. Provide letter signed in the presence of a notary attesting that the SWBD satisfies the requirements stated in this Section.
    b. Seismic qualification certification from the manufacturer including mounting recommendations.
    c. Data and results of witness tests shall be accompanied by a certificate of authenticity sworn to before a notary public by an officer of the manufacturing company. Upon approval, release for shipment to site shall proceed.
18. Reports.
    a. All certified and witnessed shop test reports
    b. All field test reports.
    c. All manufacturer's Site visit reports.

1.08 DELIVERY, STORAGE, AND HANDLING

A. SWBDs shall be delivered, stored, protected and handled in accordance with the manufacturer’s instructions, this Section, the Specifications, the manufacturer’s instructions and the following:
    1. SWBDs shall be inspected when received, for shipping damage, water intrusion which may have entered the equipment during transit or loose parts and a report of any damage made to the carrier within the specified time.

2. SWBDs shall be shipped and delivered in convenient shipping splits, each split not to exceed 6 feet in length.
3. Each split shall be mounted on shipping skids and wrapped for protection.
4. Bus bars with associated hardware for connections between shipping groups/splits shall be shipped inside one of the splits in which it shall be installed.
5. Shipping splits shall contain accessories to permit handling by cranes.
6. SWBDs shall be stored indoors in a well-ventilated, clean, level, dry and cool location with uniform temperature to prevent condensation.
7. SWBD equipment shall be protected in storage with suitable covering and air circulation maintained to ensure the equipment is kept dry and free from condensation.
8. Where dampness or condensation may be encountered, heaters shall be provided for equipment to prevent moisture damage.
9. Embedded electronics shall be shielded from harmful electrical and magnetic energy fields.
10. SWBD equipment shall be lifted, rolled, or jacked into locations shown on the Contract Drawings.
11. Where cranes are not available it shall be possible for splits to be skidded into final positions on rollers and using jacks to raise and lower.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall furnish and deliver to the Engineer, at that part of the Site and at such time as the Engineer may direct, spare parts, special tools and supplies for SWBD in accordance with the requirements of this Section and the Specifications.

B. The Contractor shall furnish for the SWBD, all spare parts, special tools and supplies as recommended by the manufacturer.

C. The spare parts, special tools and supplies shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the manufacturer's part number with complete information for use and reordering.

D. Furnish the following protective equipment and tools:

1. The Contractor shall furnish one (1) set each of protective equipment and tools for each SWBD.
2. Personnel protective equipment required to satisfy the Arc rating requirements as determined during exceution of the Arc Flash studies specified under Section 26 05 75 – Shock Hazard and Arc Flash Studies. Equipment shall be suitable for the PPE categories but at a minimum shall consist of:
   a. Safety Goggles

b. Face shields

c. Protective Apron

d. Protective Overshoes

e. Carrying case for the above equipment

3. Furnish the following tools for each SWBD:

a. One (1) infrared inspection system for thermo-graphic inspection of the inter-cell cable, bus connections and terminations.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. SWBDs shall be as manufactured by:

1. Schneider Electric, Columbia, SC;

2. Siemens, Washington, DC

3. ABB, Burlington, IA;

4. Eaton Corporation;

5. Or approved equal.

B. Keys and interlock systems shall be as manufactured by:

1. Kirk, Canton OH;

2. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Common Features

1. SWBDs shall be fully self-supporting structures with 90 inch tall vertical sections (excluding lifting eyes and pull boxes) bolted together to form the required arrangement as shown on the Contract Drawings.

2. SWBD frames shall be die formed, 12 gauge steel with reinforced corner gussets.

a. Frame shall be rigidly bolted to support cover plates (code gauge steel), bus bars and installed devices during shipment and installation.

3. All sections may be rolled, moved or lifted into position.

4. SWBDs shall be capable of being bolted directly to the floor without the use of floor sills.
5. All SWBD sections shall have open bottoms and removable top plate(s) to install conduit.
6. Front-Connected SWBD sections shall be rear aligned for placement against a wall.
7. All covers shall be fastened by hex head bolts.
8. Provide hinged doors over metering compartments and individually mounted device compartments.
    a. All doors shall have concealed hinges and be fastened by hex head bolts.
9. SWBD protective devices shall be furnished as listed on drawings and specified herein, including interconnections, instrumentation and control wiring.
10. SWBDs and devices shall be rated for a frequency of 60 Hertz. Voltage, current and short circuit rating shall be as shown on the Contract Drawings.
11. SWBD current ratings, including all devices, shall be based on a maximum ambient temperature of 40 degree C per UL 891.
    a. With no derating required, temperature rise of SWBDs and devices shall not exceed 65 degrees C in a 40 degree C ambient environment.
12. SWBD sections shall have UL listed inspection windows for infrared inspections.
13. Group mounted feeder breaker and/or main devices within SWBDs shall be circuit breakers as indicated on the drawings.
    a. Mounting for group mounted circuit breakers shall be by bolted connections

B. Incoming Section

1. Incoming section shall be direct cable connection to main breakeras shown on Contract drawings.
2. Furnish SWBDs arranged for top entry of incoming cable.
3. Provide crimp compression type lugs in the quantity and size required as shown in Section 26 06 11 - Cable and Conduit Schedule.
    a. All lugs shall be tin-plated copper and UL listed for use with copper cable.
    b. Lugs shall be rated for 75 degree C.

C. Bus Bars

1. All phase, neutral bus bars shall be tin-plated copper.
2. Main horizontal bus bars shall be mounted with all three phases arranged in the same vertical plane.
3. The bus bars shall have sufficient cross sectional area to meet UL 89 temperature rise requirements.
4. Phase and neutral bus ampacity shall be as shown on the plans.
5. The neutral bus shall have the same ampacity as the phase bus.
6. Bus bars shall be mounted on high impact, non-tracking insulated supports.
    a. Joints in the vertical bus are not permitted.
7. Bus bars shall be braced to withstand mechanical forces exerted during short circuit conditions as indicated in drawings, but in no case less than 65 kA RMS symmetrical.
8. Bus joints shall be bolted with high tensile steel Grade 5 bolts and Belleville type washers.
9. Ground Bus shall be sized to meet UL 891(minimum ¼ X 2 inch) and shall the extend full length of SWBD.
10. Buses shall be arranged to be A-B-C from left to right, top to bottom, or front to rear when facing the front of the SWBD.
    a. Where special circuitry precludes this arrangement, bus bars shall be labeled.
11. All feeder device line and load terminations and extensions of, shall be rated to carry the current rating of the device frame.
12. The main incoming bus bars shall be rated for the main protection device frame size.
13. Main horizontal bus bars shall be fully rated and arranged for future extensions.
    a. Tapered horizontal busses are not be permitted.

D. Enclosure

1. SWBDs shall be NEMA 1 dead-front construction as indicated on the Contract Drawings.

E. User Metering

1. User metering shall be UL listed digital multifunction power monitor.
2. The power monitor case shall be fully enclosed and shielded and door mounted to allow access menu and display.

3. Power monitor shall provide complete metering in one package. Monitor shall include self-protection internal fuses. Monitor shall include the following direct reading metered values:
   a. Volts, Amperes
   b. Watts, Vars, VA
   c. Power Factor
   d. Frequency
   e. Watts, VAR, VA Hours
   f. Watts, Var, VA Demand
4. Monitor shall include communication capability, using RS-485, Modbus RTU Protocol or Ethernet. Meter shall include provisions to communicate remotely using Ethernet.
5. All instrument transformers shall be UL listed and classified as indicated in Contract Drawings.
6. Current Transformers shall be provided where shown on the Contract Drawings with burden and accuracy to support connected meters and relays as required by ANSI/IEEE C57.13.

F. SWBD Main Isolation Devices

1. The SWBD Main Isolation Device shall be an individually mounted molded case circuit breaker.
2. Main Isolation Devices shall have a minimum current interrupting capacity of 65 kA symmetrical.

G. SWBD Feeder Isolation Devices

1. Feeder Isolation Devices 1200 amps and smaller shall be group mount molded-case circuit breakers with bolted connections.
2. Feeder Isolation Devices shall have a minimum current interrupting capacity of 65 kA symmetrical.

H. Molded-Case Circuit Breakers

1. Group mounted breakers shall be connected to the vertical bus by bolted connections.
2. Individually mounted molded case circuit breakers shall be stationary mounted.
3. Circuit breaker frames shall be constructed of a high-strength, molded, glass-reinforced polyester case and cover.
4. Breakers shall have an overcenter, toggle handle-operated, trip free mechanism with quick make, quick break action independent of the speed of the toggle handle operation.

a. The design shall provide common tripping of all poles.

b. Breakers shall be suitable for reverse power feeds.

5. Breakers shall have ON and OFF position clearly marked on escutcheon.

a. Breakers shall include a trip-to-test means on the escutcheon for manually tripping the breaker and exercising the mechanism and trip latch.

6. Breakers shall include factory installed mechanical lugs.

a. Lugs shall be UL listed and rated 75 or 60/75 degrees C as appropriate.

b. Breakers shall be [100]/[80] percent rated.

7. The main and feeder breaker with a frame size 400 amps and larger shall have digital electronic trip units as described in this Section.

I. Digital Electronic Trip Unit (DETU) for Molded Case Circuit Breakers

1. Each main, feeder, and tie circuit breaker shall be equipped with a DETU.

2. The main breaker trip unit shall provide protection from overloads, and short circuits.

3. Long time and short time protective functions shall have true RMS sensing technology for harmonic rich currents including up to the 19th harmonic.

4. High contrast liquid crystal display (LCD) unit shall display settings, trip targets, and the specified metering displays.

5. A multi-button keypad shall provide local setup and readout of all trip settings on the LCD.

6. Rating Plug

a. Shall be UL Listed and be interchangeable rating plug.

b. It shall not be necessary to remove the trip unit to change the rating plug.

c. Rating plugs shall be available in sizes from 40% to 100% of the breaker sensor rating.

7. The trip unit shall have an integral test jack for testing via a portable test set and connection to a battery source.

8. Noise immunity shall meet the requirements of IEEE C37.90.

9. The trip unit shall display trip targets for long time, short time, and ground fault, if included.

a. Provide visual illuminated indication of the trip unit (normal, pickup, trip, error).

10. The trip unit shall be provided with a ten event trip real-time history log.
    a. Each trip event shall be recorded with type, phase and magnitude of fault that caused the trip
11. As a minimum, the trip unit shall have the following protective functions:
    a. Current setting or long time pickup, adjustable from 50% to 100% of the rating plug value.
    b. Adjustable long time delay with typical inverse time characteristics (minimum of 10 bands).
        1) In addition, a set of straight line fuse shaped long time delay bands shall be provided to facilitate selectivity with downstream fuses (minimum 7 bands).
    c. Instantaneous pickup, adjustable from 2.0 to 10 times the rating plug in 0.5 increments
    d. Short time pickup and delay.
        1) Short time pickup shall be adjustable from 1.5 to 9 times the long time pickup setting in 0.5 increments with an OFF option.
        2) Provide minimum of 12 short time delay bands with three selectable I2t bands.
12. Surge Protective Devices (SPDs)
    a. Each bus of the SWBD shall be equipped with an integral SPD.
    b. SPDs shall
        1) Comply with Section 26 43 13 – Low-Voltage Surge Protective Devices.
        2) Be fed by its own circuit breaker or disconnect.
        3) Be capable of displaying its status without accessing the interior of the switchgear.

J. Nameplates
1. Nameplates shall clearly indicate information in accordance with NEMA and IEEE requirements.
2. Nameplates shall be engraved or embossed on stainless steel.
3. The switchboard shall have identifying nameplates in accordance with the requirements of Section 26 05 53 Identification for Electrical Systems.
4. Nameplates shall clearly indicate information in accordance with NEMA and IEEE requirements.
5. Nameplates shall be engraved or embossed on stainless steel.

6. A master nameplate shall also be provided mounted on the assembly.

7. The master nameplate shall identify switchboard designation, voltage, ampere and short circuit rating, manufacturer's name, general order number and item number.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Painting

1. All interior and exterior surfaces of the SWBD shall be properly cleaned and provided with a rust-inhibiting phosphatized coating

2. Steel surfaces shall have not less than two finish coats of acid resistant electrostatically applied epoxy ANSI 61 grey paint.

3. Finish coat shall be a minimum of 150 microns

4. Field painting, other that touchup painting, shall not be required.

5. A sufficient quantity of additional coating material and thinner shall be furnished to permit field touchup of damaged coatings.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Certified Shop Tests:

1. Each SWBD shall be completely assembled, wired and tested at the factory, including all buses, connections, insulator, terminals and terminal blocks, to demonstrate that it has been properly manufactured, properly assembled, is not overheating, is not overloading and has no electrical or mechanical defects.

2. Shop testing shall be performed on the SWBD at the manufacturer's plant prior to shipment.

3. Shop test shall be in accordance with the latest revisions of UL 891 Guide: The Switchboard Standard & Requirements.

4. The Contractor shall provide a shop test report.

a. The report shall identify the tests performed and the results obtained.

5. SWBD testing shall include the following:

a. Visual and physical inspection of the interior and exterior of the SWBD including all devices to verify consistency with approved submittals.

1) Check bus layouts and takeoffs confirm with approved submittals.

2) Check bus for proper electrical clearances.

3) Check tightness of all bolted and torqued connections.

4) Verify the polarity of all instrument transformers.

5) Verify the grounding of all instrument transformers.

6) Verify all nameplate engravings.

b. Mechanical operations shall be performed to insure proper functioning of operating mechanisms and interchangeability.

c. Continuity test shall be performed on power and control wires.

d. Functional operations test which shall include pick up, dropout, time delay, sequence and polarity.

e. Primary hi-potential tests shall be performed.

1) Primary current carrying parts shall be tested between phases, phase to ground, and line to load.

2) The applied voltage shall be twice rated voltage plus 1000 for 1 minute.

f. Hi-Potential tests on control and secondary wiring shall be performed.

1) Control circuit wiring shall be tested for 1500 volts to ground for 1 minute.

g. Power cables and buses shall be tested, for insulation breakdown resistance and circuit isolation.

1) Test voltage frequency shall not be less than the frequency of the rated voltage of the equipment tested.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examine installation area to assure there is enough clearance to install SWBD.

B. Verify that installation will yield required working spaces around the SWBD installation.

C. Check concrete pads for uniformity and level surface.

D. Verify field measurements are as shown on the approved Shop Drawings.

E. Verify that required utilities are available, in proper location and ready for use.

3.02 INSTALLATION

A. SWBD and associated equipment and accessories shall be installed in accordance with the manufacturer’s instruction and recommendations.

B. SWBDs shall be bolted to the concrete bases and shall comply with seismic requirements.

C. Identification

1. Identify field-installed conductors, interconnecting wiring, warning signs and components in accordance with Section 26 05 53 – Identification for Electrical Systems.
2. Label each SWBD compartment with nameplates complying with Section 26 05 33 – Identification for Electrical Systems.
3. Provide device nameplates complying with Section 26 05 33 – Identification for Electrical Systems.

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Testing

1. After installation, the SWBD shall be field tested for operation and conformance.
2. Field testing shall conform to the requirements in this Section, Section 01 75 10 – Preliminary and Final Field Tests, NETA ATS and the Manufacturer's recommendations.
3. Field tests shall be witnessed by the Engineer and certified by the Contractor.
4. The services of the SWBD manufacturer shall be retained for field testing.
5. SWBD testing shall be supervised by the Manufacturer's representative, prior to energizing equipment.
6. Equipment shall not be energized without the permission of the Engineer.
7. Retain the service of an independent testing firm who shall perform field testing of the SWBD.
8. The testing firm shall have experience in the inspection and testing of SWBD equipment and shall be a member company of NETA.
    a. Provide proof of membership or demonstrate that the standards and experience required for membership are possessed, all to the satisfaction of the Engineer.

B. Preliminary Field Testing

1. Preliminary Field Test of the SWBD shall be in accordance with the recommendations of the manufacturer's representative, NETA ATS and shall consist at a minimum of the following:
2. Visual and physical inspections shall at a minimum verify the following:
    a. Verify all SWBD equipment are located according to approved submittals.
    b. Verify all nameplates, tags and identification marks in accordance with approved submittal and preliminary As-Builts.
    c. Physical, electrical and mechanical condition shall be inspected.

d. Proper anchorage, required area clearances, physical damage and proper alignment shall be checked.

e. Ventilating air passageways shall be inspected for blockage.

f. Mechanical interlock systems shall be checked for proper operation.

g. Insulators shall be inspected for evidence of damage or contamination.

h. Device settings and adjustments shall be verified.

i. Breakers and vertical sections shall be checked to determine that they have been properly installed, lubricated and connected.

j. Equipment shall be cleaned and lubricated as required.

3. Electrical testing shall at a minimum include:

a. Test continuity of all circuits

b. All connections shall be inspected for high resistance.

c. Electrical interlock systems shall be checked for proper operation.

d. Ground-resistance tests shall be performed.

e. Perform resistance measurements through bolted connections with a low-resistance measuring device.

f. Perform insulation-resistance measurements on each bus section, phase-to-phase, and phase-to-ground for one minute.

g. An over potential test shall be performed on each bus section, each phase-to-ground and on each switch in the closed position. Test each pole with other poles grounded.

h. Contact-resistance test shall be performed.

i. Control and metering wiring performance test shall be performed.

j. Primary and secondary voltage and current injections shall be performed to confirm phasing, polarities, transformation ratios.

k. Circuit breaker trip characteristics shall be determined by primary current injection.

l. Control equipment and connections shall be checked to determine that they are not defective.

C. Preliminary Loading Tests

1. The Contractor may substitute load banks of the type and power factor which are approved by the Engineer to complete Preliminary Load Tests if the actual loads are not ready for energization.

a. The full load rating of the load bank shall be comparable to that of the circuit loads under test.

2. Preliminary Loading Tests shall at the minimum include:

a. Control voltages shall be applied and functional tests verifying the operations of all breakers, controls and displays.

b. Primary voltage shall be applied to the complete primary bus via the SWBD main feeder breakers with tie breakers in the normal operating positions.

1) The primary buses shall remain energized for one hour with no further operations.

a) During this one hour period all voltage and potential transformer secondaries and circuits shall be checked for voltage magnitudes, phasing, phase sequence along with all associated metering displays.

2) Each SWBD distribution feeder breaker shall be closed for one hour to energize its associated load

a) During this one hour period all metering circuits shall be checked for voltage, current, voltamp, and var values, phasing, phase sequence along with all associated metering displays.

D. Infrared testing shall be performed once after initial energization of the SWBD and a second time after full load has been applied continuously for (24) hours.

E. SWBD Final Field Test

1. SWBD Final Field Test shall be considered complete when all the outgoing circuits shall have energized their various loads for the Final Field Test of the respective load.

F. Any deficiencies or issues which may arise during Preliminary Field Tests, Preliminary Loading Test or SWBD Final Field Test shall be remedied by the Contractor at no additional cost to the City.

G. Manufacturer’s Field Services

1. The Contractor shall provide the services of a qualified manufacturer's service representative who shall adequately supervise and assist in the installation of the SWBD, check the SWBD installation before it is placed into operation and assist in the performance of Preliminary and Final Field Tests.

2. The Manufacturer’s representative shall provide SWBD equipment Start-up services and Training of the Contractor and the City’s operations and maintenance staff in the care, operation and maintenance of the SWBD in

accordance with this Section, the Specifications and the Contract Drawings and the following requirements:

a. Minimum number of manufacturer's representative site visits per SWBD:

Construction Phase	No of Visits	8 hour Days per Visit	Total Days per SWBD
Installation and Inspection	1	1	1
Field Testing	1	2	2
Acceptance Testing	1	2	2
Training	2	1	2

b. Additional trips or days that are required to achieve the proper installation, operation or training, such services shall be arranged for by the Contractor at no additional cost to the City.

c. The Engineer shall have the right to reallocate any unused time

3. The Contractor shall provide a field report from the manufacturer's representative for each visit to the site.

a. The report shall include complete information on time, schedule, tasks performed, persons contacted, problems corrected, tests results, training, instruction and all other pertinent information.

b. The SWBD manufacturer's representative shall certify in writing to the Engineer that the SWBD equipment has been installed, setup and tested properly in accordance with Contract requirements and is operating at optimum conditions and capacity.

4. The manufacturer representative shall also make any necessary adjustments and instruct the Site personnel in its operation and maintenance.

5. The service representative shall sign in and out with the Engineer on each day they are at the site.

6. A day shall be understood to be the actual time spent at site and does not include travel to and from the site.

3.04 STARTUP / DEMONSTRATION

A. SWBD Startup

1. SWBD Startup shall comply with the requirements of Section 01 79 05 – Startup and Training and shall be considered completed when all the loads on the SWBD completes their startup requirements.

B. SWBD Training

1. The Contractor shall provide Training on the SWBD in compliance with Section 01 79 05 – Startup and Training.
2. The Contractor shall submit for approval by the Engineer, lesson plans identifying in detail, the training to be conducted.
3. The Contractor shall coordinate training services with the City and the Engineer.
4. The Contractor shall schedule training at least forty-five (45) days prior to delivery of training subject to the approval of the Engineer and the City.
5. The training shall consist of both classroom and field instruction.
6. The purpose of field instruction shall be to reinforce topics covered in the classroom and to identify the location of any control switches and other equipment required for operation; and to identify locations of any maintenance equipment.
7. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor.
8. The manufacturer's representative shall sign in and out at the office of the Resident representative on each day he is at the project.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing all new panelboards. Panelboards shall be provided in accordance with the requirements specified under this Section, the Specifications, and the Contract Drawings. This Section also includes requirements for providing an integrated panelboard and transformer.

B. Panelboards shall include all power distribution, lighting, appliance and instrument panelboards.

C. The following index of this Section is included for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 05 27 - Grounding

B. Section 26 05 53 - Identification for Electrical Systems

C.	Section 26 05 73	-	Power System Studies
D.	Section 26 05 75	-	Shock Hazard and Arc Flash Studies
E.	Section 26 06 11	-	Cable and Conduit Schedule
F.	Section 26 43 13	-	Low-Voltage Surge Protective Devices

1.04 REFERENCES

A.	NEMA PB1	-	Panelboards
B.	NIST	-	US National Institute of Standards and Technology
C.	NYCEC	-	New York City Electrical Code
D.	NYCBC	-	New York City Building Code
E.	UL 67	-	Panelboards
F.	UL 489	-	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

1.05 DESCRIPTION

A. All panelboards shall be dead-front type with automatic trip-free, bolt-on, molded case circuit breakers.

B. All panelboards shall be equipped with main breakers, 1-pole, 2-pole and 3-pole branch circuit breakers as shown on the Contract Drawings.

C. All panelboards shall be enclosed in flush or surface mounted cabinets as shown on the Contract Drawings.

D. Arc Flash Labels shall be provided for all panelboards in accordance with Section 26 05 75 – Shock Hazard and Arc Flash Studies.

E. All panelboard installation shall comply with the applicable seismic requirements of the NYCBC.

1.06 QUALITY ASSURANCE

A. Panelboards shall be designed, built and tested in accordance with the latest applicable standard editions of IEEE, NEMA, UL, the Utility and NYCEC.

B. The panelboard manufacturer shall be the manufacturer of all the major components of the panelboards as specified in this Section, the Specifications and as shown on the Contract Drawings.

C. All panelboards shall be new within 6 months of manufacture and complying with the requirements of this Section, the Specifications and the Contract Drawings.

D. The manufacturer of the panelboard shall have produced panelboards for a minimum period of the last continuous fifteen (15) years.

E. The panelboard manufacturer shall maintain a documented Quality Assurance Program implementing suitable procedures and controls to monitor all aspects of production and testing.

1. The Quality Assurance Program shall be the manufacturer's standard program specifically dedicated to ensure that each panelboard and its components are designed, assembled and tested in accordance with the requirements specified in this Section, the Specifications and the Contract Drawings.

F. Panelboard shall be UL listed.

G. Whenever applicable, all Work regarding the panelboard equipment shall conform to the requirements of the Utility.

H. All cable and wire terminations at the panelboard shall be done by experienced installers who have worked with similar panelboard for a period of at least 5 years, using materials and procedures recommended by the panelboard manufacturer.

I. The Contractor shall provide list of at least five (5) installations with similar panelboard, to that which will provided under this Contract, and demonstrating compliance with these requirements.

1. The Contractor will provide the name, address, telephone number and email of the Company representative who can speak to enquires in the relation to the procurement, installation, commissioning and operation of the panelboard equipment at the above listed five installations.

J. Seismic Requirements

1. The Contractor shall provide panelboards designed, constructed and installed suitable for earthquake regulations in accordance with the seismic requirements of the NYCBC.

K. Testing

1. The panelboard manufacturer shall use a shop test facility that has calibrated testing apparatus and qualified experienced technicians for all shop tests.

2. Calibration of all testing apparatus shall be within one year.

3. Shop testing shall comply with the requirements in this Section, the Specifications and the Contract Drawings.

4. Field testing shall comply with the requirements in this Section, the Specifications and the Contract Drawings.

5. All test equipment, instrument calibration and test reports shall be in accordance with the latest edition of the accuracy standard of NIST and NETA ATS.

1.07 SUBMITTALS

A. Contractor shall submit shop drawings and material specifications for approval by the Engineer.

B. Submittals shall include, but not be limited to, the following:

1. Certified copy of the manufacturer's Design Tests made in accordance with UL 67 and conducted on panelboard models and type that is being offered for this contract.
2. Certified dimensioned outline drawings showing panelboard layouts, front view and floor plan in sufficient detail to define space required for dismantling and maintenance, exact location of and space available for conduit entrance and the interrelationship of the various components.
3. Weight of the panelboard and all associated equipment.
4. Separate customized drawings for each panelboad shall be supplied.
5. Complete Bill of Material.
    a. A listing of the panelboards with the number and size of circuit breakers identified.
6. Details of special features.
7. Instruction manuals of all protective devices.
8. Nameplate schedules.
9. Recommended spare parts list with pricing.
10. List of Special Tools.
11. Operation and Maintenance Manuals
    a. Preliminary Operation and Maintenance manuals.
    b. Finalized Operation and Maintenance manuals.
12. Certificates of Compliance/Manufacture.
    a. Provide letter signed in the presence of a notary attesting that the panelboard satisfies the requirements stated in this Section.
    b. Seismic qualification certification from the manufacturer including mounting recommendations.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Panelboads shall be delivered, stored, protected and handled in accordance with the manufacturer's instructions, this Section and the following:

1. Panelboards shall be inspected when received, for shipping damage, water intrusion which may have entered the equipment during transit or loose parts and a report of any damage made to the carrier within the specified time.
2. Panelboards shall be shipped and delivered in convenient packages.
3. Each package split shall be mounted on shipping skids and wrapped for protection.
4. Shipping packages shall contain accessories to permit handling by cranes.

5. Panelboards shall be stored indoors in a well-ventilated, clean, level, dry and cool location with uniform temperature to prevent condensation.

6. Panelboard equipment shall be protected in storage with suitable covering and air circulation maintained to ensure the equipment is kept dry and free from condensation.

7. Where dampness or condensation may be encountered, heaters shall be provided for equipment to prevent moisture damage.

8. Embedded electronics shall be shielded from harmful electrical and magnetic energy fields.

9. Panelboard equipment shall be lifted into locations shown on the Contract Drawings.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall furnish all spare parts, special tools and supplies for the panelboards as recommended by the manufacturer.

B. The spare parts, special tools and supplies shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the manufacturer's part number with complete information for use and reordering.

C. Furnish in addition the following spare parts for each panelboard installation:

1. One spare key shall be provided for each key interlock system.

2. One (1) set of complete replacement power fuses for each size and type installed.

3. One (1) spare breaker for each size and type installed.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Panelboards shall be as manufactured by:

1. Schneider, Seneca, SC

2. Siemens, Washington, DC

3. ABB, Mebane, NC.

4. Eaton Corporation;

5. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Panelboards

1. Ratings:
   a. Panelboard frequency shall be 60 Hz.
   b. Panelboard ampacities, voltage, number of phases and wires shall be as shown on the Contract Drawings.
   c. Panelboards shall be labeled with a UL short circuit rating. All panelboards shall be fully rated.
   d. Available short circuit infeed at the panelboard shall be no more than seventy percent of the panelboard short circuit rating.
   e. Panelboards rated 240VAC or less shall have a minimum short circuit rating of 22,000A RMS symmetrical and 65,000 RMS symmetrical when shown on the Contract Drawings.
   f. Panelboards rated 480VAC shall have a minimum short circuit rating of 65,000A RMS symmetrical.
2. Cabinets:
   a. Cabinets shall be constructed of 12-gauge galvanized steel with stainless steel hardware.
   b. Cabinets shall be NEMA 12 for dry, indoor areas and NEMA 4X for wet or corrosive areas. In hazardous locations, panelboards shall have a NEMA 7 rating.
   c. Cabinets shall have wiring gutters on the sides.
   d. Cabinets shall be at least 5-3/4 inches deep and 20 inches wide for panelboards with maximum branch circuit breakers of 100A. When branch circuit breakers are above 100A, cabinets shall be at least 9-1/2 inches deep and 31 inches wide.
   e. Trims for panelboards shall consist of a hinged trim door which does not leave any live parts uncovered and permits the operation of all circuit breakers. In addition, a door-in-door arrangement shall form the dead front panel door covering all parts not covered by the hinged trim door. Both doors shall have concealed hinges with flush type catches and locks. All locks shall be keyed alike.
   f. Cabinet shall have a UL listed inspection window for infrared inspections.
   g. Cabinets shall have identifying nameplates in accordance with the requirements of Section 26 05 53 – Identification for Electrical Systems.
3. Bus Bars:
   a. Bus bars shall be copper sized in accordance with UL standards to limit temperature rise on any current carrying part to a maximum of 65 degrees C above an ambient of 40 degrees C maximum.

b. Bus bar taps for single-pole branches shall be arranged for sequence phasing of the branch circuit devices.

c. A bonded ground bus shall be included in all panels.

d. Full-size neutral bars shall be provided for panelboards, unless noted otherwise on the Contract Drawings.

e. Where specifically shown on the Contract Drawings panelboards shall be provided with a 200 percent rated neutral bus suitable for use with non-linear loads. Neutral busing shall have a suitable lug for each outgoing feeder requiring a neutral connection.

4. Circuit Breakers:

a. Circuit breakers shall be the molded case type conforming to UL 489.

b. Breakers shall be the heavy-duty, bolt-on type with quick-make quick-break toggle mechanism for manual as well as automatic operation.

c. Breakers shall have 100-amp frames, with 15-amp trip elements as minimum, unless otherwise shown on the Contract Drawings.

d. All 100-amp frame breakers shall be fixed thermal magnetic trip units.

e. Frame sizes above 100 amp shall have interchangeable thermal magnetic trip units or electronic trip units.

f. Where specifically shown on the Contract Drawings breakers shall be provided with electronic trip units. Electronic trip units shall provide long time, short time, and instantaneous settings and time adjustments as a minimum.

g. Where specifically shown on the Contract Drawings ground fault circuit interrupters shall be provided. Ground fault breakers shall be equipped with solid state sensing and 5 milliamp sensitivity.

h. Breakers used for lighting circuit switching shall be suitable for the purpose and shall be marked "SWD". Breakers requiring continuous operation shall be provided with a lock-on device.

i. Where specifically shown on the Contract Drawings shunt trips, bell alarms, and auxiliary devices shall be provided.

5. Metering:

a. Where shown on the Contract drawings a UL listed microprocessor metering device (MMD) shall be installed in the panelboard.

b. The MMD shall have the capability to monitor all the panelboard outgoing and spare circuits including capacity for an additional twenty percent spare circuits.

c. The MMD shall be able to monitor and time stamp at a minimum the following per phase and line values for each circuit:

1) Voltage, Current, Power, Power Factor, VAR, VA and Frequency.

2) Watt,VAR and VA Demand.

3) Watt Hour,VA Hour and Var Hour both forward and reverse.

d. The Mmd shall be able to auto-detect sensor rating

e. The Mmd shall store the energy profile for each circuit in a non-volatile memory for a minimum of one year. The demand interval shall be 15 minutes.

f. Mmd communications ports and protocols shall have capability using RS-485, Modbus RTU protocol or Ethernet. Device shall include provisions to communicate remotely using Ethernet.

6. Surge Protection:

a. The panelboard shall be provided with surge protective devices complying with Section 26 43 13 – Low-voltage Surge Protective Devices.

7. Directories:

a. Each panel shall be provided with a directory.

b. The directory shall be protected by a glass or noncombustible plastic cover.

c. The Contractor shall maintain in each panel, during the duration of the Contract, a handwritten directory clearly indicating the circuit breakers in service and the number of spares.

1) This directory shall be updated as work progresses, and final, typewritten directories shall be provided at the end of the Contract.

d. Where execution of the work under this Contract requires certain circuits to be modified, the Contractor shall update or provide panelboard directories to reflect the modifications.

1) Final typewritten directories shall be provided at the end of the Contract.

B. Integrated Panelboard and Transformer, (Mini Power Center)

1. The power center shall consist of primary and secondary main circuit breaker disconnects, transformer and a secondary panelboard all in one enclosure.

2. Transformer shall be dry type, resin encapsulated, 60 Hertz with KVA, primary and secondary voltage and number of phases as shown on the

Contract Drawings. Transformer windings shall be copper with 180 degrees C insulation system and 115 degrees C winding temperature rise.

3. Circuit breakers shall be molded case, thermal magnetic type. The main breakers sizes shall be suitable for the KVA rating of the transformer. Panelboard branch circuit breakers shall be plug-in type with the number of breakers and poles and trip ratings as shown on the Contract Drawings.

4. The enclosure shall be heavy gauge stainless steel rated NEMA 3R. The enclosure shall be pad lockable and be equipped with a grounding terminal.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Painting

1. All metal surfaces of the panelboard enclosures shall be thoroughly cleaned and given one coat of zinc chromate primer.

2. All interior surfaces shall then be given one shop finishing coat of a nitro-cellulose enamel lacquer.

3. All exterior surfaces shall be given three coats of the same lacquer. The color of finishing coats shall be light gray ANSI No. 61.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Certified Shop Tests:

1. Each panelboard shall be completely assembled, wired and tested at the factory, including all buses, connections, insulator, terminals and terminal blocks, to demonstrate that it has been properly manufactured, properly assembled, is not overheating, is not overloading and has no electrical or mechanical defects.

2. Shop testing shall be performed on the panelboard at the manufacturer's plant prior to shipment.

3. Shop test shall be in accordance with the latest revisions of UL, IEEE and ANSI and shall demonstrate that the equipment tested conforms to the requirements specified.

4. The Contractor shall provide a Certified Shop Test Report.

   a. The report shall identify the tests performed and the results obtained.

5. Panelboard shop tests shall include the following:

   a. Visual and physical inspection of the interior and exterior of the panelboard including all devices to verify consistency with approved submittals.

      1) Check bus layouts, breaker types, sizes and quantities confirm with approved submittals.

      2) Check bus for proper electrical clearances.

      3) Check tightness of all bolted and torqued connections.

4) Verify all grounding provisions.

5) Verify all nameplate engravings.

b. Mechanical operations shall be performed to insure proper functioning of operating mechanisms and interchangeability.

c. Continuity test shall be performed on power and control wires.

d. Functional operations test which shall include pick up, dropout, time delay, sequence and polarity.

e. Primary hi-potential tests shall be performed.

1) Primary current carrying parts shall be tested between phases, phase to ground, and line to load.

2) The applied voltage shall be twice rated voltage plus 1000 for 1 minute, 1500 volts minimum.

f. Verify connectivity and communication of devices to be connected to the EMCS.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examine installation area to assure there is enough clearance to install panelboard.

B. Verify that installation will yield required working spaces around the panelboard installation.

C. Check installation surfaces for uniformity and level surface.

D. Verify field measurements are as shown on the approved Shop Drawings.

E. Verify that required utilities are available, conduit runs etc. are in required location and ready for use.

3.02 INSTALLATION

A. Equipment shall be mounted rigidly and securely to the building structure or to supporting devices which are rigidly and securely supported by the building structure.

B. Equipment shall be fastened with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on metal.

C. Mount all equipment parallel or perpendicular to walls, such that panelboards are installed in a neat and professional manner.

D. All wiring shall be neat within the panelboards. Wires shall be run vertically in the wire gutter and then terminate horizontally at a breaker.

E. The Contractor shall install blanking devices within panelboard spaces, so bus bars are not exposed.

F. Install panelboard nameplates for identification of equipment.

G. Panelboard circuits shall be installed so to balance the loads on each of the panelboards.

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Testing

1. After installation, the equipment shall be field tested for operation and conformance.
2. Field testing shall conform to the requirements in this Section, Section 01 75 10 – Preliminary and Final Field Tests, NETA ATS and the Manufacturer's recommendations.
3. Field tests shall be certified by the Contractor.
4. Equipment shall not be energized without the permission of the Engineer.

B. Preliminary Field Testing

1. Preliminary field test of the panelboard shall be in accordance with the recommendations of the manufacturer, NETA ATS and shall consist at a minimum of the following:
2. Visual and physical inspections shall at a minimum verify the following:
   a. Verify all panelboard equipment are located according to approved submittals.
   b. Verify all directories, nameplates, tags and identification marks in accordance with approved submittal and preliminary As-Builts.
   c. Physical, electrical and mechanical condition shall be inspected.
   d. Proper anchorage, required area clearances, physical damage and proper alignment shall be checked.
   e. Mechanical interlock systems shall be checked for proper operation.
   f. Insulators shall be inspected for evidence of damage or contamination.
   g. Breaker settings and adjustments shall be verified.
   h. Breakers and vertical sections shall be checked to determine that they have been properly installed, and connected.
   i. Equipment shall be cleaned as required.
3. Electrical testing shall at a minimum include:
   a. Test continuity of all outgoing circuits.
   b. All connections shall be inspected for high resistance.
   c. Electrical interlock systems shall be checked for proper operation.
   d. Ground-resistance tests shall be performed.

e. Perform resistance measurements through bolted connections with a low-resistance measuring device.

f. Perform insulation-resistance measurements on each bus, phase-to-phase, and phase-to-ground for one minute.

g. An over potential test shall be performed on each bus, each phase-to-ground and on each switch in the closed position. Test each pole with other poles grounded.

h. Control and metering wiring performance test shall be performed.

C. Preliminary Loading Tests

1. The Contractor may substitute load banks of the type and power factor which are approved by the Engineer to complete preliminary load tests if the actual loads are not ready for energization.

a. The full load rating of the load bank shall be comparable to that of the circuit loads under test.

2. Preliminary loading tests shall at the minimum include:

a. Primary voltage shall be applied to the complete primary bus via the panelboard main breakers.

1) The primary bus shall remain energized for [one hour] with no further operations.

a) During this one hour period all voltage circuits shall be checked for voltage magnitudes, phasing, phase sequence along with any associated metering displays.

2) Each panelboard circuit breaker shall be closed for one hour to energize its associated load. During this one hour period all circuits shall be checked for voltage, current, voltamp, and var values, phasing, phase sequence along with any associated metering displays.

D. Infrared testing shall be performed once after initial energization of the panelboard and a second time after full load has been applied continuously for (24) hours.

E. Panel Final Field Test

1. Panel final field test shall be considered complete when all the outgoing circuits shall have energized their various loads for the Final Field Test of the respective load.

F. Any deficiencies or issues which may arise during preliminary field tests, preliminary loading tests or panelboard final field tests shall be remedied by the Contractor at no additional cost to the City.

3.04 STARTUP / DEMONSTRATION

A. Panelboard Startup

1. Panelboard startup shall comply with the requirements of Section 01 79 05 – Startup and Training and shall be considered completed when all the circuit loads on the panelboard completes their startup requirements.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing low-voltage fuses. Low-Voltage Fuses shall be provided in accordance with the requirements of the Contract Drawings and Specifications.

B. Fuses shall be suitable for use with power circuits.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Definitions

1. Low-voltage as used in this Section and other Specifications shall mean all equipment, conductors, insulation systems and accessories intended for operation within the 600 Volt Class.

B. Reference Standards: Low-voltage fuses shall comply with the latest applicable provisions and recommendations of the following even if not specifically listed in this Section:

1. UL 248 - Low-voltage Fuses.

2. NEMA FU1 - Low-Voltage Cartridge Fuses.

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

1. Low-voltage fuses shall be designed, built and tested in accordance with UL 248.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Manufacturer's catalog cuts for the fuses proposed for use with specifications and other data required to demonstrate compliance with the specified requirements.

2. Time-current curves for the fuses proposed for use.

B. Reports

1. Field Test Reports shall be submitted.

2. Manufacturer's Site visit report shall be submitted.

C. Operation and Maintenance Manual

1. Operation and Maintenance Manuals shall be submitted in accordance with this Section and the Specifications.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Fuses shall be delivered, stored and handled in accordance with this Section, the Specifications and the manufacturer's recommendations.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Spares

1. The Contractor shall furnish and deliver to the Engineer, at that part of the site and at such time as the Engineer may direct, spare fuses in accordance with this Section and the Specifications.

2. The spare fuses shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the

manufacturer's part number with complete information for use and reordering.

3. Spare fuses shall include at a minimum the following:

a. 10 percent of each rating used.

b. Minimum of three of each rating.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Low-voltage fuses shall be as manufactured by:

1. Mersen Ferraz Shawmut, San Francisco, CA;

2. Littlefuse, Chicago, IL;

3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. General:

1. Fuses shall be compatible with the system operating voltage shown on the Contract Drawings.

2. Low-voltage fuse ampere ratings shall be as shown on the Contract Drawings.

B. Low-voltage Fuses:

1. Low-voltage fuses shall be current limiting, time delay type or non-time delay type where specified. Low-voltage fuses shall have a 200,000 RMS symmetrical ampere interrupting rating.

2. Low-voltage fuses with current ratings up to 600 ampere shall be UL class RK1, except fuses that serve the fire alarm system shall be UL class J.

3. Low-voltage fuses with current ratings greater than 600 ampere shall be UL class L.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Fuses shall be installed within equipment in accordance with the manufacturer's recommendations.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 26 29 13 – ENCLOSED CONTROLLERS AND DEVICES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing enclosed controllers and devices. Enclosed controllers and devices shall be provided in accordance with the requirements specified under this Section, the Specifications and the Contract Drawings.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 05 27 - Grounding

B. Section 26 05 53 - Identification for Electrical Systems

C. Section 26 08 11 - General Electrical Testing

1.04 REFERENCES

A. Definitions

1. Low-voltage as used in this Section and the Specifications shall mean all equipment, conductors, insulation systems and accessories intended for operation within the 600 Volt Class.

B. Reference Standards

1.	NYCEC	-	Electrical Code of the City of New York.
2.	UL 98	-	Enclosed and Dead-Front Switches
3.	UL 508	-	Industrial Control Equipment
4.	UL 489	-	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures.
5.	NEMA KS-1	-	Heavy Duty and Dead-Front Enclosed Switches
6.	NEMA ICS	-	Industrial Control and Systems General Requirements
7.	NEMA ICS 2	-	Industrial Control and Systems, Controllers, Contactors and Overload Relays rated 600V.
8.	NEMA ICS 5	-	Industrial Control and Systems Control-Circuit and Pilot Devices
9.	NEMA ICS 6	-	Industrial Control and Systems Enclosures

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Unless otherwise shown on the Contract Drawings, or directed by the standards and codes referenced under this Section, the Contractor shall provide for each low-voltage motor or other power device, complete equipment for starting, stopping and control.

B. The starting, stopping and control equipment shall be provided with features of protection, current limitation, functioning and be complete with all accessories, appurtenances and supporting structures.

C. Control equipment shall be UL listed and properly designed with relation to the characteristics of operation of the motor and or device controlled.

D. Unless otherwise shown on the Contract Drawings or stated in the Specifications, each motor shall be provided with control equipment consisting of apparatus as follows:

1. Motors of 1/4 HP or less may, in the absence of other requirements, be controlled by a manual motor starter having thermal overload protection at all times.

2. Motors larger than 1/4 HP shall be controlled by a magnetic motor starter.

E. Each motor shall include overload protection based on latest standards.

1.07 SUBMITTALS

A. Shop Drawings

1. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

a. Manufacturer's catalog cuts, technical information and enclosure details for the equipment proposed.

B. Operations and Maintenance Manuals

1. Operations and Maintenance Manuals

a. Operation and Maintenance Manuals shall be submitted in accordance with the Specifications.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Equipment shall be delivered, stored and handled in accordance with the Specifications and the manufacturer's instructions

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall furnish and deliver to the Engineer, at that part of the site and at such time as the Engineer may direct, spare parts for the enclosed controllers in accordance with this Section and the Specifications.

B. The spare parts shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the manufacturer's part number with complete information for use and reordering.

C. The following spare parts shall be furnished:

1. One (1) set of contact tips, shunts and coils shall be provided for each 6 or less of each size motor starter.

2. One (1) auxiliary contact unit or one set of auxiliary contact tips shall be provided for each 6 or less motor starter.

3. Two (2) sets of arc chutes shall be provided for each type and rating of magnetic contactor.

4. One (1) timing relay shall be provided of each type installed as part of control equipment installation.

5. One (1) complete auxiliary relay shall be provided of each type installed as part of control equipment installation.

6. One (1) control transformer shall be provided of each rating and type installed as part of control equipment installation.

7. Two (2) complete sets of fuse replacements shall be provided of each rating and type installed as part of control equipment installation.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Switching devices shall be as manufactured by:
   1. General Electric Company, Stamford, CT
   2. Siemens, Washington, DC
   3. Or approved equal.

B. Magnetic motor starters shall be as manufactured by:
   1. General Electric Company, Stamford, CT
   2. Siemens, Washington, DC
   3. Or approved equal

C. Manual motor starters shall be as manufactured by:
   1. General Electric Company, Stamford, CT
   2. Siemens, Washington, DC
   3. Or approved equal

D. Control stations shall be as manufactured by:
   1. General Electric Company, Stamford, CT
   2. Siemens, Washington, DC
   3. Or approved equal

E. Docking Station shall be as manufactured by:
   1. Trystar, Fairbault, MN
   2. ESL Power Systems, Corona, CA
   3. Eaton Corporation
   4. Or approved equal

2.02 MATERIALS / EQUIPMENT

A. Switching Devices
   1. Switching devices shall be low-voltage devices provided in accordance with the details shown on the Contract Drawings. The switching devices required under this Section shall be the disconnect switch and circuit breaker types.

2. Switching devices shall be enclosed in NEMA type enclosures in accordance with the requirements specified under this Section, the Specifications and the Contract Drawings.

3. Switching device line and load terminals shall be provided with shields to prevent accidental contact with them. In addition, instrument probe holes shall be provided within the shields to permit investigation of the state of the terminals, by authorized personnel and approved procedures.

   a. Disconnect switch type switching devices shall be in accordance with the following:

      1) Switches shall be heavy duty type with number of poles, voltage and current ratings as shown on the Contract Drawings.

      2) Switches shall be capable of interrupting the full rated current at full rated voltage.

      3) Switch enclosure shall be provided with a viewing window through which it shall be permissible to observe the state of the main contacts and surge protective devices when provided.

      4) Where specifically shown on the Contract Drawings, disconnect switches shall be complete with fuses, surge protective devices and remote operation.

      5) Switches shall be the quick make and quick break type covered with an arc resisting barrier. The switch shall be provided with provision for locking in either open or closed position. The ratings shall be as follows:

Switch Rating in Amperes	Motor Horsepower	
	208-240 Volts	480Volts
60	Over 5 to 15	Over 5 to 30
100	Over 15 to 25	Over 30 to 60
200	Over 30 to 50	Over 60 to 125
400	Over 50 to 75	Over 125 to 200

   b. Circuit breaker type switching devices shall be in accordance with the following:

      1) The enclosed main and generator circuit breakers shall be the molded case type with number of poles, voltage, current and short circuit ratings as shown on the Contract Drawings. The main service breaker shall be UL listed as service entrance type.

2) Where indicated on the Contract Drawings, the main service breaker enclosure shall be equipped with a 120 Volt supply side fire alarm system tap ahead of the main service breaker with provisions for close coupling the fire alarm disconnect adjacent to the main circuit breaker enclosure.

3) Breakers shall be manually operated solid state type. Contacts shall be nonwelding silver alloy and arc extinction shall be accomplished by means of arc chutes.

4) Breakers shall have 100 amp frames as a minimum. Overload protection shall be provided on all poles, with trip settings as shown on the Contract Drawings.

5) Breakers shall be operated by a toggle-type handle and shall have a quick-make/quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position.

6) Breaker enclosures shall be equipped with an external lockable handle with provision for locking in the closed or open position. The main circuit breakers open-close operation handles shall be suitable for remote operation using the remote switch operator system.

7) Where shown on the Contract Drawings breakers shall be provided with electronic trip units. Electronic trip units shall be RMS type and include long time, short time, and instantaneous settings as minimum.

8) Where specifically shown on the Contract Drawings breakers shall be provided with zone interlocking features, shunt trips, provisions for annunciation of status and auxiliary devices.

B. Motor Starters

1. Magnetic

1) Magnetic motor starters shall be provided complete with fused control power transformer, pilot devices, auxiliary contacts and accessories as shown on the Contract Drawings or stated in the Detailed Specifications. Motor starters shall not be smaller than NEMA size 1.

2) Magnetic motor starters shall be enclosed in NEMA type enclosures in accordance with the requirements specified under this Section. The starter shall be combination type. The enclosure shall be equipped with an external operable, pad lockable handle, arranged so that it is impossible to open the door unless the breaker is open.

3) The starter shall be magnetic coil operated, and shall include a magnetic or solid state motor circuit protector with trip unit range adjustable from 700 to 1300 percent of full load.

4) The combination starters shall be suitable for interrupting the available low-voltage short circuit infeed at the line terminals of the enclosure.

5) Magnetic contactors shall be 3 pole, single throw, 60 Hz with auxiliary contacts for under-voltage protection. Contactors shall be mounted upon steel bases with insulated mountings or upon bases of insulating material. Contactors shall be provided with necessary barriers and arc chutes.

6) Contactors shall be NEMA rated as follows:

NEMA Size of Contactor	Motor Horsepower	
	208-240 Volts	480Volts
1	¼ to 71/2	¼ to 10
2	Over 71/2 to 10	Over 10 to 25
3	Over 15 to 25	Over 25 to 50
4	Over 30 to 40	Over 50 to 100
5	Over 40 to 75	Over 100 to 200

7) Contactors in Sizes 1 through 4 shall have double break, silver to silver main contacts. Contactors in Size 5 shall have silver plated tips which close with rolling action and which have self-aligning and self-cleaning features. Auxiliary and interlocking contacts for all sizes shall be of the silver button type. All contact tips shall be easily renewable. Flexible shunts shall be tinned copper braid or tinned extra flexible copper cable.

8) Overload relays shall be of the ambient temperature compensated bi-metallic or solid state type with interchangeable sensors and manual reset feature. Relay shall include a normally open auxiliary contact for remote alarm purposes. Sensors for overload relays shall be selected to match full load currents of the motors to allow motor operation at maximum safe loads without damage to equipment. Full load current data shall be obtained from nameplates of motors actually installed.

9) Pilot devices shall be heavy duty type, rated 10 amp continuous. Pushbuttons, selector switches, indicating lights, and other devices shall be located on the starter

enclosure. Indicating lights shall be push-to-test, LED, transformer type with 12 volt secondaries.

10) Relays shall be standard, latching type and pneumatic or solid state time delay type. Relays shall be provided with contacts rated 10 amp with number as required.

11) Special overload protection shall be provided where definite purpose motors cannot be protected by standard thermal overload relay applications.

2. Manual

a. Manual motor starters shall be provided complete with pilot devices as shown on the Contract Drawings.

b. Manual motor starters shall be enclosed in NEMA type enclosures in accordance with the requirements specified under this Section.

c. Manual motor starters shall be toggle operated, NEMA horsepower rated, single phase type with thermal overload protection unless shown otherwise on the Contract Drawings. Pilot devices when required shall be in accordance with the requirements specified under this Section.

d. Where shown on the Contract Drawings, manual motor starters shall be low-voltage, three phase type without overload protection for use as manual starting disconnect switches. The switches shall be horsepower rated, as required for the application intended.

3. Control Stations

a. Control Stations shall be provided in accordance with the details on the Contract Drawings.

b. Control Stations shall be enclosed in NEMA type enclosures in accordance with the requirements specified under this Section.

c. Control stations shall be industrial, heavy duty, oil tight construction with clearly marked legend plates. Stations shall have operating devices as shown on the Contract Drawings.

d. Contact ratings shall be 10 amp minimum. All indicating lights shall be LED, transformer type, lens color shall be as shown on the Contract Drawings.

4. Enclosures

a. Enclosures shall be provided for the enclosed controllers, switching devices, motor starters and control stations.

b. Enclosures located indoors in dry, dusty areas shall be gasketed and shall be constructed of 14-gauge sheet steel.

c. Cabinet type enclosures shall include hinged and gasketed front doors.

d. Enclosures shall be provided in accordance with NEMA requirements as required for the area classifications indicated on the Contract Drawings.

1) For dry, dusty locations, enclosures shall meet NEMA 12 requirements.

2) For wet or corrosive locations, enclosures shall meet NEMA 4X requirements. NEMA 4X enclosures shall be fabricated from 316 stainless steel.

3) Enclosures within hazardous locations shall meet Class 1, Division 1, Group D requirements. Hazardous enclosures shall be fabricated from cast metal

C. Remote Switch Operator System:

1. Provide a remote switch operator and actuator system, CBS ArcSafe Chicken Switch, to enable operating personnel to stand outside the arc flash protection boundary while opening and closing the enclosed main circuit breaker for the two service entrance main circuit breakers, one located at the TI-010 Dechlorination site and the other located at the TI-011 Disinfection site.

2. The system operator shall include a portable base unit that includes a 24 Volt DC power supply and a radio remote control. The system actuator shall be suitable to open and close the enclosed molded case main circuit breakers.

3. The system actuator shall be matched to the actual manufacturer's breaker type and mounting. Contractor shall coordinate the actuator requirements with the information of the approved circuit breakers to be installed.

D. Docking Stations:

1. Provide docking stations for connection of a portable generator at each location shown on the Contract Drawings.

2. Docking stations shall be UL listed suitable for 65KA short circuit rating and 208/120 Volt, 4 pole, 3 phase operation or 480 Volt, 3 phase operation and continuous ampere rating as shown on the Contract Drawings.

3. Docking station enclosures shall be stainless steel construction rated NEMA 4X. Enclosures shall include a pad lockable door and removable

panels suitable for conduit entry with access to terminations. Enclosure shall be suitable for bottom entry of the portable cables.

4. Docking stations shall be equipped with tin plated copper bus bars, and mechanical lugs terminations sufficient for the quantity and size of cables shown on the Contract Drawings. Docking station shall also include Posi-Lok panel mounted, male receptacles rated 600Volt suitable for 3 phase, neutral and ground as required with protective covers. When multiple sets are indicated on the Contract Drawings provide the additional phase, neutral and ground receptacles for each parallel set. Provide matching Posi-Lok female plugs, one for each receptacle.

5. The docking stations shall include a phase rotation monitor and two 120 Volt, single phase receptacle outlets. One outlet shall be duplex type, rated 20 amperes and the second single outlet shall be rated 30 amperes.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Equipment shall be mounted so that sufficient access and working space is provided for ready and safe operation and maintenance.

B. Equipment shall be securely fastened to walls or other surfaces on which they are mounted.

C. Independent supports shall be provided where no wall or other surface exists.

D. Connect the generator supply cables at the docking station to comply with DEP standard of clockwise ABC phase rotation.

E. Enclosed controllers shall be installed in conformance with the NYCEC.

3.03 FIELD TESTING / QUALITY CONTROL

A. Test phase rotation of the Con Edison service supplies to verify suitability with the generator supply standard for clockwise ABC phase rotation. Adjust, if necessary, the Con Edison supply connections to ensure compatible rotation.

B. Provide testing for the main and generator service circuit breakers. Testing for these breakers shall be included as a part of the panelboard testing. Test the main and generator service circuit breakers in accordance with the applicable requirements specified under Section 26 24 16, Panelboards.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 26 29 23 – VARIABLE-FREQUENCY MOTOR CONTROLLERS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing Variable-Frequency Motor Controllers known as Variable Frequency Drives (VFD/s). VFDs shall be provided in accordance with the requirements specified under this Section, the Specifications and the Contract Drawings.

B. The VFDs required under this Section shall be the low-voltage, 18 pulse converter, voltage source pulse -width modulated inverter types.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 05 27 - Grounding

B. Section 26 05 53 – Identification for Electrical Systems

C. Section 26 05 91 – Low-Voltage Electric Motors

1.04 REFERENCES

A. Definitions

1. All references to the Electric Utility or the Utility shall mean the Local Electric Utility having jurisdiction.

2. The Electric Utility is Con Edison.

3. Low-voltage as used in this Section and the Specifications shall mean all equipment, conductors, insulation systems and accessories intended for operation at less than 1000 volt and within the 600 V Class

B. Reference Standards. VFD shall comply with the latest applicable provisions and recommendations of the following:

1.	NYCEC	-	New York City Electrical Code.
2.	NEMA ICS 2	-	Industrial Control and System Controllers, Contactors and Overload Relays Rated 600 volts.
3.	NEMA ICS 7	-	Adjustable Speed Drive Systems.
4.	NEMA MG-1	-	Motors and Generators.
5.	NETA ATS	-	NETA Acceptance Testing Specification.
6.	NIST	-	National Institute of Standards and Technology.
7.	IEEE 519	-	Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.
8.	ANSI/UL 508	-	Industrial Control Equipment.
9.	UL 489	-	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.
10.	BWT Design Guideline	-	Motor Starting for Low-voltage applications.

1.05 DESCRIPTION

A. VFD General

1. Each VFD unit shall consist of an adjustable frequency controller and associated controls for continuous speed adjustment and protection of the driven equipment.

2. The adjustable frequency controller shall be a microprocessor-based, pulse-width modulated design, suitable for operation on a low-voltage, 3 phase, 60 Hz supply.

3. The controller shall consist of

   a. a power factor /harmonic filter unit (if required)

   b. 18 pulse, minimum, diode-bridge converter fed by rectifier-grade phase-shifting transformer

   c. a fixed DC bus section

   d. and an IGBT based power transistor inverter output section.

4. The controller shall produce an adjustable AC voltage/frequency output to vary the speed of the driven equipment and maintain the drive motor V/Hz rating.

1.06 QUALITY ASSURANCE

A. VFDs shall be designed, built and tested in accordance with the latest applicable editions of ANSI/IEEE, NEMA, and UL. The VFDs shall be a custom package solution to satisfy the 18 pulse specified requirement due to the low horsepower of the driven equipment.

B. The VFD shall be UL listed.

C. The VFD manufacturer shall have 10 years' experience in the design and be regularly engaged in manufacturing and servicing equipment for installations of the type and size specified under this Section.

D. Each VFD shall be totally compatible with the driven equipment and motors. The VFD shall be matched to the driven equipment specific load requirements for each system specified in this Section or as shown on the Contract Drawings.

E. Output speed control of the controlled motor shall be continuous throughout speed range of 2 to 60 Hertz under variable torque load or constant torque load as specified for the driven equipment.

F. Operation of the variable frequency drive shall not over stress the driven motor insulation system.

G. Each and multiple VFD/s installation/s shall meet the requirements in IEEE 519 for individual and total harmonic voltage and current distortion on both the utility and emergency generator.

H. In order to centralize responsibility and to ensure that all equipment is properly coordinated, the VFDs specified under this Section shall be obtained from the driven equipment suppliers.

I. All VFDs that comprise a given system shall be similarly equipped. Similar components of each system shall be the product of a single manufacturer.

J. All materials, equipment and parts comprising the each VFD shall be new, of current manufacture and of the highest grade. All components shall be covered by the manufacturer's standard warranty on new VFDs.

K. The VFD manufacturer shall have complete parts and service facilities and a factory-trained serviceman, located within a hundred miles of the project site, available on a 24-hour basis. Services shall be readily available so to avoid long periods of interruption or require extensive spare parts inventory.

L. Unless otherwise authorized by the Engineer, the manufacturer's service representative shall be direct employee of the equipment manufacturer, with at least five (5) years of experience in the installation, testing and startup of equipment specified herein.

M. Manufacturer's sales and marketing representatives shall not be accepted as manufacturer's service representative

N. The VFD manufacturer shall use a shop test facility that has recently calibrated testing apparatus and qualified, experienced technicians, for all shop tests.

O. Calibration of testing apparatus shall be within one year.

P. All test equipment and instrument calibration shall be in accordance with the latest edition of the accuracy standard of the NIST.

Q. Field Tests:

1. VFDs shall be field tested. Field testing shall be performed in accordance with the requirements specified under this Section.

2. Retain the services of the VFD manufacturer for field service. Field service shall be in accordance with the requirements specified under this Section.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. A list of proposed manufacturers with the products they produce proposed for the contract.

2. Manufacturer's technical information which shall include:

a. Dimensional information and construction details of enclosures. Enclosure details shall consist of exterior and interior front door with nameplate legends, interior door front and rear views and terminal block layout.

b. Three-line power and control schematic diagrams.

c. Technical specifications.

d. Catalog cuts.

e. Wiring diagrams showing the interconnection of conductors to remote devices with terminal assignments.

f. Harmonic analysis which shall include all voltage and current harmonics up to the 49th.

3. Description of shop and field testing methods and procedures, and apparatus with calibration dates shall be submitted.

4. Qualifications of proposed service firm who will perform the service and maintenance agreement. Five recent references with phone numbers shall be submitted.

B. Certificates of Compliance

1. Certification letters from the VFD and motor manufacturers that the approved driven equipment has been reviewed and that the VFDs and motors are compatible and shall be provided in accordance with the requirements specified.

C. Reports

1. Manufacturer's written determination as to whether reforming of DC bus capacitors is required before the commencement of Field Tests

2. Shop test and field test reports shall be submitted.

3. Manufacturer's site visit report shall be submitted.

D. Software

1. Software shall be submitted and provided to permit the Engineer or other selected authorized personnel:

a. To set or modify VFD parameters

b. Perform analysis of VFD operation

c. View and analyze VFD faults.

E. Operation and Maintenance Manuals

1. Operation and Maintenance Manuals shall be submitted in accordance with this Section and the Specifications.

1.08 DELIVERY, STORAGE, AND HANDLING

A. VFDs shall be delivered, stored and handled in accordance with this Section and the Specifications, the manufacturer's instructions and the following:

1. VFD equipment shall be inspected for shipping damage or loose parts when received.

2. Evidence of water which may have entered equipment during transit shall be checked for.

3. VFD equipment shall be stored in a clean, dry location in which a uniform temperature is maintained. Equipment shall be protected with coverings and air circulation shall be maintained.

4. Where dampness or condensation may be encountered, heaters shall be provided for equipment to prevent moisture damage.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall furnish and deliver to the Engineer, at that part of the site and at such time as the Engineer may direct, spare parts for the VFD in accordance with this Section and the Specifications.

B. The spare parts shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the manufacturer's part number with complete information for use and reordering.

C. Spare parts shall be furnished and shall include one set for every four drives installed per horsepower rating. Each spare part set shall consist of the manufacturer's recommended spare parts inventory and shall include at a minimum the following:

1. One set of transistor and diode modules with accessories
2. One power supply module
3. One set of fans
4. One set of power fuses of each size and type used.
5. Two sets of control power fuses of each type and size used.
6. Two per ten of pilot lights of each type used.

D. A rugged portable microprocessor based viewer shall be provided to run software provided to set or modify VFD parameters, perform analysis of VFD operation and view and analyze VFD faults.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. VFDs shall be as manufactured by:

1. Siemens, Alpharetta, GA;
2. Schneider Electric;
3. ABB, New Berlin, Wisconsin;
4. Rockwell Automation
5. Or approved equal.

B. The VFD shall be customized by:

1. ABB

2. Engineered Drive Solutions.
3. Electronic Drives and Controls
4. Integrated Controls
5. Or approved equal

2.02 MATERIALS / EQUIPMENT

A. Enclosure

1. Each VFD shall be provided with a free standing, dead-front, front access, grounded, NEMA 12, filtered and gasketed enclosure. Each enclosure shall be suitable for mounting all components required of a given unit.
2. Each enclosure shall provide adequate cooling for the components within and shall include positive ventilation.
3. Each enclosure shall include a circuit breaker disconnect switch. The switch handle shall be suitable for padlocking and shall be through-the-door type. Operation of the switch shall remove the service supply from all internal components. Power devices shall be suitable for the interrupting capacity shown on the Contract Drawings. Include current limiting semi-conductor fuses where required for protection of solid state components.
4. Each enclosure door shall include an operator interface for access to controller's digital keypad and display.
5. The enclosure shall have identifying nameplates in accordance with the requirements of Section 26 05 53 Identification for Electrical Systems.
6. Each enclosure shall be equipped with phenolic type terminal blocks suitably labeled for all internal and remote wiring requirements plus 20 percent spare.

B. Adjustable Frequency Controller

1. General
   a. The adjustable frequency controller shall be microprocessor-based, pulse width modulated design, suitable for operation on a low-voltage, 3 phase, 60 Hz supply. The supply voltage shall be as shown on the Contract Drawings.
   b. The controller shall produce an adjustable AC voltage/frequency output to vary the speed of the driven equipment and maintain the drive motor V/Hz rating.
   c. The controller shall consist of
      1) A power factor /harmonic filter unit (if required)
      2) 18 pulse, minimum, diode-bridge converter fed by rectifier-grade phase-shifting transformer.
      3) A fixed DC bus section

4) A 3 percent DC bus reactor or input line reactor.

5) An IGBT based power transistor inverter output section.

d. The controllers' solid state converter input section switching devices shall have a 1600-volt PIV rating.

e. The controller shall have an overload rating of 110 percent variable torque, 150 percent constant torque for one minute.

f. RMS harmonic content of output current shall be less than 5 percent of fundamental current.

g. Controller shall be able to withstand output terminal line-to-line short circuits without component failure.

2. Operating Criteria

a. The controller's operating criteria shall be in accordance with the following:

1) Ambient temperature range shall be 0 degrees C to 40 degrees C.

2) Operational humidity shall be up to 90 percent non-condensing.

3) Altitude shall be below 3,300 feet above sea level.

4) Nominal input voltage variation shall range from plus 10 percent to minus 10 percent.

5) The controller shall include an undervoltage feature to permit trip-free operation down to 35 percent undervoltage.

6) Nominal frequency shall be 60 Hertz plus or minus 3 Hz.

7) Input power factor shall be 95 percent displacement power factor at all operating speeds.

8) Efficiency shall be a minimum of 96 percent at full speed and full load.

9) Losses in the efficiency calculations shall include those of the input transformer, harmonic filter and power factor correction if applicable, convertor, output filter if applicable, auxiliary controls, internal boards and cooling equipment.

3. Features

a. The controller shall have features in accordance with the following:

1) Digital keypad and display module shall provide parameter setting, adjustments and monitoring of control functions and faults. Display messages shall be in English.

2) Serial communication port shall allow connecting to a programmable logic controller interface.

3) Independent acceleration/deceleration rates shall provide 2 to 600 seconds minimum. When called to stop, the motor shall decelerate to minimum speed before stopping.

4) Power loss feature shall allow ride through capability.

5) Time delay automatic restart shall allow restart after controller fault conditions with programmable attempts.

6) Coasting motor restart shall permit the controller to restart into a coasting motor without damage or tripping.

7) The coasting motor restart feature shall allow switching from bypass mode to VFD mode while operating without shutdown.

8) Control inputs and outputs shall be isolated.

4. Protection and Logging of faults

a. The controller shall have protective functions in accordance with the following:

1) Input line surge protective device shall provide transient protection.

2) Electronic over-current trip shall provide instantaneous and inverse time overload protection.

3) Over-temperature trip shall provide temperature protection.

4) Current limit trip shall provide current protection.

5) Input line over and under voltage trip shall provide voltage protection.

6) Ground fault trip shall provide ground protection.

b. The controller shall have a built in fault log in accordance with the following:

1) All faults shall be retained indefinitely in the log.

2) The date and time of each fault shall be part of the information describing the fault.

3) It shall be possible to download the complete fault log into a CSV file for off controller analysis.

C. Output Filter

1. General

a. An output filter shall be provided to prevent overstressing the motor insulation system. An output filter shall be included for each VFD,

whenever the cable length between the motor and VFD exceeds the following based upon the noted switching frequencies.

1) 1 KHZ switching frequency, 200 feet cable length.

2) 3 KHZ switching frequency, 175 feet cable length.

3) 12 KHZ switching frequency, 100 feet cable length.

b. Output filters shall be provided in all other cases, based upon the recommendations of the VFD and motor manufacturer's, whenever the actual voltage peaks at the motor terminals exceed the NEMA-MG1 limits.

2. Filter Design:

a. The filter shall be three phase, low-voltage class motor-protecting type consisting of suitable values of inductance, capacitance and resistance to form a damped, low pass filter.

b. The filter shall be a low-loss type specifically designed to reduce the voltage wave form dV/dT. The filter shall allow cable lengths at minimum exceeding the actual application distances with a waveform resulting in voltage spikes at the motor terminal which are within the NEMA-MG1-Part 31 voltage stress levels.

c. The filter shall be suitable for mounting within the VFD enclosure.

D. Overload Relays:

1. Overload relays shall be provided as required to protect the motor from overload where the controller overload protective function exceeds the motor capability.

2. Overload relays shall be solid state or thermal ambient temperature compensated type sized for the full load amperes of the actual motors furnished.

3. Overload relays shall include manual reset capability and a normally open auxiliary contact for alarm indication,

E. Controls

1. General

a. Each VFD control system shall be equipped with all control and pilot devices and other components required for a complete functional system.

b. Each VFD control shall be powered from a suitably sized and protected control power transformer.

c. Each VFD control shall include status indicators, controller and system fault condition displays and operating controls.

d. Status indicators and operating controls associated with the drives control shall be installed on the front door of the enclosure.

e. The control arrangement shall be such that the VFD internal electronic supply voltage is isolated from all field wiring.

2. Control and Pilot Devices:

a. Relays shall be standard, latching type and solid state time delay type.

b. Relays shall be provided with contacts rated 10 amp with number as required.

c. Pilot devices shall be heavy duty type, rated 10 amp continuous.

d. Indicating lights shall be push-to-test LED type.

F. Controls:

1. Stop/Start and Speed Control for all VFDs: VFDs shall respond to remote field mounted control station that includes a Local-Off-Remote selector switch, start/stop pushbuttons and a potentiometer. Field mounted control station shall also include speed indication. With the switch in remote position, stop/start and speed control shall be based upon a remote stop/start contact and a 4-20mADC speed signal from the control system. In local position, stop/start and speed control shall be from the remote field mounted control station's, start/stop pushbutton and potentiometer.

2. Protective Controls: The VFDs shall be provided with the following protective controls:

a. High Pressure Shutdown: The high pressure control shall respond to a remote pressure switch that activates at high pressure. When high pressure is activated, VFD shall shutdown after an adjustable delay.

b. Leak Detection Shutdown: The leak detection control shall respond to a remote leakage switch that activates when leakage is detected. When the leak switch is activated, VFD shall shutdown after an adjustable delay. Include provisions to remotely supply 120 Volt to the leakage switch.

c. Motor Overtemperature Shutdown: The motor over-temperature control shall respond to a remote normally closed thermal contact that activates on motor over-temperature. When the thermal contact is activated, VFD shall shutdown.

G. Auxiliary Features:

1. Each VFD shall be provided with the following auxiliary features.

a. Status indicators shall include separate pilot lights for indication of

1) Motor run –Red.

2) Control power on - White.

b. Shutdown and alarm indicators shall include separate pilot lights

1) Amber for each of the shutdown and alarm condition.

c. Shutdown indication circuitry shall be arranged such that when activated, the indicator will require manual reset.

d. Contact outputs shall include separate dry contacts for remote indication of Local-Off-Remote selector switch not in remote, motor run, each shutdown condition and controller faults.

e. Speed output shall include a 4-20 MA signal for remote indication of motor speed.

2. Field Mounted Control Station; Provide field mounted control station (Nema 4X) for each VFD with the following functionality:

a. Local-Off-Remote Switch

b. Start/Stop Pushbutton

c. Speed Potentiometer

d. Common malfunction indicating light

e. Speed indicator

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Finishes

1. All metal surfaces of the VFD shall be thoroughly cleaned and given one coat of zinc chromate primer.

2. All interior surfaces shall then be given one shop finishing coat of a nitro-cellulose lacquer enamel.

3. All exterior surfaces shall be given three coats of the same lacquer. The color of the exterior finishing coats shall be light gray ANSI No. 61.

4. All printed circuit boards shall be coated with a conformal coating to provide protection for all components.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Certified Shop Tests:

1. Shop testing shall be performed at the VFD manufacturer's plant prior to shipment.

2. Shop test shall demonstrate that the equipment tested conforms to the requirements specified.

3. Manufacturers standard factory tests shall be performed on each VFD and shall in addition include:

a. Operating the VFD with a motor of ratings similar to the driven equipment motor through all of the speed and load ranges in a heated environment for a minimum of two hours.

b. Simulation of each control signal and each alarm function to verify proper and correct drive action.

4. The Contractor shall provide a Shop Test Report. The report shall identify the tests performed and the results obtained.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. VFD equipment shall be installed in accordance with manufacturer's instructions and recommendations.

B. VFD equipment shall be installed so that sufficient access and working space is provided for ready and safe operation and maintenance.

C. VFD equipment shall be installed on concrete pads at locations shown on the Contract Drawings.

D. Steel channels shall be provided for support of equipment. Equipment shall be secured to mounting surface with anchor bolts of sufficient size and number to secure equipment.

E. Install nameplates for identification of equipment.

3.03 FIELD TESTING / QUALITY CONTROL

A. After installation, VFD shall be field tested for operation and conformance. The Contractor shall perform field tests in accordance with this Section and Specifications.

B. VFD testing shall be performed by the manufacturer's representative, prior to energizing equipment.

C. Equipment shall not be energized without the permission of the Engineer.

D. The testing shall be in accordance with the recommendations of the manufacturer's representative and shall consist at a minimum of the following:

1. Manufacturer’s determination of whether the reforming of DC bus capacitors is required,

2. Device settings and drive adjustments shall be verified.

3. Mechanical and electrical interlocks shall be inspected and controls shall be checked for proper operation.

4. Each drive shall be tested through the specified speed ranges and loads for a minimum of two hours.

5. Each drive shall be tested by using the actual control signal for remote and local operation.

6. Each drive alarm function shall be tested.

7. Tests to verify the Harmonic analysis submitted. Test shall be conducted at the input to the drive and shall be conducted with and without the VFD operating.

E. Manufacturer's Field Services

1. The Contractor shall provide the services of a qualified manufacturer's service representative who shall adequately supervise and assist in the installation of the generator sets, check the generator set installation before it is placed into operation, assist in the performance of field tests, observe and assist initial operations and train the Contractor and the City's operations and maintenance staff in the care, operation and maintenance of the generator sets.

2. The Contractor shall provide equipment start-up services and training in accordance with this Section, the Specifications and the Contract Drawings and the following requirements:

a. Minimum number of manufacturer's representative site visits per type of generator set:

Construction Phase	No of Visits	Person-days per visit
Installation	5	2
Field Tests	3	2
Training	3	2

3. Any additional time required to achieve a successful installation shall be at the expense of the Contractor.

4. The Engineer shall have the right to reallocate any unused person-days.

5. The Contractor shall provide a field report from the manufacturer's representative for each visit to the site. The report shall include complete information on time, schedule, tasks performed, persons contacted, problems corrected, tests results, training, instruction and all other pertinent information.

6. The service representative shall sign in and out with the Engineer on each day they are at the site. Person-days shall be understood to be the actual time spent at site and does not include travel to and from the site.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 26 31 00 – PHOTOVOLTAIC POWER SYSTEM
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing photovoltaic power systems. Photovoltaic power systems shall be provided in accordance with the requirements specified under this Section, the Specifications, and the Contract Drawings.

B. The Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install photovoltaic power systems complete and operational.

C. Two separate and distinct photovoltaic power systems are required, one located at the TI-010 Dechlorination Facility and one located at the TI-011 Disinfection Facility as shown on the Contract Drawings.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the

applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 05 53 - Identification for Electrical Systems

1.04 REFERENCES

A. Photovoltaic power systems shall comply with the latest applicable provisions and recommendations of the following:

1. New York City Electrical Code.
2. NFPA 70, National Electric Code
3. UL 1699B, Standard for Photovoltaic DC Arc-Fault Circuit Protection
4. UL 1703, Standard for Safety Flat-Plate Photovoltaic Modules and Panels.
5. UL 1741, Standard for Inverters, Converters, Controllers, and Interconnection System Equipment for Use with Distributed Energy Resources.
6. IEC 61215, International Standard for Crystalline Silicon Terrestrial Photovoltaic Modules – Design Qualifications and Type Approval
7. FCC Part 15 Class B, Code of Federal Regulations.
8. ASCE 7-05, Standard for Minimum Design Loads for Buildings and Structures
9. IBC, International Building Code.
10. NABCEP, North American Board of Certified Professional and Associates.

1.05 DESCRIPTION

A. The photovoltaic power systems required under this section includes providing roof mounted solar panels, associated supports and interconnecting wiring and conduits. Each system shall be grid connected and include an inverter to supply a 208 Volt AC single or three phase output from the DC supply of the interconnected solar panels as shown on the Contract Drawings.

B. The solar array pitch shall be 10 Degrees and an array azimuth of 180 Degrees. The interconnected solar panel system shall have a total peak power output of 4.0 KW for the TI-010 Dechlorination facility and 9 KW for the TI-O11 Disinfection facility. Total peak power output shall be DC-STC (Standard Test Conditions) of 1000 W/m2 solar irradiance and 25 degrees C PV module temperature.

C. The Contract Drawings show the overall system arrangements. The drawings are for purposes of guidance and for showing the functional features and spacing

required. The drawings do not show all components required and the photovoltaic power system shall incorporate all necessary requirements for proper functionality and operation.

D. The photovoltaic power systems shown on the Contract Drawings and specified under this Section is based upon information from the specified manufacturers and is the basis of the design presented.

1.06 QUALITY ASSURANCE

A. General:

1. Photovoltaic panels and inverters shall be designed, built and tested in accordance with the latest applicable editions of UL and IEC standards. Photovoltaic panels and inverter shall be UL listed.

2. The photovoltaic panels and inverters manufacturers shall have experience in the design and be regularly engaged in manufacturing equipment for installations of the type and size specified.

B. Photovoltaic Power System Installer:

1. In order to centralize responsibility, the Contractor shall retain the services of a photovoltaic power system licensed NABCEP installation professional. The system installer shall have experience with photovoltaic power systems with a minimum of five successful grid-connected projects of comparable size and complexity.

2. The system installer shall provide a turnkey installation and be responsible for the photovoltaic power system designs and overall supervision of each installation utilizing the available free roof space shown on the Contract Drawings.

3. All equipment provided under this Specification shall be obtained from the system installer who shall assume full responsibility for the completeness of each system and shall be the source of information on all equipment furnished regardless of the manufacturing source of that equipment.

4. Provide the services of one of the following system installers:

a. Solar Liberty.

b. Buffalo Solar.

c. CIR Solar.

C. Field Tests and Services:

1. The photovoltaic power systems shall be field acceptance tested. The photovoltaic power system installer shall be retained for field testing and services. Field testing and services shall be in accordance with the requirements specified under this Section.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited, to:

B. Manufacturer's technical Information which shall include for each system:

1. Manufacturer's specifications and other data. Data shall be submitted for each component to be provided. Data shall include type, ratings, settings, catalog cuts and other technical information.

2. A completed materials list with outline and summary sheets and schedule of components and supporting system.

3. Site plan drawing showing the solar panel roof mounted arrangement along with system summary information and legend.

4. Wiring diagrams showing the inverter and solar panel wiring interconnections and sizes.

5. Solar panel support details.

C. Reports:

1. Field test and site visit reports shall be submitted.

1.08 DELIVERY, STORAGE, AND HANDLING

A. All equipment shall be delivered, stored, and handled in accordance with this Section, the Specifications, and the manufacturer's recommendations and the following:

1. Equipment shall be inspected for shipping damage or loose parts when received. Evidence of water which may have entered equipment during transit shall be checked.

2. Equipment shall be stored in a clean, dry location in which a uniform temperature is maintained. Equipment shall be protected with coverings and air circulation shall be maintained.

B. Where dampness or condensation may be encountered, heaters shall be provided for equipment to prevent moisture damage.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

1.11 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall furnish manufacturer's recommended spare parts, special tools and supplies that match products installed and that are packaged with protective covering for storage and identified with labels describing contents with the manufacturer's name and part number with complete information for use and reordering.

B. Spare parts, special tools and supplies shall consist of the system installer's recommended inventory. Special tools that are required to assemble, repair and maintain the photovoltaic power system shall be provided.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide photovoltaic panels manufactured by one of the following:

1. Hanwha, model Q-cells.
2. Canada Solar, model CS6P.
3. LG Solar, model LG250
4. Or approved equal.

B. Provide inverter manufactured by one of the following:

1. Solar edge.
2. SMA.
3. Enphase.
4. Or approved equal.

C. Provide racking system manufactured by one of the following:

1. DynoRaxx.
2. Unirac.
3. Iron Ridge
4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Photovoltaic Panels:

1. The photovoltaic panels shall be monocrystalline modules rated 250 watts, STC complying with UL 1703 and IEC 61215.

2. Panel construction shall include an anodized aluminum frame with pre-stressed anti-reflection glass front cover and composite film back cover.

3. Panels shall be equipped with combiner box with bypass diodes, cable and connector as required for the system interconnections.

B. Inverter:

1. Inverters shall be grid connected to a utility supply. Inverter power input and operating characteristics shall be compatible with the PV panel supply.

2. Inverters shall be certified to meet the requirements of UL-1741, IEEE 1547 and FCC part 15 class B.

3. Inverter features shall include the following:

   a. Automatic rapid shutdown upon AC grid disconnection.

   b. Integrated arc fault protection

   c. RS-485 surge protection.

   d. Reverse polarity protection.

   e. Integrated DC disconnect switch.

4. The electrical requirements of each inverter shall include:

   a. Maximum Input Voltage: 500 VDC or less.

   b. AC Grid Connection: TI-010 Single phase, TI-011 three phase, 208 Vac

   c. Nominal AC Voltage Range: 183 to 229 Volts

   d. Nominal AC Frequency: 60 Hz

   e. Rated AC Power Output: TI-010 4150 VA and TI-011 9000 VA

   f. CEC Efficiency 97% or greater

   g. Maximum DC Power TI-010 5100 Watts and TI-011 12150 Watts

5. Inverter environmental and mechanical features shall include:

   a. Enclosure Rating NEMA 12 minimum.

   b. Relative Humidity: 0-95%

   c. Ambient Temperature -10ºC to +50ºC

C. Combiner Boxes:

1. Combiner boxes shall be NEMA 4X rated and UL listed as an accessory to UL 1741 for combining multiple photovoltaic circuits. Combiner boxes shall be equipped with terminals, fuses, surge protection, grounding and all required hardware necessary for proper operation and protection of the photovoltaic circuits.

D. Mounting System:

1. The solar panels shall be mounted on a ballasted racking system. The racking system shall be suitable for mounting on flat roof surfaces and slightly sloped roofs, 5 degrees or less without the need for roof penetrations.

2. The racking system shall be wind tunnel tested and certified by a Professional Engineer licensed in the State of New York and compliant with ASCE 7-05, and the IBC.

3. The racking system shall be non-corrosive construction consisting of fiberglass, thermoplastic resin or glass reinforced composite with Type 304 stainless steel clamps.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Equipment shall be installed in accordance with the system installer's instructions and recommendations.

B. Equipment shall be installed at locations shown on the Contract Drawings. Install solar panels at available free roof space when accounting for both fire code and equipment access.

C. Install nameplates for identification of equipment.

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Commissioning and Testing:

1. After installation, each system shall be field commissioned, and tested for operation and conformance. The Contractor shall perform field commissioning and testing in accordance with this Section.

2. The field commissioning and testing shall be witnessed by the Engineer and Certified by the Contractor.

3. The field commissioning and testing of each shall be performed by the system installer skilled representatives, prior to energizing equipment. All commissioning and testing shall be in accordance with the procedures and recommendations of the system installer's representatives.

4. Equipment shall not be energized without the permission of the Engineer.

B. System Installer's Field Services:

1. The Contractor shall furnish the services of the system installer qualified service representatives who shall supervise in the installation of each system, check the equipment installation before it is placed into operation, perform field commissioning and testing, observe and assist initial operations.

2. The Contractor shall provide equipment start-up services in accordance with this Section and the Specifications.

3. The Contractor shall provide the services of the representatives for the number of site visit and time durations necessary to perform each of the specified services and as required to successfully place the equipment of each system in proper operation.

4. The Contractor shall provide field reports for each system from the system installer representatives for each visit to the site. The report shall include complete information on time, schedule, tasks performed, persons contacted, problems corrected, tests results, training, instruction, and all other pertinent information.

5. The system installer representatives shall sign in with the Engineer on each day they are at the site.

6. The system installer shall provide system training for City's staff on the operation and maintenance of the system equipment. The training shall be conducted by the system installer representative who shall be skilled at providing training programs of the type required. The training shall be conducted during separate two 8-hour sessions and shall include both classroom and field instruction at times selected by the City. The training program shall be video-taped and turned over to the City.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. This section includes the requirements for providing three mobile power generator sets. The mobile portable generator sets shall be purchased and delivered to the Site for inspection and testing and when completed, the mobile generator set shall be turned over to the City.

B. The generator sets shall be a self-contained transportable trailer mounted and truck towed for a mobile generating system suitable for transporting across New York City streets. The portable system shall contain all necessary items for a complete operating power plant and requiring only fuel oil, and generator output connections to make it functional. Starting shall be accomplished by a battery system contained within the module.

C. The three generator sets required include one generator set for the TI-010 Chlorination site (existing Flushing Bay CSO Facility), one generator set for the TI-010 Dechlorination Facility and one generator set for the TI-011Disinfection Facility.

D. The following index of this Specification is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Mobile generator power shall comply with the latest applicable provisions and recommendations of the following:

1. Electrical Code of the City of New York.
2. NEMA MG1 - Motors and Generators.
3. NEMA MG2 - Safety Standard for Construction and Guide for Selection, Installation and Use of Motors and Generators.
4. ISO STD 8528 - Reciprocating Internal Combustion Engines.
5. ISO STD 3046 - Performance Standard for Reciprocating Internal Combustion Engines.
6. UL 508 - Industrial Control Equipment.

1.05 DESCRIPTION

A. Design Requirements

1. The generator sets shall be designed, built and tested in accordance with the latest applicable standards of NEMA MG1 and MG2, ISO 8528 and 3046 508 and UL 508.
2. The generator sets shall operate at 1800 rpm, 60 hertz from ultra-low sulfur diesel fuel and be equipped with all necessary accessories.
3. The generator sets shall be prime power rated sufficient for unlimited operation with a variable type of load of up to the nameplate KW as defined by ISO 8528.
4. The generator sets shall have the following minimum ratings:
5. 0.8 power factor, 3 phase, 4 wire, 60 Hz with switchable output voltage of 208/120 Volt and 480/277Volt. The prime rated kW of each generator set shall not be less than the size indicated on the Contract Drawings.
6. The generator set shall be rated for the specified KW without overload when operating under the following environmental conditions:

a. Ambient temperature - 50 degrees C.

b. Height above sea Level - 1500 Feet.

c. Relative Humidity - 95 percent.

7. The generator set shall meet the latest U. S. EPA Tier 4F air emission requirements applicable at the time of installation and be certified for mobile applications.

1.06 QUALITY ASSURANCE

A. General:

1. Generator sets shall be of current manufacture from a firm regularly engaged in the production of such equipment.

2. The generator sets manufacturer shall have a minimum of 5 years experience in designing, supplying, and supporting engine generators sets.

3. Generator sets shall be factory assembled in an ISO 9001 certified manufacture facility and tested to determine that it is free from electrical or mechanical defects and to assure that it meets design specifications.

4. Generator sets shall be adequately guarded both physically and electrically for protection of operating personnel.

5. All materials, equipment and parts comprising the generator sets shall be new, of current manufacturer and of the highest grade. All components shall be covered by the manufacturer’s warranty.

6. The generator sets manufacturer shall have complete parts and service facilities and a factory trained serviceman, located within one hundred miles of the project site, available on a 24-hour basis. Services shall be readily available so to avoid long periods of interruption or require extensive spare parts inventory.

1.07 SUBMITTALS

A. Shop Drawings: Submit for approval the copies of manufacturer's technical information, which shall include:

1. Standard published curves of engine-generator set rating. Special or maximum ratings are not acceptable.

2. Published data of the generator line and machine constants.

3. Published data of fuel and oil consumption estimates, based on engine manufacturer's data.

4. Published manufacturers estimated data of cooling and combustion air flow requirements, plus heat rejection of the engine and generator when operating at full load.

5. Exhaust emissions data.

6. Sound attenuating calculations showing conformance to specified requirements.

7. Complete installation drawings with wiring diagrams and interconnections.

8. Complete generator enclosure and trailer details, including equipment arrangement drawings and specifications.

9. Manufacturer's literature, specifications, engineering data and installation instructions necessary to fully describe engine-generator set and all appurtenances and to substantiate compliance with the specified requirements.

10. Description of shop and field testing methods, procedures, and apparatus. Submit at least 45 days in advance of confirmation of testing dates.

B. Reports:

1. Shop test and field test reports shall be submitted.

2. Manufacturer's site visit testing report shall be submitted.

C. Operation and maintenance manuals shall be submitted and shall include the following information:

1. Detailed Operating Instructions: Instructions at a minimum shall cover starting, stopping, protection of circuits, automatic controls, battery charging and safety considerations.

2. Detailed Adjustments Methods: Adjustments at a minimum shall cover speed, output voltage and control timers.

3. Detailed Performance Parameters: Parameters shall include nominal values and acceptable limits for operator's guidance, at a minimum output voltage, frequency, load, engine temperature and oil pressure shall be included.

4. Circuit drawings with component identifications.

5. Maintenance Procedure Outline: Outline for scheduled maintenance, for all equipment supplied, to be affected on a daily, weekly, monthly or on an hourly run basis.

6. Selection Guidance: Guidance with respect to selection of fuel oil, lubricating oil, use of water treatment and anti-freeze.

7. Troubleshooting Procedure: Procedure shall be available to enable the speedy diagnosis of any defect considered likely to occur in service.

1.08 DELIVERY, STORAGE AND HANDLING

A. Generator sets shall be delivered, stored, and handled in accordance with the generator manufacturer's instructions and the following:

1. Inspect the generator sets for shipping damage when receive.

2. Generator sets shall be stored indoors in clean, dry heated areas until ready for testing. Provisions, such as maintaining battery charge and energization of heaters, shall be made to prevent moisture from condensing within or on the generator sets and its accessories.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall furnish and deliver to the Engineer, at that part of the Site(s) and at such time as the Engineer may direct, spare parts, special tools and supplies for the generator sets.

B. The spare parts, special tools and supplies shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the manufacturer's part number with complete information for use and reordering.

C. Spare parts, special tools and supplies shall be furnished in accordance this Section, the Specifications and the manufacturer's recommendations for the generator size and type.

D. Spare parts which shall be provided shall include at a minimum for each generator set the following:

1. Two complete sets of air, oil and fuel filters of each type and size used.

2. One complete set of belts and hoses of each type and size used.

3. Two sets of control power fuses of each type and size used.

4. Two per ten pilot lights of each size and type used.

E. The Contractor shall furnish as part of the bulk lubricant order the quantity of lubricants required to operate and maintain each generator set furnished under this Section for a period of one year after acceptance.

1. As a minimum, there shall be provided sufficient oil and grease to make a least one lubricant change for each generator as applicable.

2. Replace all lubricants used during startup and testing prior to acceptance of equipment. Furnish this replacement lubricant in addition to the lubricants included in the bulk order.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mobile generator sets shall be as manufactured by:

1. Caterpillar, Inc.
2. Cummins, Inc.
3. Detroit Diesel Corporation.
4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Engine:

1. The engine shall be configured for generator set service and be of the internal combustion-diesel, four cycle design. The engine shall be equipped to operate on ultra-low sulfur diesel fuel.
2. The rated net horsepower of the engine at the generator synchronous speed, with all accessories, shall not be less than that required to produce the output kW indicated on the Contract Drawings.
3. The engine shall be constructed with a package mounted aftertreatment system suitable for Tier 4 Final based upon the manufacturer's standard arrangement which shall consist of but not limited to a particulate filter and selective catalytic reduction.
4. The engine shall be equipped with a solid state electronic governor, isochronous type to maintain frequency within 1/4 percent of its mean value for constant loads from no load to full load. The engine shall have a 4 second maximum transient recovery time for one-step load acceptance and a 20 percent maximum transient frequency dip on one-step application of a 0.8 power factor load at 80 percent of unit full load rating. Random frequency variation with steady load from no load to full load shall not exceed +/- 0.25 percent.
5. Engine shall include a cooling system consisting of an engine mounted radiator with blower type fan, sized to maintain safe operation. The coolant system shall be filled with a 50 percent solution of ethylene glycol and be equipped with coolant and level shutdowns.

6. Engine shall include a filtration system consisting of a cartridge-type air filter with service indicator, fuel filter with upstream pre-filter and water separator and lube oil filter with oil pressure shutdown.

7. The engine shall be equipped with an automatically controlled jacket water heater. Heaters shall be of sufficient capacity to keep the jacket water at a suitable temperature for trouble-free starting.

B. Alternator:

1. The alternator shall be engine-driven, single or two bearing type, 4-pole, synchronous, revolving field with brushless excitation and drip-proof, guarded construction. The alternator shall be coupling connected to the engine flywheel housing to ensure permanent alignment.

2. The winding insulation shall be Class H in accordance with NEMA MG1. Temperature rise shall not exceed 130 degrees C rise over 40 degrees C ambient. The windings shall be impregnated with a heavy coat of anti-tracking, acid resisting vanish for protection against oils, moisture, and condensation.

3. The rotor shall be dynamically balanced and include amortisseur windings to minimize voltage deviations and heating effects under unbalanced load conditions.

4. The alternator shall be equipped with a static electronic voltage regulator to maintain voltage within plus or minus 1/2 percent under load, from no load to 100 percent load. The regulator shall also maintain the random voltage variation for constant loads within plus or minus 1/2 percent under load, from no load to 100 percent load.

5. The alternator shall be equipped with an excitation support system. The system shall consist of a permanent magnet exciter to provide a dedicated source of power for the exciter field. The permanent magnet exciter shall isolate the excitation system and sustain 300 percent short circuit current, under any short circuit condition, for up to 10 seconds.

6. The alternator shall be equipped with space heaters. Space heaters shall be 120 volt, single phase, of sufficient wattage to maintain the temperature approximately 5 degrees above ambient when the generator is idle. Space heaters shall be disconnected when generator is running.

C. Air Supply/Exhaust System:

1. Generator sets shall be provided with an air supply/exhaust system. The system shall consist of a heavy duty air cleaner, silencer and exhaust piping of suitable size, configuration, and material in accordance with engine manufacturer's recommendations.

2. The silencer shall be critical grade type, constructed of double plate sheet with condensate drain ports.

3. Exhaust piping shall be welded schedule 40 stainless steel with standard bend radius and stainless steel flexible exhaust fittings.

D. Starting System:

1. Generator sets shall be provided with a battery system. The system shall consist of batteries, cables, and a battery charger. The system shall include a treated battery tray resistant to electrolyte deterioration constructed to contain spillage for housing the batteries.

2. Batteries shall be heavy duty lead acid type, with number of cells, voltage, and rating in accordance with requirements of the engine manufacturer. The batteries shall be sized for a minimum of four crank cycles of the specified engine and have sufficient current available for break-away of the particular engine at worst case temperature.

3. Battery cables and connectors shall connect the starting motor and the generator control panel and circuit breaker to the battery supply.

4. Battery charger shall be automatic float type, current limited with 120 volts, 60 Hertz input. The battery charger shall be capable of recharging a discharged battery in 12 hours while carrying normal loads. The battery charger shall be equipped with DC voltage and ampere meters, cranking disconnect relay and voltage alarm relays.

E. Fuel System:

1. Day Tank:

a. The generator sets shall be provided with a fuel tank sufficient for 24 hours of run time at 75 percent of the prime rated KW. The day tank shall be double wall welded steel construction.

b. The day tank shall be constructed in accordance with the United States Department of Transportation Title 30-75.1906 requirements.

c. The tank shall include fittings and vents as required for engine supply, return, manual fill, normal and emergency venting. The tank shall be treated with rust inhibiting primer and standard finish paint.

d. The tank shall be equipped with the level indicator and level and leak switches per the manufacturer's recommendations.

F. Control Panel:

1. The generator sets shall be provided with a control panel. The control panel shall include the necessary controls, instruments, lights, and devices to be able to manually and automatically start, stop, monitor and protect each generator unit.

2. The control shall be UL 508 listed. The panel control shall be microprocessor based with programmable adjustments and shall provide monitoring, metering and control of the system based upon the manufacturer's standard arrangement. Control power to the panel shall be DC supplied from the starting battery system.

3. The panel controls shall include the following:

   a. Cranking controls which automatically disconnect while engine is running.

   b. Four 7 seconds minimum cranking cycles with cranking attempts separated by appropriate rest periods.

   c. Cranking controls locked out, requiring manual reset, if engine fails to start at the completion of the starting program.

   d. Overspeed shutdown.

   e. Overcrank shutdown.

   f. 30 minute adjustable timer for cool down.

   g. Hand-Off-Auto switch with provisions for two wire remote start connection terminals.

   h. Start-stop and Emergency stop pushbuttons.

   i. Voltage adjusting rheostat.

4. The panel shall be equipped with malfunction protection, status and alarm indicators and accessories as recommended by the manufacturer. An alarm horn with silence feature shall be included for alarm conditions.

5. The control panel shall be completely pre-wired. All instruments, controls and indicating lights shall be suitably mounted and properly identified. All wires and terminals shall be individually identified.

6. The control panel shall be mounted in a 14 gauge steel enclosure with a hinged, lockable door.

G. Power Distribution:

1. The generator sets power distribution shall include a main circuit breaker and distribution accessories mounted within the enclosure that houses the control panel.

2. The main circuit breaker shall be sized as required for protecting each unit. The circuit breaker shall be a molded case with electronic trip unit and shunt trip. The electronic trip unit shall include adjustable long, short, instantaneous fault time delay functions with delay.

3. The distribution accessories shall include the following:

   a. Switch for selection of output voltage, 480/277 Volt, 3 phase or 208/120Volt 3 phase.

   b. Posi-Lok main power distribution 400 ampere female receptacles on each generator set rated 600 Volt, suitable for 3 phase, neutral and ground power output. Provide a total of six doors for each parallel phase which includes one pair for the additional phase, the neutral phase and the ground receptacles. Provide matching Posi-Lok male plugs, one for each receptacle, to be attached to the power cables.

   c. 20 ampere, 120 Volt, GFCI receptacle circuit breaker protected for auxiliary power output.

   d. 30 ampere, 120 Volt receptacle circuit breaker protected for auxiliary input power for block heater, battery charger and space heater.

H. Enclosure:

1. Generator sets shall be provided with a weatherproof steel enclosure, completely enclosing the entire generator set.

2. The enclosure shall be built with suitable access doors for proper access of the components within with exterior drains for coolant and oil and fuel connections. The enclosure shall be sound attenuated to limit noise to 73 dBA at 23 feet for the 175 KW unit and 77 dBA at 23 feet for the 250 KW unit.

I. Trailer:

1. The generator sets trailer shall be welded frame construction, equipped with towing rig. The trailer capacity shall be suitable for the generator set weight with axles and wheel arrangement suitable for short radius turns in both the forward and reverse direction.

2. The trailer bed shall be of sufficient size to permanently mount the generator set, enclosure and skid. The trailer shall be equipped with devices in accordance with the manufacturer's recommendations for the generator size and type, which shall include at a minimum the following:

   a. Side and rear reflectors.

   b. Stop and turn signals.

c. License plate holder and light.

d. Six ply tires with high-speed wheels for highway towing.

e. Trailer brakes complete with controls.

f. Safety chains, towing eye and miscellaneous hardware.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. All ferrous metal surfaces to be cleaned and painted with a rust inhibiting primer and manufacturer's standard finish paint.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Certified Shop Tests:

1. Shop testing shall be performed for each generator, for each circuit breaker, and the associated controls at the manufacturer's plant.

2. A shop test report identifying the tests performed and the results obtained, shall be submitted.

3. The generator shop test shall be in accordance with the latest revisions of NEMA MG1 and shall demonstrate that the equipment tested conforms to the requirements specified. The generator set shall be tested for a period of two hours at full load, 0.8 power factor with suitable load banks.

4. The generator set test may include the manufacturer's standard test procedure, but at minimum shall include the following:

a. Verify generator set assembly, prior to operation, including all mechanical and electrical connections.

b. Verify fuel and lubrication systems are clean and filled with proper grades of fuel and lubricants.

c. Adjust as required the governor and voltage regulator controls.

d. Inspect operation of all gauges, switches, meters, and devices. Verify generator set monitoring meters against calibrated load bank meters.

e. Verify operation of all safeties and alarms.

f. Maintain records of unit operation, at 15-minute intervals, for duration of test. Records at a minimum shall include, water temperature, oil pressure, ambient air temperature, voltage, current, frequency, kilowatts, and power factor.

5. The generator sets manufacturer shall use a shop test facility that has recently calibrated testing apparatus and qualified, experienced

technicians, for all factory tests. Calibration of testing apparatus shall be within one year.

6. All test equipment and instrument calibration shall be in accordance with the latest edition of the accuracy standard of the U.S. National Institute of Standards and Technology and the NETA maintenance testing specification.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Deliver the generator sets to each site and park the unit at a location designated by the Engineer.

3.03 FIELD TESTING / QUALITY CONTROL

A. Manufacturer’s Services:

1. A qualified manufacturer's service representative shall check each generator set before it is placed into operation, assist in the performance of field tests, observe, and assist initial operations and train the plant operations and maintenance staff in the care, operation and maintenance of the generator set.

2. A separate field report for each generator set from the manufacturer's representatives shall be submitted for each visit to the site. The report shall include complete information on time, schedule, tasks performed, persons contacted, problems corrected, tests results, training, instruction, and all other pertinent information.

3. Training for plant staff shall be scheduled at a time suitable to the City when the work is substantially completed.

4. The service representative shall sign in with the Engineer on each day they are at the site.

3.04 FIELD TESTS

A. Each generator set shall be field tested in the presence of the Engineer prior to being turned over to the City. The Contractor shall provide protection of the generator set and associated cables from potential damage during testing.

B. Generator set testing shall be performed under the supervision of the manufacturer's representative. The generator set shall be tested in accordance with NYPA-110. Provide all materials and equipment, including load banks fuel and lubricants required for site testing. Verify the following:

1. That the entire installation is in accordance with the approved manufacturer's drawings, and that the unit and all auxiliaries are ready for operation.

2. That fuel coolant and lubrication systems are complete, clean and filled with the proper grades of coolant and lubricants.

3. That the unit and all subsystems start, operate, and shutdown in accordance with manufacturer's recommendations.

4. at all safeties, alarms and shut-downs function at the correct set points and sequence.

5. That the unit accepts load, governs speed, and regulates voltage.

C. The generator sets shall be tested using portable resistance type load banks and station loads. Load testing shall include the following:

1. Operate the engine generator set for 1 hour at 50 percent of rated load using load bank.

2. Increase load to 75 percent of rated load and operate the generator set for 1 hour.

3. Increase load to 100 percent of rated load and operate the engine generator for 2 hours.

4. Operate the engine generator set for 1 hour using plant loads.

5. Records shall be maintained at 30 minute intervals for duration of test. Records at a minimum shall include fuel consumption, water temperature, oil pressure, ambient air temperature, voltage, current, frequency, kilowatts and power factor.

D. All tests and values shall be in accordance with the manufacturer's recommendations.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 26 36 23 – AUTOMATIC TRANSFER SWITCHES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing low-voltage open transition Automatic Transfer Switches (ATSs).

1. The Contractor shall provide all labor, materials, equipment and incidentals, and is required to furnish and install ATSs complete and operational, as specified herein and as shown on the Contract Drawings.

2. Each ATS shall be provided in an enclosure.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 05 11 – General Electrical Requirements

B. Section 26 05 27 – Grounding

C. Section 25 05 29 – Hangers and Supports for Electrical Systems

D. Section 26 05 53 – Identification for Electrical Systems

1.04 REFERENCES

A. Definitions

1. Low-voltage as used in this Section and the Specifications shall mean all equipment, conductors, insulation systems and accessories intended for operation within the 600 Volt Class.

2. All references to the Electric Utility or Utility shall mean Consolidated Edison Company or the Local Electric Utility having jurisdiction.

B. Reference Standards: The ATSs shall comply with the latest applicable provisions and recommendations of the following:

1.	IEEE-446	-	Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications
2.	ISO 9001	-	Quality management systems - Requirements
3.	NEMA ICS 10 Part 1	–	Electromechanical AC Transfer Switch Equipment
4.	NEMA ICS 10 Part 4	–	Guide to the Application of Low-Voltage Automatic Transfer Switch Equipment
5.	NFPA 110	–	Emergency and Standby Power Systems
6.	NYCEC	-	New York City Electrical Code
7.	UL 508	–	Industrial Control Equipment
8.	UL 1008	-	Transfer Switch Equipment

1.05 DESCRIPTION

A. ATSs shall be rated for the voltage, ampacity and number of poles as shown on the Contract Drawings.

B. Switches shall have 600 volt insulation on all parts in accordance with NEMA standards.

C. The current rating shall be a continuous when the switch is installed in a non-ventilated enclosure, and shall conform to NEMA temperature rise standards.

D. ATSs shall be rated based on all classes of loads, resistive, tungsten, ballast and inductive loads.

E. ATs shall have a short circuit and withstand ratings as shown on the Contract Drawings and shall withstand the magnitude of fault current without welding of contacts.

F. ATSs shall include, but not be limited to the following:

1. ATS Mechanism permitting alternate connection to Source No. 1 or Source No. 2
2. Control Panel
3. Enclosure

G. Source No. 1 and Source No. 2 shall be as shown on the Contract Drawings.

H. All ATS lugs shall be tin-plated copper.

1.06 QUALITY ASSURANCE

A. ATSs shall comply with UL 1008, UL 508 and NEMA ICS 10.

B. The ATS manufacturer shall use a shop test facility, for all factory tests, that has recently calibrated testing apparatus and qualified and experienced technicians.

1. Calibration of testing apparatus shall be within one year.

C. The ATSs shall be field tested.

1. Field testing shall be performed in accordance with the requirements specified under this Section.

D. The services of the ATS manufacturer shall be retained for field service.

1. Field service shall be in accordance with the requirements specified under this Section.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval by the Engineer.

B. Submittals shall include, but not be limited to:

1. The proposed manufacturer along with the location of its closest service facility from which the ATSs shall be serviced and location of closest parts inventory.
2. Manufacturer’s catalog cuts and technical information required to demonstrate compliance with the specific requirements.
3. A completed materials list showing all items proposed for use.
4. Control and wiring diagrams
5. Construction details of enclosures.
6. Description of shop and field testing methods, procedures and apparatus with calibration dates.
    a. Testing methods and procedures shall be submitted at least 60 days in advance prior to confirmation of witness testing dates and actual testing.
7. Qualifications of proposed testing firm to perform acceptance testing.

a. Submit firm experience records and five (5) recent references with phone numbers, at least 60 days in advance to actual testing.

C. Certificate of Compliance:

1. Seismic qualification certification from the manufacturer including mounting recommendations.

2. Data and results of witness tests accompanied by a certificate of authenticity sworn to before a notary public by an officer of the manufacturing company.

D. Reports:

1. Shop test and field test reports.

2. Manufacturer's site visit and acceptance testing reports.

E. Operation and Maintenance (O&M) Manuals

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver ATSs to ensure uninterrupted progress of the work.

B. Releases of ATSs for shipment shall occur only upon approval of data and results of witness test reports.

C. Ship, handle and protect ATSs in accordance with the Specifications.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall furnish and deliver to the Engineer, at that part of the site and at such time as the Engineer may direct, spare parts for ATSs.

B. The spare parts shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the manufacturer's part number with complete information for use and reordering.

C. Spare parts shall be as recommended by the manufacturer.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ATSs shall be as manufactured by:

1. ASCO, Florham Park, NJ

2. Russelectric, Hingham, MA.

3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Power section:

1. The ATSs shall be an open transition switch of double throw construction whose operation in either direction shall be initiated by a reliable electrical mechanism that is momentarily energized and the switch mechanically held in its required position.
2. Designs are not acceptable, that utilize components of molded-case breakers, contactors or parts thereof and which are not intended for continuous duty, repetitive switching or transfer between Source No. 1 and Source No. 2.
3. There shall be a direct mechanical coupling of Source No. 1 and Source No. 2 mechanisms to facilitate transfer switch operation in three cycles or less.
4. The Source No. 1 and Source No. 2 contacts shall be mechanically interlocked such that failure of any coil or disarrangement of any part shall not permit a neutral position or connection of both sources to the common load connection.
5. The mechanical interlocking shall be such that the switch is unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.
6. The ATSs shall have sufficient arc interrupting capabilities for 60 cycles of operation between Source No. 1 and Source No. 2, which are 120 degrees out of phase at rated voltage, 600% of rated current at 0.50 power factor to ensure that there will be no current flow between the two isolated sources during switching.
7. The contact structure shall consist of a main current carrying silver alloy contact, with a minimum of 50% silver content.
8. The current carrying contacts shall be protected by silver tungsten arcing contacts on all sizes.
9. Inspection of all switch components shall be possible from the front of the switch without the disassembly of operating linkages and without the disconnection of power conductors.
10. Maintenance of all switch components shall also be possible from the front of the switch with access to all components.
11. The transfer switches shall have a minimum short circuit withstand rating as shown on the Contract Drawings or as required by short circuit studies but not less than 65 kA symmetrical.
12. When the isolation switch is in the "Test" or "Open" mode, the bypass switch shall function as a manual transfer switch.

B. Controls:

1. Solid State Control System

a. The control system for the ATS shall be solid state based and shall also contain all logic devices including control, voltage sensing, time delays and any auxiliary equipment required for to properly implement the functions detailed under this Section.

b. Control system shall have a programmable microprocessor controller with keypad and LCD display.

2. The panel shall be shielded and door mounted on the inside door of the switch enclosure.

3. All components shall be connected with a numbered wiring harness equipped with a disconnect plug that allows isolation of the control panel.

4. The solid state panel controls shall include adjustable three phase under voltage setting on each of the two sources to provide the following sequence of operation:

a. When the voltage of any phase of Source No. 1 is reduced to 80 percent of nominal voltage for a period of 1 second (fixed), the transfer switch shall be signaled to transfer to Source No. 2, after an adjustable time delay (0 -30 seconds).

b. The transfer switch shall remain in the Source No. 2 position indefinitely. Should any phase of the Source No. 2 source be reduced to less than 80 percent of nominal voltage for a period of 1 second (fixed), the transfer switch shall be signaled to transfer to Source No. 1, after an adjustable time delay (0 -30 seconds), if the Source No. 1 is available for operation.

c. The option of automatic transfer from Source No. 2 to Source No.1, as soon as Source No. 1 is available for operation shall also be provided

5. The transfer switches shall contain red indicating lights. The lights shall indicate switch position. The indicating lights shall be push-to-test, heavy-duty transformer LED type. Indicating light voltage shall be 12 Volts.

6. All relays shall be continuous duty industrial type with wiping contacts. Customer interface contacts shall be rated 10 amperes minimum. Coils, relays, timers and accessories shall be readily front accessible.

7. The transfer switches shall contain door mounted transfer/re-transfer pushbuttons. It shall allow an operator to switch from Source No.1 to Source No.2 and from Source No.2 to Source No.1. Transfer between sources shall be immediate.

8. ATS-1 and ATS-2 at TI-010 Chlorination Facility shall have dry contact for remote start stop control of generator.

9. ATS-1 and ATS-2 at TI-010 Chlorination Facility shall have dry contact for remotely signaling power on of each source. One normally open contact shall be provided that closes when the switch is in Source No.1 position.

One normally open contact shall be provided that closes when the switch is in Source No.2 position.

10. ATS-1 and ATS-2 at TI-010 Chlorination Facility shall have dry contact for remotely signaling source failure of each source. One normally open contact shall be provided that closes after time delay upon failure of Source No.1. One normally open contact shall be provided that closes after time delay upon failure of Source No.2.

11. ATS-1 and ATS-2 at TI-010 Chlorination Facility shall have dry contact for remotely signaling source is available of each source. One normally open contact shall be provided that closes after time delay when Source No.1 is available. One normally open contact shall be provided that closes after time delay when Source No.2 is available.

C. Power Meter

1. ATS-1 at the DeChlorination and Disinfection Facilities shall have a power meter load side connected for monitoring either of the two supply sources. The power meter shall be a microprocessor based metering device with liquid crystal display that provides real time three phase power of each phase, neutral and average measurements for the following:

2. Voltage.

3. Current.

4. Frequency.

5. Percent unbalance voltage and current.

6. Real, reactive, and apparent power.

7. Real and reactive energy with maximum demand recall.

8. Power factor.

D. Enclosure:

1. The entire ATS shall be completely assembled within one enclosure. The enclosure shall be NEMA 12, painted gray, ANSI 61.

2. Terminal blocks shall be provided within the switch enclosure facilitate the connection of off enclosure signals and auxiliary power provisions.

   a. Twenty percent spare terminals, two minimum, shall be provided.

   b. Terminals shall be lettered or numbered to conform to the wiring diagrams.

3. The wires within automatic transfer switch shall be neatly harnessed to prevent the door damaging the wires and to prevent the wires hampering the door operation. All wires shall have identification markers on each end.

4. The enclosure shall be provided with a thermostatically controlled strip heater to keep humidity and temperature within acceptable levels.

5. The enclosure shall have identifying nameplates in accordance with the requirements of Section 26 05 53 – Identification for Electrical Systems.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Painting

1. The enclosure shall be painted gray, ANSI 61.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Certified Shop Tests:

1. Shop testing shall be performed on the ATSs at the manufacturer's plant prior to shipment.

2. Shop tests shall demonstrate that the equipment conforms to the requirements specified.

3. The tests shall include the manufacturer's standard tests and the following at a minimum.

a. Operational tests to ensure proper operation of the components and sequence of operation.

b. High potential test in accordance with NEMA standard.

4. The Contractor shall provide a shop test report. The report shall identify the tests performed and the results obtained.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. ATSs shall be installed in accordance with 26 05 11– General Electrical Requirements, Section 26 05 29 – Hangers and Supports for Electrical Systems, this Section and the manufacturer's instruction and recommendations.

B. ATSs shall be fully assembled with all required devices, wiring, nameplates, terminal blocks and enclosures.

C. ATSs shall be rigidly and securely mounted to the building structure or to supporting devices, which are rigidly and securely supported to the building structure.

D. ATSs shall be installed with sides parallel or perpendicular to walls or equipment, in a neat and professional manner.

E. ATSs shall be installed such that door swing is not hampered.

F. ATSs shall be securely fastened in position with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel work.

G. ATSs shall be grounded in accordance with Section 26 05 27 - Grounding and NYCEC requirements.

H. Install nameplates for identification of equipment in accordance with Section 26 05 53– Identification for Electrical Systems.

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Tests

1. After installation, ATSs shall be field tested for operation and conformance in presence of the Engineer.

2. The Contractor shall perform field testing in accordance with the Specifications, and as described in this Section.

3. ATS testing shall be performed by the manufacturer's representative, prior to energizing equipment. The testing shall be in accordance with the recommendations of the manufacturer and shall include the following at a minimum.

a. Mechanical and electrical components shall be inspected.

b. The switches shall be sequence operated to verify proper operation.

B. Manufacturer's Field Services

1. A qualified manufacturer's representative shall check the ATSs before it is placed into operation, assist in the performance of field tests, observe and assist initial operations and train the plant operations and maintenance staff in the care, operation and maintenance of the ATSs.

2. The Contractor shall provide equipment start-up services and training in accordance with the Specifications.

3. The Contractor shall provide a field report from the manufacturer's representative for each visit to the Site.

a. The report shall include complete information on time, schedule, tasks performed, persons contacted, problems corrected, tests results, training, instruction and all other pertinent information.

4. The service representative shall sign in and sign out with the Engineer on each day they are at the site.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 26 41 13 – LIGHTNING PROTECTION FOR STRUCTURES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing lightning protection of structures.

B. Lightning Protection Systems (LPS) for structures or buildings shall be provided in accordance with the requirements specified under this Section, the Specifications and the Contract Drawings.

C. The Contractor shall retain the services of a Certified LPS Installer.

D. The Certified LPS Installer shall furnish all labor, materials, equipment, services and incidentals necessary for the installation of a functional and complete LPS as specified herein.

E. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 25 05 27 - Grounding

B. Section 26 05 53 - Identification for Electrical Circuits

C. Section 26 24 16 - Panelboards

D. Section 26 43 13 - Low-Voltage Surge Protective Devices.

1.04 REFERENCES

A. Definitions

1. Certified LPS Installer is a Subcontractor who is UL Master Labelled Certified Lightning Protection System Installer or Lightning Protection Institute Certified Installer.
2. Certificate of Inspection, where used in this Section, shall mean UL Lightning Protection Master Label Certificate.
3. Letter of Findings, where used in this Section, shall mean an official UL report detailing inspection of a LPS with intentional noncompliance due to construction or limitations of scope outlined by the installer that render an LPS ineligible for a UL Lightning Protection Master Label Certificate.
4. Low-voltage as used in this Section and the Specifications shall mean all equipment, conductors, insulation systems and accessories intended for operation within the 600 Volt Class.
5. All references to the AHJ (Authority Having Jurisdiction) shall mean the NYCEC.
6. All references to the Electric Utility or Utility shall mean Consolidated Edison Company or the Local Electric Utility having jurisdiction.
7. LPI – Lightning Protection Institute.

B. Reference Standards

1. LPI 175 - Standard for the Design-Installation-Inspection of Lightning Protection Systems.
2. NFPA 780 - Standard for the Installation of Lightning Protection Systems
3. NYCEC - New York City Electrical Code.
4. UL 96 - Standard for Lightning Components.
5. UL 96A - Standard for Installation Requirements for Lightning Protection Systems.
6. UL 467 - Grounding and Bonding Equipment
7. UL 651 - Schedule 40, 80, Type EG and A Rigid PVC Conduit and Fittings.
8. UL LPS Guide - UL Marking and Application Guide – Lightning Protection.
9. ANSI/IEEE 141 - Recommended Practice for Electric Power Distribution for Industrial Plants.

10. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Installer

1. The LPS Installer shall be a Certified LPS Installer.
2. Provide proof of the certification, or demonstrate that the standards and experience required for certification are possessed, all to the satisfaction of the Engineer.

B. Materials

1. All materials shall be new and shall comply in weight, size and composition as required by UL 96A and NFPA 780 and for the structures or building to be protected.
2. Class I materials shall be used for systems on structures not exceeding 75 feet in height.
3. Class II materials shall be used for systems on structures exceeding 75 feet above grade.
4. All materials used in the installation shall be labeled or listed by UL for use in LPSs
5. All materials shall be of copper and high copper-content bronze castings or stainless steel.
6. LPS materials shall be selected to ensure that electrolytic or galvanic action does not occur at the contact points or surfaces.
7. Where dissimilar metals are in contact care must be taken to ensure that bimetallic connecting accessories are used and permit only similar metals to be in contact.

C. Certification of the Installation

1. The Engineer shall be given 96 hours notice of the intent to cover or conceal all parts of the LPS which will not be visible after completion and turn over of the installation.
2. The completed system shall be in accordance with UL 96A and NFPA 780 or LPI 175 but not both.
3. A Certificate of Inspection shall be provided for the completed LPS.
4. For installation areas, where a Certificate of Inspection is not available, a Letter of Finding shall be obtained.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer.

B. Submittals shall include, but not be limited to:

1. Qualifications of proposed Certified LPS Installer.
    a. Submit experience records at least 45 days in advance to equipment submittals.
    b. Five recent references with phone numbers shall be submitted.
2. Manufacturer's catalog cuts and technical information for the LPS materials proposed for use in this Contract.
    a. Submittals shall demonstrate the mechanism that will be used to isolate dissimilar materials.
3. Scaled Shop Drawings showing proposed routing and layout of the LPS with installation details. Drawings shall include the stamp of the Certified Installer- Designer responsible for the system design.
4. Photographic and video documentation to show how the LPSs were installed in-ground and all concealed portions of the installation.

C. Certificates of Compliance:
1. Certificate of Inspection or Letter of Finding shall be submitted.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Lightning protection system materials shall be delivered, stored and handled in accordance with the manufacturer's recommendations and this Section.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The lightning protection system shall be as manufactured by:
1. Heary Brothers Lightning Protection Company, Springville, NY.
2. Thompson Lightning Protection Company, West St Paul, MN.
3. East Coast Lightning Equipment, Winsted, CT.
4. Pentair Erico, Solon, OH
5. Harger, Grayslake, IL;
6. Or approved equal.

B. Non-metallic conduit and fittings shall be by as manufactured by:
1. Carlon (Thomas & Betts) - Memphis, TN.
2. Cantex Inc., Fort Worth, TX

3. Or approved equal.

C. Not Used

2.02 MATERIALS / EQUIPMENT

A. All materials used in the installation shall be new and shall comply in weight, size and composition as required by UL 96A and NFPA 780

B. All lightning protection system fittings shall be heavy duty type.

C. All bolts, screws and hardware shall be stainless steel.

D. Air Terminals and Accessories

1. Air terminals shall be not less than 18 inches long, not less than 5/8-inch in diameter and may be manufactured in separate parts if longer than 10 inches.

2. Air terminals shall include a cast bronze point protector, stainless steel adapter and copper base.

3. Air terminals shall be provided with an integral base support, or shall have not less than five full threads of engagement with a separate attachment base mounted to the structure.

4. If the air terminal has internal threads the wall thickness shall be not less than 1/16 inch at the base of the threads.

5. Air terminals longer than 24 inches shall have bracing at half its height and listed for the purpose.

6. Air terminal bases are permitted to be stamped or cast construction.

a. Copper bases shall 0.061 minimum for copper material. If cast either copper or aluminum shall be at least 3/32 inches thick.

b. Air terminal base support must incorporate a connector fitting for connection of the lightning conductor.

1) The conductor contact area must be at least 1-1/2 inches on all sides of the cable.

E. Conductors

1. Class I

a. Main conductors shall be stranded copper conductors and shall be at least 57,400 circular mils at 187 lbs per 1000 ft.

b. Secondary or bonding conductors minimum size shall be 26,240 cir. mils for copper.

2. Class II

a. Main conductors; shall be not less than 115,000 cir. mils for copper conductor at 375 lbs per 1000 ft.

b. Secondary or bonding conductors minimum size shall be 26,240 cir. mils for copper.

F. Grounding Electrodes

1. Ground rod electrodes shall be stainless steel, a minimum 5/8" diameter and 10 feet long.
2. Ground rods shall conform to the requirements of Section 26 05 27 - Grounding.

G. Ground Cables:

1. Ground cables shall be copper or aluminum where necessary to prevent dissimilar metal reaction.
2. Ground cable stranding, number and size shall be suitable for the classification of the structure to be protected.
3. All ground cable where exposed shall be corrosion resistant.

H. Non-metallic conduit shall be schedule 80 PVC plastic, 90 degrees C rated, conforming to UL No. 651.

I. Non-metallic fittings shall be of same material and manufacturer as base conduit. Cement shall be provided for joining fittings to the conduit and shall be the same manufacturer as the base conduit.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Air Terminals and Air Terminal Accessories

1. Air terminals shall extend a minimum of ten inches above the object or area they are to protect.
2. Air terminals shall be located at intervals not exceeding 20'-0" along ridges of pitched roofs and along the perimeter of flat or gently sloping roofs (flat or gently sloping roofs include roofs that have a pitch less than 3:12).
3. Flat or gently sloping roofs exceeding 50'-0" in width shall be provided with additional air terminals located at intervals not exceeding 50'.
4. Air terminals shall be located within two feet of the ends of ridges, roof edges and outside corners of protected areas.
5. Air terminals shall be installed on stacks, flues, mechanical units and other objects not located within a zone of protection.

6. Permanent metal objects on the structure having an exposed metal thickness 3/16" or greater may be substituted for air terminals and shall connected to the lightning protection system as required by the specified standards using main size conductor and bonding plates having a minimum of 3 square inches of surface contact area.

7. Air terminal bases shall be securely fastened to the structure in accordance with the specified standards.

   a. Fasteners may include stainless steel screws, bolts, nails or anchors.

   b. Adhesives shall only be used to complete other types of fasteners and shall be compatible with the fastener and structure material.

   c. Any protective sheets or pads that may be required by the roofing system manufacturer shall be furnished and installed by the Contractor.

8. Air terminal spacing exceeding these dimensions shall be permitted so long as the area protected lies within a zone of protection.

9. Air terminals shall be installed for stacks, flues, mechanical equipment, and other objects, having a metal thickness of less than 3/16 of an inch, and not located within a zone of protection.

   a. Permanent metal objects having a metal thickness 3/16 of an inch or greater shall be connected to the LPS in lieu of air terminals by main size conductors and bonding plates having a minimum of 3 square inches of surface contact area.

10. Flat or gently sloping roofs exceeding 50 feet in width, shall be protected with additional air terminals located at intervals not exceeding 50 feet in the flat or gently sloping area.

B. Conductors and Accessories

1. Conductors shall provide a two way, horizontal or downward path from each strike or air terminal to connections to the lightning protection ground electrode system.

2. Down conductors shall be sized as Class I or Class II materials in accordance with the specified standards.

   a. Down conductors where required as shown on the Contract Drawings shall be concealed in the exterior wall construction.

   b. Class II conductors from a higher portion of a structure shall continue to connections to the lightning protection ground electrode system.

   c. Down conductors shall be spaced at intervals averaging not more than 100 feet around the perimeter of the structure.

   d. In no case shall a structure have fewer than two down conductors.

   e. Where down conductors are installed exposed on the exterior of a structure and are subject to physical damage or displacement, guards

shall be used to protect the conductor a minimum of 6 feet above grade.

f. Metallic guards shall be bonded at each end.

3. In the case of structural steel frame construction, down conductors may be omitted and roof conductors shall be connected to the structural steel frame at intervals averaging not more than 100 feet around the perimeter of the structure.

a. Connections to the steel frame shall be made with bonding plates having an area of a minimum of 8 square inches.

4. Conductors shall be installed free of excessive splices and sharp bends.

5. Conductor bends shall form an included angle of not less than 90 degrees nor have a radius of bend of less than 8 inches.

6. Conductors shall be secured to the structure at intervals not exceeding 3 feet.

a. Fasteners shall be of the same material or of a material equally resistant to corrosion as that of the conductor.

b. Any protective sheets or pads that may be required by the roofing system shall be furnished and installed by the Contractor.

7. Connector fittings shall be listed for the purpose and of the same material as the conductor or of electrolytically compatible materials.

C. Ground Electrodes and Accessories

1. Each down conductor shall terminate at a ground electrode dedicated to the LPS, or to a building or facility ground electrode system that consists of multiple ground electrodes that are interconnected with a ground ring conductor.

2. The down conductor shall be connected to the ground electrode by a bolted connection.

3. Ground rod electrodes shall be located a minimum of 2 feet below grade and shall be installed below the frost line where possible (excluding shallow topsoil conditions).

4. Where it is not possible to drive ground rod electrodes because of bedrock or shallow topsoil conditions, ground plate electrodes, radial electrodes, ground ring electrodes, concrete- encased electrodes, or combinations of these may be used in accordance with NFPA 780.

5. Where the structural steel framework is utilized as down conductors for the system, ground electrodes shall be connected to columns around the perimeter of the structure at intervals averaging not more than 60 feet apart.

a. The grounding connection at the columns shall be made using either bonding plates having 8 square inches of surface contact area or by exothermically welded connections.

D. Common Bonding of Grounded Systems

1. Common bonding of all grounded systems within the building shall be ensured by interconnecting them to the LPS using main size conductor and fittings.
2. For structures exceeding 60 feet in height, the interconnection of the LPS ground electrodes and other grounded systems shall be in the form of a ground loop conductor.
3. These grounded systems to be interconnected shall include but are not limited to the electrical service, communication, and antenna system grounds as well as all underground metallic piping systems including water, gas, sewer, underground metallic conduits, etc.
4. Interconnection to service lines or conduits shall be made on the customer's side of the meter.
5. Ground Electrodes in test wells shall be bonded to the ground system by a bronze ground rod clamp having at least 1-1/2 inches of contact between the rod and the conductor, measured parallel to the axis of the rod.
6. The system shall be installed with common grounding by interconnecting ground mediums entering the building using main size conductors and fittings. Grounded metal bodies shall be bonded to the system using bonding connections and fittings. Ground conductors where installed in conduit, shall be non - metallic type.

E. Potential Equalization

1. Grounded metal bodies located within the required bonding distance as determined by the bonding distance formula in NFPA780 shall be bonded to the LPS using the required bonding conductors and connections.

F. Roof Penetrations

1. Roof penetrations required for down conductors or for connection to structural steel framework shall be made using thru-roof assemblies with solid riser bars or conduits and appropriate roof flashing.
2. Conductors shall not pass directly through the roof.
    a. The Contractor shall furnish and install the materials required to properly seal all roof penetrations of the LPS components and any additional roofing materials or preparations required by the roofing manufacturer for lightning conductor runs to assure compatibility with the warranty for the roof including roof pads that may be required to protect the roof under each of the lightning protection components.

G. Surge Protective Devices (SPD)

1. SPDs shall be provided at all power services entrances and at entrances of conductive signal and data communication devices.
2. SPDs shall comply with Section 26 43 13 – Low-Voltage Surge Protective Devices.

3.03 FIELD TESTING / QUALITY CONTROL

A. The Contractor shall have the master installer or inspector perform field inspection of the lightning protection system at several stages during the installation in accordance with LPI requirements.

B. Upon completion of the lightning protection system the Contractor shall arrange for a final inspection of the system. The final inspection shall be performed by the master installer or inspector in accordance with LPI requirements.

C. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing surge protective devices (SPDs).

B. SPDs shall be provided in accordance with the requirements specified under this Section and the Contract Drawings.

C. SPDs shall utilized to limit repetitive transient voltage and current surges in low-voltage AC power circuits.

D. The Contractor shall furnish all labor, materials, equipment, services and incidentals necessary for the installation of the SPDs as specified herein.

E. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 05 53 - Identification for Electrical Circuits

B. Section 25 05 27 - Grounding

C. Section 26 24 16 - Panelboards

1.04 REFERENCES

A. Definitions

1. Low-voltage as used in this Section and the Specifications shall mean all equipment, conductors, insulation systems and accessories intended for operation within the 600 Volt Class.

2. All references to the AHJ (Authority Having Jurisdiction) shall be as set out in the NYCEC.

3. All references to the Electric Utility or Utility shall mean Consolidated Edison Company or the Local Electric Utility having jurisdiction.

B. Reference Standards

1.	ANSI/IEEE C84.1	–	Electric Power Systems and Equipment – Voltage Ranges (60 Hertz).
2.	ANSI/IEEE 141	-	Recommended Practice for Electric Power Distribution for Industrial Plants.
3.	IEEE 1100	-	Recommended Practice for Powering and Grounding Electronic Equipment.
4.	IEEE C62.41	-	Recommended Practice on Surge Voltages In Low-Voltage AC Power Circuits.
5.	IEEE C62.45	-	Recommended Practice On Surge Testing For Equipment Connected to Low-Voltage AC Power Circuits.
6.	IEEE C62.62	-	Test Specifications for Surge-Protective Devices (SPDs) for Use on the Load Side of the Service Equipment in Low-Voltage (1000 V and Less) AC Power Circuits.
7.	IEEE C62.72	-	Guide for the Application of Surge Protective Devices for Low Voltage AC Power Circuits.
8.	UL 1012	-	Power Units Other Than Class 2.
9.	UL 1283	-	Electromagnetic Interference Filters
10.	UL 1449	-	Surge Protective Devices 4th Edition or later.

11. NYCEC - Electrical Code of the City of New York.

1.05 DESCRIPTION

A. SPDs shall be Type 1, 2 or 3.as defined by UL 1449.

1. Type 1 SPDs shall be

a. Permanently connected and intended for installation between the secondary of the service transformer and the line side of service equipment.

b. Installed without use of external overcurrent protective device.

2. Type 2 SPDs shall be

a. Permanently connected and intended for installation on the load side of the service equipment overcurrent device.

3. Type 3 SPDs shall be

a. Permanently installed at the point of utilization.

b. Installed at a minimum conductor length of 10 meters (30 feet) from the electrical service panel.

c. Not used at the utilization point if the distance criteria of a. and b. above cannot be satisfied.

1.06 QUALITY ASSURANCE

A. SPDs shall be designed, built and tested in accordance with the latest applicable editions of NEMA, ANSI/IEEE, UL and NFPA.

B. SPDs shall be UL listed.

C. SPDs of the types and ratings required are of those acceptable manufacturers who have been regularly engaged in the development, design, testing, listing, manufacture and servicing of SPDs for a period of ten years or more and whose products have been in satisfactory use for 10 years or more.

D. SPD manufacturers shall maintain a documented Quality Assurance Program implementing suitable procedures and controls to monitor all aspects of production and testing.

E. The Quality Assurance Program shall be the manufacturer’s standard program specifically dedicated to ensure each SPD is designed, assembled and tested in accordance with the requirements specified herein.

F. Testing shall be done in accordance with UL 1449 on the complete SPDs with lead length comparable to that which will be required to connect the SPDs to the equipment to be protected and as shown on the Contract Drawings.

G. Only qualified personnel or licensed electricians shall actually install SPDs.

H. The Contractor shall retain the services of the SPD manufacturer for field service.

I. Field service shall be in accordance with the requirements specified under this Section and the Specifications.

1.07 SUBMITTALS

A. Contractor shall submit working drawings, shop drawings and material specifications for the approval of the Engineer.

1. Upon request, suppliers or manufacturers shall provide a list of not less than three (3) customer references showing satisfactory installation and operation.

2. Catalog cuts indicating selected ratings and mechanical drawings of SPDs, shall be submitted for approval by the Engineer.

3. Submittals shall contain the required published device specifications and Drawings to show conformance with all parts of this Section.

4. Instructions for installation and connection shall be provided with the SPDs.

5. All Let-Through voltage data shall be measured on an "As Installed" lead length basis, simulating actual installation. At the module or at the bus "Zero lead length" data is not acceptable.

6. Copy of the ISO 9001:1994 Certificate of Registration will accompany the submittal.

7. The connection lead length from the SPD enclosure to the connection point of protected circuit must be detailed in the submitted documentation.

B. Report Submittals:

1. Surge Protective Device (SPD) shop test reports shall include test data verifying let-through voltage, surge current rating and noise attenuation.

2. Manufacturer’s field report

3. Surge Life (Repetitive Surge) rating

4. Maximum Continuous Operating Voltage (MCOV) rating

5. Voltage Protection Ratings for all modes (VPR)

6. Nominal Discharge Current (In)

C. Operation and Maintenance (O&M) manuals shall be submitted for approval.

1.08 DELIVERY, STORAGE, AND HANDLING

A. SPDs shall be delivered, stored and handled in accordance with the Specifications and the manufacturer’s recommendations.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. SPDs shall be as manufactured by:

1. Schneider, Seneca, SC;
2. Siemens, Washington, DC;
3. ABB, New Berlin WI;
4. Eaton Corporation;
5. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Electrical Requirements

1. The SPD operating voltage and configuration shall be as shown on the Drawings.
2. The Maximum Continuous Operating Voltage (MCOV) shall not be less than 115% of the nominal system operating voltage.
3. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels.
    a. Each thermally protected MOV shall have an end of life indicator and the suppression system shall be continuously self-monitoring.
    b. End of life mode to be open circuit.
    c. SPDs with end of life short-circuit mode are not acceptable.
    d. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards.
4. SPDs must not require external OCPD or replaceable internal OCPD for the UL Listing.
5. The SPD must protect all modes of the electrical system being utilized, i.e. Normal (L-L, L-N) & Common (N-G, L-G).
6. The Nominal Discharge Current (I_n) for all SPDS shall not be less 20 kA regardless of Type.
7. The surge current rating per phase shall be 240 kA for category C locations, 160 kA for category B locations and 120 kA for category A locations.

8. The Voltage Protection Rating (VPR) of the SPDs shall not exceed the following:

Mode	208Y/120	480Y/277	600Y/347
L-N; L-G; N-G	700	1200	1500
L-L	1200	2000	3000

B. Features

1. Balanced Suppression Platform

   a. Surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance.

   b. The surge suppression platform must provide equal impedance paths to each matched MOV.

   c. SPDs containing items such as single-mode replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted.

2. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.

3. Each thermally protected MOV shall have an end of life indicator and the suppression system shall be continuously self-monitoring.

4. SPDs with removable covers or doors shall be equipped with internal safety barriers having lockout provisions to prevent contact with energized components.

5. Internal Connections

   a. No plug-in single-mode modules or printed circuit boards shall be used as surge current conductors.

   b. All internal components shall be soldered, hardwired with connections utilizing low impedance conductors.

6. Electrical Noise Filter

   a. Each Type 2 unit shall include a high-performance EMI/RFI noise rejection filter.

   b. Noise attenuation for electric line noise shall be [50 dB] or [40 dB] minimum from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method. Products unable to meet this specification shall not be accepted.

   c. Type 2 units with filtering shall be co-listed to UL 1283 5th Edition or later.

   d. Type 1 units shall not contain filtering nor can they have a UL 1283 5th Edition Listing.

7. Monitoring and Diagnostics

a. Protection Status Indicator

1) Each SPD shall have a green/red solid-state indicator lights that reports the status of the protection on each phase.

a) For wye configured units, the indicator lights must report the status of all protection elements and circuitry in the L-N and L-G modes.

b) Wye configured units shall also contain solid-state indicator lights that report the status of the protection elements and circuitry in the N-G mode.

c) SPDs that indicate only the status of the L-N and L-G modes shall not be accepted.

d) For delta configured units, the indicator lights must report the status of all protection elements and circuitry in the L-G and L-L modes.

e) The absence of a green light and the presence of a red/yellow light shall indicate that damage has occurred on the respective phase or mode.

f) All protection status indicators must indicate the actual status of the protection on each phase or mode.

g) If power is removed from any one phase, the indicator lights must continue to indicate the status of the protection on all other phases and protection modes.

h) Diagnostics packages that simply indicate whether power is present on a particular phase shall not be accepted.

b. Remote Status Monitor

1) SPDs, where shown on the Contract Drawings, must include Form C dry contacts (one NO and one NC) for remote annunciation of SPD status.

2) Both the NO and NC contacts shall change state under any fault condition.

c. Audible Alarm

1) SPDs shall contain an audible alarm that will be activated under any fault condition.

2) There shall also be an audible alarm silence button used to silence the audible alarm after it has been activated.

d. Surge Counter

1) SPDs shall be equipped with an LCD display that indicates to the user how many surges have occurred at the location.

2) The surge counter shall register a count for each surge event clamped by the SPD.

3) A reset pushbutton shall also be standard, allowing the surge counter to be zeroed.

4) In order to prevent accidental resetting, the surge counter reset button shall be depressed for a minimum of 2 seconds in order to clear the surge count total.

5) If power to the SPD is completely interrupted, the ongoing count indicated on the surge counter's display prior to the interruption shall be stored in non-volatile memory and displayed after power is restored.

6) The surge counter's memory shall not require a backup battery in order to achieve this functionality.

8. MOV Protection

a. SPDs shall contain thermally protected MOVs.

b. The self-protected MOVs shall have a thermal protection element integrated with the MOV and a mechanical disconnect with arc quenching capabilities in order to achieve overcurrent protection of the MOV.

c. The thermal protection assembly shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur that would cause them to enter a thermal runaway condition.

d. Each thermally protected MOV shall have an end of life indicator and the suppression system shall be continuously self-monitoring.

9. Overcurrent Protection

a. The unit shall not require external overcurrent protective device (OCPD) as part of the UL 1449 listing.

b. If the AHJ requires overcurrent protection of the conductors connecting the SPD to the system then OCPD shall be sized based on governing AHJ electrical code requirements.

10. Fully Integrated Component Design

a. All of the SPD's components and diagnostics shall be contained within one discrete assembly.

b. The use of plug in single-mode modules that must be ganged together in order to achieve higher surge current ratings or other functionality shall not be accepted.

11. Safety Requirements

a. The SPD shall minimize potential arc flash hazards by containing no single-mode plug in user serviceable/replaceable parts and shall not require periodic maintenance.

b. SPDs containing items such as replaceable single-mode plug in modules, replaceable fuses, or replaceable batteries shall not be accepted.

c. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device can pose a safety hazard and shall not be accepted.

d. SPDs designed to interface with the electrical assembly via conductors shall require no user contact with the inside of the unit or shall have barriers that block access to harmful voltages.

e. Lockout provisions, capable of accepting a padlock, shall be provided on units with a disconnecting internal breaker if applicable.

f. SPDs without barriers or lockout provisions shall be factory sealed to reduce exposure to harmful voltages.

g. Factory sealed units shall have installed phase, neutral, ground and remote status contact conductors and shall have a pigtail set of conductors protruding outside of the enclosure for field installation.

12. The manufacturer shall certify that all materials and processes used as a component of the SPD units, and used in the process of manufacturing and packaging of the units are in accordance with The Federal Clean Air Act Amendments of 1990, Sections 602 and 611, prohibiting the use of Class I or Class II ozone depleting chemicals.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. SPDs shall be factory mounted within the equipment as shown on the Contract Drawings. A circuit breaker disconnect shall be provided to protect and isolate the SPD from the main supply.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Certified Shop Tests:

1. Shop testing shall be performed on the SPD at the manufacturer’s plant prior to shipment.

2. Shop tests shall include the manufacturer’s standard tests and shall demonstrate quality assurance inspection and testing procedures for the equipment.

3. The Contractor shall provide a shop test report. The report shall identify the tests performed and the results obtained.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. SPDs of the appropriate listing shall be installed at locations shown on the Contract Drawings

B. Installation locations shall include Service Entrance Equipment, Distribution Equipment and Utilization Equipment.

C. SPD installations shall confirm to the manufacturer's written instructions and recognized installation practices including:

1. Proximity to the protected equipment
2. Strict adherence to the total length of conductors feeding the SPD.
3. Minimum bend radius of feed conductors.
4. Maximum number of bends in the feed conductors.
5. Whether the grounded conductor is to be bonded at the SPD.
6. Grounding of both the SPD and the protected equipment.

D. The SPD manufacturer shall make available experienced, qualified, power-quality application and field supervision engineering services during installation and start-up.

E. The Contractor shall verify the proper application of the SPDs (i.e. voltage, phase, etc.) and coordinate with upstream and downstream SPDs.

F. The Contractor shall assure that all neutral conductors are bonded to the system ground at the service entrance or at separately derived system point, prior to installation of the associated SPDs.

G. Install nameplates for identification of equipment.

3.03 FIELD TESTING / QUALITY CONTROL

A. Manufacturer's Representative

1. A qualified representative from the SPD manufacturer shall assist in the installation of the SPDs, check the installation before it is placed into operation, observe and assist initial operations and train operations and maintenance staff in the care, operation and maintenance of the SPDs.
2. The service representative shall sign in with the Engineer on each day they are at the site.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 26 46 20 - FIRE DETECTION AND ALARM SYSTEM

CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall design, furnish, install, test and place into satisfactory operation fire detection and alarm systems as specified herein and in compliance with the Contract Drawings and all applicable codes and standards listed in this section.

B. Two separate and distinct fire detection and alarm systems are required, one at each of two of the three sites shown on the Contract Drawings. Each fire alarm and detection system shall be microprocessor based, addressable supervised fire detection and alarm system.

C. Each System shall include, but not be limited to: Fire Alarm Control Panel (FACP), Fire Alarm Communicator, power supplies and fire alarm initiating and notification devices including addressable monitor and control relay modules as indicated on the Contract Drawings.

D. Each fire alarm system shall include conduit, wire, fittings, and all required system accessories required to provide a complete operating system.

E. Each FACP shall display system information to the extent applicable including system status, alarms, trouble, and supervisory indications. Each fire alarm system shall be able to remotely transmit alarms to the Central Station Monitoring.

F. All charges and fees required by the NYC Fire Department local Authority having jurisdiction (AHJ) to inspect each the installation and implement fire alarm notifications are to be included by the Contractor under this section at no additional cost to the City.

G. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

B. Pay under the lump sum for all fees and give all notices, file all plans, obtain certificates and obtain all necessary approvals from NYC Fire Department. Deliver all certificates of inspection to the NYC Fire Department. No work shall be covered before examination and approval by NYC Fire Department. Replace imperfect or condemned work to conform to inspectional requirements, satisfactory to the City, Engineer, and NYC Fire Department without extra cost to the City. If Work is covered before inspection and acceptance, pay costs of uncovering and reinstalling the covering, whether it meets contract requirements or not.

1.03 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedures

B. Section 01 43 10 – Quality Assurance Inspections

C. Section 01 41 00 – Regulatory Requirements

D. Section 01 78 24 – Spare Parts and Maintenance Materials

E. Section 01 78 25 – Operations and Maintenance Manuals

F. Section 26 05 11 – General Electrical Requirements

G. Section 26 05 20 – Low Voltage Wires, Cables, and Accessories

H. Section 26 05 27 – Grounding

I. Section 26 05 29 – Hangers and Supports for Electrical Systems

J. Section 26 05 33 – Raceways and Boxes for Electrical Systems

K. Section 26 05 53 – Identification for Electrical Systems

1.04 REFERENCES

A. National Fire Protection Association (NFPA):

1. 70: National Electrical Code (NEC).

2. 72: National Fire Alarm Code

3. 101: Life Safety Code.

B. Underwriters' Laboratories (UL)

1. Fire Protection Equipment Directory
2. 268: Standard for Smoke Detectors for Fire Alarm Signaling Systems
3. 464: Standard for Audible Signal Appliances
4. 864: Control Units for Fire Protective Signaling Systems
5. 1971: Signaling Devices for the Hearing Impaired

C. State and Local Building Codes.

1. NYC Building Code
2. NYC Electrical Code
3. NYC Fire Code
4. NYC Mechanical Code

1.05 DESCRIPTION

A. Type of System:

1. Fire Alarm Systems: Each fire alarm system shall operate as a low voltage addressable type system and shall automatically be placed into an alarm condition whenever any manual or automatic fire detecting devices or monitor modules are placed into an alarm mode. The system shall indicate areas of alarm and sound local alarms at the FACP.
2. The systems shall be capable of operating with a single break or ground fault condition in the initiating, notification, and data communication circuits.
3. Signaling line circuits for initiating devices, monitor modules, control relay modules and any other required addressable devices shall utilize Class X wiring as described in NFPA 72. Notification appliance circuits for horns, strobes, speakers, and any other notification appliances shall utilize Class A wiring as described in NFPA 72.
4. Power Supply for the Systems: The power supply for each FACP and fire alarm communicator shall be provided in accordance with NYC Electrical Code Article 760 and shall consist of the following:
    a. Normal power shall be obtained from the service entrance supply tapped ahead of the main service disconnecting means. A second alternate power supply tapped ahead of generator main disconnection means shall enable each FACP to be supplied from the generator. The normal and alternate power distribution shall include the fused disconnect switches and auto transfer switch and fused cutouts as indicated on the Contract Drawings. Dedicated fuses at the fused cutout shall be provided, one for the FACP and one for the alarm communicator.
    b. Backup power shall be obtained from a manufacturer provided battery backup system consisting of rechargeable, sealed type storage batteries and battery charger mounted within each FACP.

Additional external power supplies required by the system at the discretion of the fire alarm system manufacturer or due to circuit load or length shall be provided from a dedicated fuse at the fused cutout.

5. Each system shall interface with HVAC systems and other building systems using monitor modules and control relay modules as shown on the Contract Drawings and as required by NFPA 72 to provide all required monitoring and control functions.

B. Standards and Codes:

1. Each fire alarm system shall comply with the NFPA, UL and State and Local Codes as referenced under Article 1.04.

C. Sequence of Operation:

1. When a fire-alarm condition is detected by one of the system's initiating devices, the following functions shall immediately occur, refer to Contract Drawings for detailed sequence of operation:

a. Automatic programs assigned to the alarm point shall be executed and the associated indicating devices and relays activated.

b. Fire-alarm notification devices in the building shall operate.

c. The Audio/Visual alarm notification devices shall operate.

d. The system alarm on the FACP shall indicate condition.

e. The alarm shall be transmitted to the Central Station Monitoring.

f. Shutdown of all HVAC equipment and any defined exhaust and pressurization operations to be initiated.

2. When a trouble or supervisory condition is detected by one of the system's initiating, indicating circuits, or upon loss of AC power the following functions shall immediately occur, refer to Contract Drawings for detailed sequence of operation:

a. System Trouble or Supervisory will be indicated on FACP.

b. A local trouble-sounding device in the FACP shall be activated. This sound shall be distinct from the alarm sound.

c. The trouble alarm shall be transmitted to the Central Station Monitoring.

1.06 QUALITY ASSURANCE

A. Telephone and Cellular Services:

1. Contractor shall make all necessary arrangements in advance with Verizon as required to obtain new telephone and cellular services for the purpose of communicating system alarms to the Central Station Monitoring.

2. Per the requirements of the NYC Fire Code, two separate means of communication are required: one primary and one secondary. The primary

means of communication shall be via a redundant pair of telephone landlines, and the secondary means shall be via a LTE cellular network service.

3. All work regarding the connection and installation of Verizon telephone and cellular services shall comply with the requirements of Verizon. Contractor shall coordinate the service requirements with Verizon in advance.

4. Contractor shall be responsible to establish the Verizon accounts and pay the Verizon monthly bills for each of the services until Substantial Completion or until the accounts can be transferred to the City.

5. Contractor shall be responsible to facilitate and coordinate with Verizon and the City regarding the transfer of the service accounts.

B. Comply with the requirements specified in Section 01 43 10 – Quality Assurance Inspections.

C. Standard Products: Material and equipment shall be the latest standard products of a single manufacturer regularly engaged in the manufacture of the product for the 5 years as a minimum.

D. Obtain NYC Department of Building work permits in accordance requirements specified under Section 01 41 00 – Regulatory Requirements.

E. Qualifications of the installer before commencing work: The fire alarm vendor shall hold a NYC Fire Department issued fire alarm company certificate. Submit the following information:

1. Fire alarm company certificate issued by NYC Fire Department.

2. Identify the employment of staff who are to be used and certify they have performed NYC Fire Department approved fire alarm installations, inspections, and testing services.

F. Nameplates: The components of equipment shall have the manufacturer's name, address, type or style, contract tag number and catalog number on a plate securely attached to the equipment.

G. Tags: Tags with stamped identification number shall be furnished for keys and locks. Tags shall be furnished to identify cable and conduit runs, wiring circuits, and all spare parts furnished for Authority's stock to maintain the system.

H. Keys and Locks: All locks shall be keyed alike.

I. Verification of Dimensions: Become familiar with details of the work and verify dimensions in the field.

J. Compliance: The fire detection and internal alarm system shall be configured in accordance with NFPA 72. The equipment furnished shall be UL listed and in accordance with the applicable NFPA standards.

K. Verify conduit size and wire quantity, size, and type are suitable for the equipment supplied. Review the proper installation of each type of device with the equipment supplier.

L. Review the NYC Fire Department submittal documents for completeness prior to submission to the Fire Department.

1.07 SUBMITTALS

A. Submit the following shop drawings in accordance with Section 01 33 00.

1. Copy of this Section with addenda and all referenced Contract Sections with addenda checkmark each paragraph to indicate specification compliance or indicate deviation and reason for deviation.

a. Failure to include a copy of the marked-up Contract Sections will result in return of the entire submittal with no further review and consideration.

2. Installer and system supplier certification qualifications and list of three similar projects with name and phone number of contact person.

3. Complete list of equipment and materials, including manufacturer's descriptive and technical literature, catalog cuts. Shop drawings shall contain complete conduit riser diagrams, wiring diagrams, plan layout drawings, schematic diagrams, and sequence of operations for all equipment, devices, conduits, and cables furnished. Riser diagrams shall identify cable sizes and quantities, equipment layout, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit.

4. Manufacturer’s printed installation instructions.

5. Battery capacity calculations to demonstrate that the battery size selected is a minimum of 125 percent of the calculated requirement. Calculation to include supervisory power requirements for all equipment, and alarm power requirements for all equipment including notification circuits.

6. Wiring diagrams from the fire alarm system integrator or supplier differentiating clearly between factory and field installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Identify all diagrams to be specific to this project and distinguish between field and factory wiring.

7. Voltage drop calculations based on field measured wiring distances indicating that signaling and notification appliance circuits do not exceed the manufacturer’s recommended maximum voltage drop for each type of circuit.

B. Spare Parts Data:

1. After approval of the list of shop drawings, and not later than six months prior to the date of substantial completion, furnish copies of spare parts data for each different item of materials and equipment specified. The data shall include a complete list of parts and supplies with current unit prices and source of supply, a list of supplies that are either normally furnished at no extra cost with the purchase of the equipment or specified to be furnished in accordance with paragraph Special Tools and Spare Parts and a list of

additional items recommended by the manufacturer to assure efficient operation for a period of 120 days.

C. Operating and Maintenance Instruction Manuals:

1. Submit operation and maintenance manuals as specified in 01 78 25 – Operation and Maintenance Manuals, outlining the step-by-step procedures required for system startup and operation. The manual shall include the manufacturer's name, model number, service manual parts list and detailed description of all equipment and their basic operating features. The manuals shall include all approved riser, plan, wiring and schematic drawings as well as detailed sequence of operations tables.

2. Maintenance instructions manuals outlining maintenance procedures shall be furnished. The manual shall include a troubleshooting guide listing possible breakdown and repairs and a simplified connection wiring diagram for the system as installed. Provide the names, addresses, and telephone numbers of service organizations that provide technical assistance and carry stock of repair parts for the system to be furnished.

3. Performance Test Reports: Upon completion of the installed system, submit in field tests performed to prove compliance with the specified performance criteria and as detailed in Part 3 of this specification.

D. Submit Certificate of Compliance, signed by manufacturers of fire alarm system components certifying that their products comply with specified requirements.

E. Submission to NYC Fire Department: In addition to submission of the above material, make submission to the NYC Fire Department. Submit copies of each fire alarm system approved riser and plan Shop Drawings and related information as needed to facilitate Fire Department review. Upon receipt of comments from the NYC Fire Department, provide clarifications and revisions and make resubmittals of Shop Drawings until Fire Department approval is obtained.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with the requirements specified in Section 01 65 00.

B. Equipment placed into storage shall be protected from the weather, humidity and temperature variations, dirt, dust, and other contaminants.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Comply with the requirements specified in Section 01 78 24 – Spare Parts and Maintenance Materials.

B. Provide for each fire alarm system one spare FACP motherboard and one spare of each FACP enclosure component including but not limited to signal circuit cards, notification circuit cards, network interface cards, and PLFA power supplies. At a minimum provide an additional 10 percent quantity (or minimum of 2) of each initiating device type, notification device type, control relay module and monitor module. The manufacturer shall also submit a list of recommended spare parts to be furnished for review by the Engineer.

C. Three sets of all special tools necessary for the maintenance of the equipment shall be furnished. The list of special tools to be furnished shall be submitted for review by the Engineer. Two spare sets of fuses of each type and size required and five spare lamps for each type shall be furnished.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Siemens - Cerebrus Pro

B. Honeywell

C. Simplex – Grinnell

D. Or approved equal

2.02 MATERIAL / EQUIPMENT

A. General Product Description:

1. Each Fire-Alarm Control Panel (FACP) shall be capable of fire detection, equipment supervision, data/network communication and control, alarm management, and historical data collection and archiving. The FACP shall have a minimum capacity of 500 addressable points and 100 notification appliance circuits.

B. Communications:

1. Each FACP shall have sufficient memory to support its operating system and databases including:

a. Fire management

b. Alarm management

c. Historical/Trend Data

d. Maintenance Support Applications

e. Custom Processes

f. Operator I/O

2. Integrated On-Line Diagnostics: The FACP shall continuously perform self-diagnostics, communication diagnostics and diagnostics on all subsidiary equipment.

3. Surge and Transient Protection: Isolation shall be provided at all field point terminations to suppress induced voltage transients where required. Surge arrestors shall provide protection from all non-signal electrical surges that

could cause damage to the equipment. Line surge arrestors shall be isolated from the electrical circuitry that they are protecting.

C. System Software Features:

1. Provide software to form a complete operating system as described in this Section and as shown on the Contract Drawings.

2. The software programs specified in this section shall be provided as an integral part of the panel and shall not be dependent upon any higher level computer for execution.

3. Alarm Management: Alarm management shall be provided to monitor, buffer, and direct alarm reports to operator devices and memory files. The control unit shall have capability of performing alarm analysis and signaling. The panel alarms shall be secure and at no time shall be overridden.

4. Status Change Report: All alarm or point change reports shall include the point's description in English along with the time and date of occurrence.

5. Prioritization: The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of three priority levels shall be provided.

6. Report Routing: Alarm reports shall be archived for future recall.

7. Alarm Messages: In addition to the point's description and the time and date, the user shall be able to print, display or store a custom alarm message to more fully describe the alarm condition or direct operator response.

8. The FACP shall be capable of storing a library of at least 2500 events.

9. History Mode:

   a. The system shall be able to store and display at least 2500 system events that have occurred in a non-volatile buffer memory. Display of these events shall be accomplished on-site through the use of the front control panel indicators and switches.

10. Field Configurable:

    a. The system shall be fully configurable and expandable without the need for erasable programmable read-only memory. All configurations shall be accomplished through downloading of programs from a computer. Reconfiguration shall not require knowledge of any programming languages or require any special training. All programs shall be stored in non-volatile memory. Entry into program mode shall require a special key and a special password entered into the front panel.

D. Addressable Device Interface:

1. The Addressable Device Interface will be capable of supporting devices as indicated on the Contract Drawings with minimum 25 percent spare capacity for future devices on each loop as well as 25 percent spare capacity for interface cards within the FACP enclosure.
2. The addressable device interface shall contain its own microprocessor control interfaced with FACP motherboard and operating system software.
3. The addressable device interface shall communicate and provide power to all devices on its loop over a single pair of wires. The fire-alarm system signaling circuits shall function as a Class X system as described in NFPA 72.
4. The addressable device interface board shall receive information from all addressable devices and shall process this information to determine normal, alarm, or trouble conditions. The information shall also be used for automatic test and determination of maintenance requirements.
5. Communication with connected devices shall be performed every 5 seconds or less. Average time to detect an alarm shall be less than 10 seconds (longer for alarm verification detectors).

E. Notification Appliance Circuit:

1. Each FACP shall provide supervised Class A notification circuits as indicated on Contract Drawings with 25 percent spare capacity for future devices on each circuit and 25% spare capacity of notification circuit cards/interface boards within the FACP. The circuit capacity shall be 2.0 amperes maximum per circuit, maximum of 8.0 amperes from the FACP's power supply. If a short-circuit trouble occurs on one of the circuits, it will not affect the operation of the remaining circuits. The manufacturer shall submit notification appliance circuit calculations showing load of each circuit and field setting of each visual (cd) or audio (dBA) device on the circuit.
2. Booster Power Supplies (BPS) shall be provided for notification circuits where the notification circuit load exceeds the capacity of the FACP power supply and/or where the voltage drop on a notification circuit exceeds manufacturer recommended voltage drop.

F. Function Relays:

1. Each FACP shall be provided with a minimum of five relays with Form "C" relay contacts, rated at 2 A at 120 VAC. Three relays shall be dedicated for fire alarm and shall be programmed to activate for detection of fire from the system detectors or the manual pull stations. Two relays shall be dedicated one for trouble alarm and shall be programmed to activate for detection of system trouble conditions and the second for supervisory alarm and shall be programmed to activate for detection of sprinkler tamper switches. Relay dry contacts shall be hard wired to terminals for remote indication of the following:
   a. Fire alarm to telemetry panel.

b. Trouble alarm to telemetry panel

c. Supervisory alarm to telemetry panel.

G. Central Processing Unit (CPU):

1. The CPU shall communicate with the operator interface, LCD display, LED display and control other modules in the panel. Removal, disconnection, or failure of any control panel shall be detected and reported by the Central Processing Unit.

2. The CPU shall contain and execute all control-by-event programs for specific action to be taken if a fire situation is detected in the system. Such control-by-event programs shall be held in non-volatile programmable memory and shall not be lost even if system primary and secondary power failure occurs. The CPU shall also provide a real time clock for time annotation on the display and remote optional printer.

H. Operator Display:

1. The operator display shall provide controls and indicators used by the system operator. The display shall contain, and display as needed, custom alphanumeric message for all intelligent detectors and addressable modules. Such message information shall be stored in programmable non-volatile memory.

2. The display board shall provide a backlit 80-character alphanumeric Liquid Crystal Display (LCD). It shall also have LEDs for system indication such as AC POWER; SYSTEM ALARM; SYSTEM TROUBLE; ACKNOWLEDGE; SIGNAL SILENCE, etc.

3. Factory programmable system indications shall be available for standard unique functions. Programmable functions shall be secure and password protected.

4. The Display Interface shall provide a key touch keypad with control capability to command all system functions, and entry of any numeric information. The keypad shall include means to enter a minimum of two different passwords to prevent unauthorized manual control.

5. Ground fault, short circuit, and open circuit indications shall be displayed on an overall system basis as well as by signaling circuit, and notification circuit.

I. Communications Ports:

1. Each system shall provide communication ports to the extent applicable for the following interfaces:

a. System Annunciators.

b. Alarm communicator.

c. Service and field programming.

d. Printer.

J. Fire Alarm System Panels:

1. The panel enclosures shall comply with the requirements of UL 864. Panels shall be housed in enclosures that are designed for mounting recessed or directly to a wall or vertical surface. The back box and door shall be constructed with provisions for electrical conduit connections. The door shall provide a key lock and shall include an opening for viewing.

2. The panels shall be modular in structure for ease of installation and maintenance.

3. Enclosures having doors over 48 inch (1200 mm) in height shall be provided with a three-point catch and lock; all other doors shall contain a cabinet type cylinder lock. Inserts shall be blind fastened so that no screws show on the panel front.

4. Enclosures shall be provided with ample gutter space to allow proper clearance between the enclosure and live parts of the panel equipment. If more than one modular unit is required to form a control panel, the units shall be installed in a single cabinet large enough to accommodate all units and allow ample gutter space for interconnections of panels and field wires.

5. The enclosures shall be painted red and labelled as Fire Alarm System with equipment designation with decal or approved markings.

K. One Person Test Feature: The control unit shall include a special one person test feature, which will allow a single person to test all initiating devices and indicating appliance in a system without returning to the panel to reset the system. A special password shall be required to enter the test mode. The service-technician shall be able to re-select the initiating and indicating circuits that are to be included in the one person test mode. The Walk-Test shall include a special audible indication that a trouble has been detected on an analog device, for the service-technician to check proper system wiring.

L. Provide addressable monitor modules on signaling circuits to interface FACP to non-addressable detection components and subsystems as required and as indicated on the Contract Drawings. Each module shall be capable of receiving a minimum of one dry contact indication from the component/system being monitored. The modules shall be capable of being mounted in a 4 x 4 x 2 1/8 inch (100 x 100 x 54 mm) junction box.

M. Provide addressable control relay modules on signaling circuits to interface FACP to HVAC systems, auxiliary audible and visual devices and other control components as required and as indicated on the Contract Drawings. Each module shall have a minimum of one Form C dry contact capable of sending control inputs to two separate devices/systems. Control relay modules shall have an external LED to indicate when the relay function has been activated. The modules shall be capable of being mounted in a 4 x 4 x 2 1/8 inch (100 x 100 x 54 mm) junction box.

N. Fire-Alarm Initiating Devices:

1. Addressable Devices: All addressable detectors shall:

a. Provide a test means whereby they will simulate an alarm condition and report that condition to the FACP. Such a test shall be initiated from the FACP or via a field programmable electronic device communicating with the detectors. All detectors shall have self-diagnostic capabilities and report change in health status to the FACP.

b. Provide address-setting means using the FACP software and a field programmable electronic device. The detectors shall also store an internal identifying code which the FACP shall use to identify the type of detector.

c. Provide dual alarm and power LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel. Both LEDs may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED.

2. Addressable pull stations shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key. Operated stations shall have a positive, visual indication of operation and utilize a key type reset. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inch (45 mm) or larger. Mount stations inside a red, weatherproof enclosure with a clear polycarbonate hinged front cover.

3. Addressable Area Photoelectric Smoke Detectors: Photoelectric Smoke Detectors shall use the photoelectric principle to measure smoke density and shall, on command from the FACP send data to the panel representing the analog level of smoke density. These addressable detectors shall connect via a two wire signaling circuit to one of the FACP addressable input circuits. Each detector shall utilize a dust-resistant, field cleanable photoelectric detection chamber with microprocessor based electronics. The detector shall be capable of differentiating between an actual fire and other similar phenomena (i.e. dust, cigarette smoke).

4. Addressable Heat Detectors: Heat detectors shall use an electronic sensor to respond to temperatures exceeding 135 degrees F (57 degrees C) or 190 degrees F (88 degrees C) as noted on the plans. The sensing element shall be a thermistor or other equivalent electronic heat sensing element. The sensing element shall be capable of being replaced without removing the detector base. The detector shall, on command from the control panel, send data to the panel representing the analog temperature level. These

addressable detectors shall connect via a two wire signaling circuit to one of the FACP addressable input circuits.

5. Each detector shall be provided with a steel mounting plate, and the entire unit shall mount on a double gang electrical box.

6. Addressable Duct Smoke Detectors:

   a. The detectors shall be an air sampling type duct smoke detector and shall be provided with a remote test and alarm indicating station. Provide cable required to interconnect the remote test station and alarm indicating station with the detector.

   b. The detectors shall, on command from the control panel, send data to the panel representing the analog level of smoke intensity.

   c. The duct detectors shall be suitable for operation in the following environment: Temperature: -4 degrees Fahrenheit to 158 degrees Fahrenheit, Humidity: 0-93 percent RH, non-condensing.

7. Provide devices suitable for the area classifications as indicated on the Contract Drawings.

O. Fire Alarm Indicating Devices:

1. Visual appliances shall be installed as shown on the Contract Drawings in accordance with the requirements of the UL 1971 standard and NFPA 72. Where multiple visual signals are visible from any location, circuitry shall be incorporated for the synchronization of the flash rate.

   a. UL 1971 Listed for Emergency Devices for Hearing Impaired in all public mode installations.

   b. Strobes shall meet UL 1971 flash rate.

   c. Visual signals shall incorporate a Xenon flashtube enclosed in a rugged Lexan lens or equivalent with solid state circuitry.

   d. The strobe intensity shall be rated per UL 1971.

   e. The strobes shall be available for semi-flush or surface mounting and in conjunction with audible signals as required.

   f. Strobes shall have field configurable intensity levels.

2. Audible Devices: Audible evacuation signals shall be provided meeting the following requirements:

   a. Audible Notification appliance shall be electronic and use solid state components.

   b. Each electronic signal shall provide four field selectable alarm tones. The tones shall consist of slow hoop, continuous, temporal or interrupted.

   c. The device UL dBA measurement at 10 feet (3 m) shall be a minimum of 84 dBA for separately mounted audible signals.

d. The device shall have provisions for standard reverse polarity type supervision and in/out field wiring using terminals that accept 12 AWG wiring.

e. Horns shall be diode polarized, heavy duty, 24 volt DC operated. Enclosure shall be red with a corrosion resistant epoxy finish suitable for wet, corrosive and /or the Hazardous locations as defined on the Contract Drawings.

f. Combination audiovisual alarm horns shall have a high intensity flashing light and alarm horn as an integral unit. Both audio and visual components shall operate from the 24 volt dc polarized indicating circuits. The audiovisual assembly shall be housed in a red color impregnated plastic enclosure, and the electronic light source shall be protected by a polycarbonate clear lens. The strobe output rating shall be selectable, 15, 30, 75 and 110 cd. Horn output shall have a temporary audible repeat cycle pattern.

P. Power Supply:

1. The power supply for each FACP and fire alarm peripherals shall be integral to the FACP. The power supply shall provide FACP and peripheral power needs.

2. Positive-temperature-coefficient thermistors, circuit breakers, or other over-current protection shall be provided on all power outputs.

3. Input power shall be 120 VAC, 60 Hertz. The power supply shall provide internal batteries and charger. Internal battery capacity shall be sized as required to meet system requirements.

4. The main power supply shall provide a battery charging circuit consisting of a fully automatic standby battery charger, rate compensated, capable of maintaining battery in fully charged state and be capable of recharging batteries to 70 percent of alarm capacity within 12 hours. Provide for normal supervisory operation of entire system for 24 hours followed by full load operation for 15 minutes.

5. Provide charger with the following supervised functions: circuit protection for shorts, open, disconnected, or reversed polarity battery connection, supervision, or protection of high or low voltage, overcharging and charger failure. Automatic load shedding or battery disconnect on deep discharge to prevent battery damage.

6. Batteries shall be 24 volt, rechargeable, gelled electrolyte, totally sealed, fully charged with al interconnections ready for service, maintenance free, long-life.

Q. Wiring within Cabinets, Enclosures, Boxes, Junction Boxes, and Fittings:

1. Provide wiring installed in a neat and workmanlike manner and installed parallel with or at right angles to the sides and back of any box, enclosure, or cabinet.

2. Conductors which are terminated, spliced, or otherwise interrupted in any enclosure, cabinet, mounting, or junction box shall be connected to terminal blocks.

3. Mark each terminal in accordance with the wiring diagrams of the system.

4. Make connections with approved pressure type terminal blocks, which are securely mounted.

5. The use of wire nuts or similar devices shall be prohibited.

R. Terminal Cabinets:

1. Provide a terminal cabinet at the base of any circuit riser were indicated on the Contract Drawings.

2. Terminal size shall be appropriate for the size of the wiring to be connected.

3. Conductor terminations shall be labeled and a drawing containing conductors, their labels, their circuits, and their interconnection shall be permanently mounted in the terminal cabinet.

4. Minimum size is 8 inch (200 mm) high by 8 inch (200 mm).

S. Wiring:

1. Signaling line circuits shall be connected to the FACP with 14 AWG (minimum) twisted shielded pair copper cabling type FPLP NYC certified.

2. Notification appliance circuits shall be connected to the FACP with 12 AWG (minimum) unshielded twisted pair copper cabling type FPLP NYC Certified

3. Wire size shall be increased beyond the minimum specified sizing to prevent voltage drop problems as required or as deemed appropriate by the fire alarm system manufacturer.

4. Power wiring, operating at 208/120 VAC minimum shall be 12 AWG (minimum) solid copper having 600V insulation. Ground wiring shall be 10 AWG (minimum) solid copper.

5. Provide all wiring in rigid galvanized metal conduit, minimum size 3/4" and in accordance with Section 26 05 33 – Raceways and Boxes for Electrical Systems.

6. Outer jacketing for all cables shall be red. Conductor insulation for all pairs shall be red/black.

7. Data communication wiring for the alarm communicator connections shall be 4 pair Ethernet shielded cable, UL listed 2 hour fire rated, NYC approved of a type recommended by the fire alarm system supplier.

T. Conductor Terminations:

1. Labeling of conductors at terminal blocks in terminal cabinets, FACP, and remote fire alarm control units shall be provided at each conductor connection.

2. Each conductor or cable shall have a shrink-wrap label to provide a unique and specific designation.

3. Each terminal cabinet, FACP, and fire alarm control unit shall contain a laminated drawing which indicates each conductor, its label, circuit, and terminal.

4. The laminated drawing shall be neat, using 12 point lettering minimum size, and mounted within each cabinet, panel, or unit so that it does not interfere with the wiring or terminals.

5. Maintain existing color code scheme were connecting to existing equipment.

U. Fire Alarm Communicators:

1. Provide fire alarm communicators as indicated on the Contract Drawings for transmitting alarms from the FACP to the Central Station Monitoring. The fire alarm communicators shall be capable of both primary and backup communication.

2. The fire alarm communicator primary communication method shall be the two telephone landlines. The fire alarm communicator backup communication method shall be an LTE cellular network service.

3. Each FACP alarms shall be transmitted to the central station monitoring via the fire alarm communicator primary telephone communication means. The primary telephone communicator shall transmit alarms using the first primary telephone number. If the primary telephone line number is unsuccessful, the secondary telephone line number shall transmit the alarms. If the two telephone lines are out of service or fails, the fire alarm communicator backup cellular communication means shall instantly transmit the FACP alarms to the Central Station Monitoring.

V. Cellular Antenna:

1. Provide antennas suitable for outdoor installation with high directional gain 2x2 MIMO signal boosting for 2G/3G/4G/5G networks and ground impulse suppressor for each FACP. Antenna shall be manufactured by Panorama Antennas, Parsec Technologies, Taoglas or approved equal.

2. The antennas shall be suitable for a frequency range of 698-960/1710-2700/3400-3800 MHZ with a gain of 6-9 dBi and an impedance of 50 Ohms. Maximum input power rating shall be 20 watts.

3. The antennas shall be equipped with a N-Female type connector and a coax double shielded RG58 cable. Provide cable lengths as required to suit each installation, 25 feet at a minimum

4. Provide antenna mast and mounting hardware. Mast shall be suitable for withstanding 105 mph wind and one-half inch ice. Provide clamps and standoff hardware as recommended by the antenna manufacturer.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used.

3.02 INSTALLATION

A. Install each fire alarm system as indicated on the Contract Drawings, in accordance with the manufacturer's diagrams and printed instructions, except where otherwise indicated.

1. Wiring: Wiring for systems shall be installed in conduit. Provide conduit as specified in Section 26 05 33– Raceways and Boxes for Electrical Systems.
2. Station loops shall be arranged to permit disconnecting and bypassing the system at the base of each riser. External wiring between the control panel and the stations and horns/lights shall connect to terminal strips in accessible locked cabinets. Connections to the terminal strips shall be made with terminal spade lugs or with approved type terminal blocks. Terminal cabinets shall be installed at each point where a station circuit riser originates or any point along a circuit where a tap is made. The conductors for the fire alarm system shall be installed in dedicated conduits, junction boxes, or outlet boxes and keep separate from conductors of other systems.
3. Initiating Devices and Notification Appliances shall be installed in accordance with manufacturer's printed instructions.
4. Provide complete wiring and conduit between all equipment. Devices shall be mounted upon UL listed boxes. Wiring splices and transposing or changing of colors will not be permitted.
5. All power distribution equipment dedicated to the fire alarm system, fused disconnect switches, auto transfer switches, fused cutout shall be painted red and labeled as serving the “Fire Alarm System” with decal or approved markings in accordance with the NYC Building Code and Electrical Code.
6. Review the design drawings and perform a walk-through of all areas with the NYC Fire Department inspector.

3.03 FIELD TESTING / QUALITY CONTROL

A. Provide field service technician and instruments as required to perform for each system the initial system programming and testing. Once the initial system programming and testing is completed the performance and acceptance tests for each system shall be conducted.

B. Notify the NYC Fire Department and the Engineer 30 days before the performance and acceptance tests are to be conducted. The tests shall be performed in the presence of the NYC Fire Department and the Engineer or an authorized representative. Submit detailed test reports for all testing required in this section. Tests shall be conducted to the extent applicable for the following:

1. Verify that the system is free of grounds or open circuits. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. The FACP shall indicate when a ground or open circuit exists.

2. Alarm initiating devices shall be observed and logged for correct zone and sensitivity. These devices and their bases shall be tagged with adhesive tags located in an area not visible when installed, showing the initials of the installing technician and date.

3. Verify that all strobes, audible devices, pull stations, transmitters, automatic detectors, supervisory devices, and remote alarms are functioning. Submit a field test procedure for testing the following elements to the extent applicable for review and approval by the Engineer.

   a. Strobes shall deliver the correct foot-candle. Audible devices shall deliver the correct sound pressure levels decibels of the specified device.

   b. Stations shall close the circuits specified and deliver specified alarm codes. Verify central station receives alarm.

   c. Automatic detectors shall actuate the specified zones when the appropriate fire or smoke conditions are generated. The detectors shall be exposed to actual smoke and/or heat used to simulate this test on each and every smoke/heat detector as located in the building; no other test will be accepted. The operation of associated control relay modules shall be verified to ensure that the relay module activates upon the appropriate alarm and that the associated equipment being controlled for emergency function (i.e. HVAC units, roll up doors) operates as intended.

   d. Panels and supervisory devices shall display, and control functions as specified. Loss of AC system power shall also be tested.

   e. Close each sprinkler system valve and verify proper supervisory alarm.

   f. Verify activation of all water flow switches.

   g. Verify alarm communication, primary and backup to Central Station Monitoring.

h. Verify monitoring of all points for subsystems including but not limited to the HVAC systems.

i. Verify emergency shutdown/operation of HVAC units is as per submitted and approved sequence of operations. A HVAC shutdown matrix detailing sequence of operations for each applicable unit under various alarm conditions shall be included in the field test procedure.

C. System tests to be performed under the supervision of a qualified representative and the AHJ.

D. Perform all tests to verify the correction of defects found in the initial testing. If testing identifies system modifications are required to accomplish the required operation, perform work at no additional cost to the City and retest the system.

E. Provide training on the system in compliance with Section 01 79 05 – Startup and Training. Schedule training at least forty-five (45) days prior to delivery of training subject to the approval of the Engineer and the City. Provide two separate training sessions, one day each session.

3.04 STARTUP / DEMONSTRATION

A. Not Used.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used.

END OF SECTION

SECTION 26 51 11 – LIGHTING FIXTURES, DEVICES AND SCHEDULES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing lighting fixtures (luminaires) and devices. Luminaires and devices shall be provided in accordance with the requirements specified under this Section, the Specifications and the Contract Drawings.

B. The lighting system shall be complete and include all equipment, devices and accessories as required for the installation of the luminaires and devices.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 05 27 - Grounding

B. Section 26 05 29 - Hangers and Supports for Electrical Systems

C. Section 26 05 33 - Raceways and Boxes for Electrical Systems

D. Section 26 05 53 - Identification for Electrical Systems

1.04 REFERENCES

A. Reference Standards

Luminaires and devices shall comply with the latest applicable provisions and recommendations of the following even if not specifically listed in this Section:

1. ANSI C78.377 - Specifications for the Chromaticity of Solid State Lighting (SSL) Products
2. DLC PR - DesignLights Consortium Premium Technical Requirements
3. EISA 2007 - Energy Independence and Security Act of 2007
4. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Sold State Lighting Products
5. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules
6. IES TM-21 - Technical Memorandum on Projecting Long Term Lumen Maintenance of LED Light Sources
7. NEMA SSL-1 - Electronic Drivers for LED Devices, Arrays, or Systems.
8. NYCEC - New York City Electrical Code.
9. NYCECC - New York City Energy Conservation Code
10. UL 20 - General Use Snap Switches.
11. UL 1598 - Luminaires
12. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products.
13. CBM - Certified Ballast Manufacturers, CBM.

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. General:

1. Luminaires shall be UL listed, approved for use in the City of New York and comply with NYCECC.
2. The luminaire types are noted within the fixture schedule which is shown on the Contract Drawings. The descriptions and catalog numbers serve to establish the quality, appearance and performance of the specified luminaires.
3. Luminaires and controls shall be as manufactured by the same manufacturer.
4. All luminaires shall be the products of lighting equipment manufacturers who have previously demonstrated, by performance and reputation, the ability to manufacture products of the quality specified and shall have a minimum of 5 years' experience manufacturing the luminaires specified. Such manufacturers must maintain an organization and manufacturing facility capable of actually manufacturing the specified luminaires. For the purpose of inspection, Contractor shall assure the Engineer, free and easy access to the manufacturing facilities and inventories of any manufacturer whose equipment the Contractor proposes to supply.
5. Luminaries over the range of operating voltage and temperature shall comply with the following:
    a. Minimum power factor of 0.95
    b. THD for both current and voltage of less than 10%
6. Luminaries shall have integral UL Listed Class 2 drivers and ballasts.
7. Luminaires shall have integral surge protective devices (SPD) to protect the luminaire from common mode transient peak voltages and transient peak currents.
8. Luminaires shall comply with DLC PR.
9. Luminaires utilizing incandescent sources are not permitted.
10. Luminaires shall utilize electronic or solid state drivers or ballasts where applicable.
11. The Contractor shall be responsible to assure that the exact inscription for exit and stairway signs required by local code is checked against that specified, prior to providing same. The Engineer shall be advised of any changes required to conform to local codes before such changes are effected.
12. The Contractor shall be responsible for reviewing all Contract drawings and coordinating with all trades the installation of luminaires and devices. Luminaire and device finishes and construction shall be compatible with the approved wall and ceiling types which shall be determined by the Contractor's review of all Contract drawings.

13. All luminaires shall be of the highest quality material and construction for their respective types.

14. Lamps for all luminaires shall be in accordance with EISA 2007.

15. Luminaires shall be suitable for connection to concealed or exposed conduit runs as required in each particular location and shall be of sizes suitable for lamp sizes indicated on the Contract Drawings.

16. Luminaires designated for emergency use shall be equipped with UL 924 compliant battery backup with a minimum emergency run time of 90 minutes.

17. Fittings and other materials for special luminaires not definitely shown or specified shall be of approved material, make and quality and shall have a finish that will harmonize with other parts of the luminaires. Where suitable standard materials are not available such parts of the luminaires shall be specially manufactured.

B. Field Testing:

1. Luminaires shall be field tested. The field testing shall be performed in accordance with the requirements specified under this Section.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. A list of proposed manufacturers with the products they produce proposed for the contract.

2. Manufacturer's catalog cuts and drawings showing all technical information, and construction details for luminaires, including dimensions, type of wiring, weight, size, installation methods, provisions for relamping or replacing luminaires from the ground, test information criteria and rated life in hours with corresponding standard.

3. Photometric data, developed for each fixture type.

4. Lamp type and technical information.

5. Ballast type and technical information.

6. Driver type for LED luminaires and technical information including input voltage, power factor, Crest Factor and THD.

7. Scaled Shop drawings showing the locations of all fixtures and devices. The Drawings shall include the proposed routing of the branch circuits.

B. Reports

1. Field test reports shall be submitted.

2. Manufacturer's site visit report shall be submitted.

C. Operations and Maintenance Manuals

1. Operations and Maintenance Manuals shall be submitted in accordance with this Section and the Specifications.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Luminaires and devices shall be delivered, stored and handled in accordance with this Section, the Specifications and the manufacturer's instructions.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall furnish and deliver to the Engineer, at that part of the site and at such time as the Engineer may direct, spare parts for luminaires and devices in accordance with this Section and the Specifications.

B. The spare parts shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the manufacturer's part number with complete information for use and reordering.

C. The following spare parts shall be furnished:

1. 10 percent lamps, lamp module or array shall be provided of each wattage of each type of lamp, lamp module or array but not less than the requirement for two luminaires.

2. Where the lamp, lamp module or array is an integral part of the luminaire and the lamp, lamp module or array is not normally replaceable provide spare luminaires instead.

3. 5 percent ballasts or drivers shall be provided of each type of type of ballast or driver, but not less than two.

4. 5 percent total fuses for each luminaire type and size but not less than one set for each size.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Lamps shall be as manufactured by:

1. Cree, Durham, NC;

2. Nichia America Corporation, Wixom, WI;

3. GE Lighting, Cleveland, OH;

4. Osram Sylvania, Wilmington, MA;

5. Or approved equal.

B. Drivers and Ballasts shall be as manufactured by:

1. Osram Sylvania, Wilmington, MA;
2. Universal Lighting Technologies Inc., Nashville, TN;
3. Eldo LED, Conyers, GA;
4. Advance Transformer, Rosemont, IL;
5. Or approved equal.

C. General use receptacles shall be as manufactured by:
1. Hubbel Incorporated, Shelton, CT;
2. Arrow-Hart Incorporated, Chicago, IL;
3. Or approved equal.

D. Hazardous location receptacles and 480 volt receptacles shall be as manufactured by:
1. Crouse-Hinds Company, Syracuse, NY;
2. Appleton Electric Company, Rosemont, IL;
3. Or approved equal.

E. General use switches shall be as manufactured by:
1. Hubbel Incorporated, Shelton, CT;
2. Arrow-Hart Incorporated, Chicago, IL;
3. Or approved equal.

F. Hazardous location switches shall be as manufactured by:
1. Crouse-Hinds Company, Syracuse, NY;
2. Appleton Electric Company, Rosemont, IL;
3. Or approved equal.

G. Plates shall be as manufactured by:
1. Hubbel Incorporated, Shelton, CT;
2. Arrow-Hart Incorporated, Chicago, IL;
3. Or approved equal.

H. Covers shall be as manufactured by:
1. Crouse-Hinds Company, Syracuse, NY;
2. Appleton Electric Company, Rosemont, IL;
3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Luminaires

1. A luminaire shall be provided for each luminaire symbol shown on the Contract Drawings.
2. Luminaires shall be provided with all necessary hangers, supports, conduit adaptors, reducers, hooks, brackets and other support hardware. All hardware shall have a protective, non-corrosive finish.
3. Recessed luminaires shall be provided with trim moldings and frames suitable for the types of ceilings.
4. Pendent mounted luminaires shall be suspended by means of an enclosed and gasketed cushion type hanger. The hanger shall be suitable to be mounted directly to the luminaire outlet box and shall provide a minimum of 8 degrees swing from the vertical. Stems shall be threaded rigid metal conduit, 1/2 inch minimum size. In corrosive areas stems shall be PVC coated.
5. Where luminaires are subjected to moisture, or assembled of dissimilar metals, gaskets of approved material and thickness shall be provided.
6. Luminaires shall be completely wired except where they will be directly connected to branch circuit wiring. The conductors shall be not less than No. 12 gauge, stranded, with approved heat resistant covering.
7. Mounting heights of all luminaires shall be as shown on the Contract Drawings. For special types, the height shall be determined at the time of installation.

B. Lamps

1. Lamps in association with their ballasts or drivers shall have voltage ratings suitable for the voltages shown on the Contract Drawings.
2. The color temperature of lamps shall be such that the installed luminaire color temperature is as listed in this Section or shown on the Contract Drawings.
3. LED lamps shall be in accordance with the following:
   a. Comply with UL 8750
   b. CRI of not less than 85
   c. Minimum efficacy of 140 lumens/watt
   d. Lamp L80 life of not less than 100,000 hours at 25 degrees C
   e. Maximum junction temperature of 150 degrees C
   f. Binning per ANSI C78.377 at 85 degrees C
   g. Very low thermal resistance to permit optimum heat transfer from the junction to the operating ambient.

C. Drivers and Ballasts

1. General:

a. Ballasts and Drivers shall be matched for proper operation of lamps and shall meet the requirements for luminaire light output, reliable starting and operation.

b. Ballasts shall be UL listed and certified by approved Nationally Recognized Testing Laboratories (NRTL). Testing Laboratories and shall conform to CBM.

2. LED Drivers

a. LED drivers shall be matched to their lamps such that the luminaire supply voltage and its likely site variations shall produce a level of performance indicated in this Section and as shown on the Contract Drawings

b. LED Drivers in conjunction with the respective luminaire construction shall achieve the following:

1) Specified lumen output with variation from specified voltage of plus or minus 10%.

2) Rated life of not less than 100,000 hours.

3) THD of less than 10% across the specified voltage range and full power.

4) Power factor of not less than 95% and over the full range if dimming specified.

5) Consistent performance over the range of temperatures expected at the installation location either indoors or outdoors.

6) Cooling shall be achieved with static arrangements. Active cooling, thermal foldback or thermal sensing to achieve temperature control are not permitted.

c. Electrical connections between LED Drivers and all components of the luminaire shall be polarized and color coded to permit trouble free connection and reconnection. A connection diagram shall be imprinted on the Driver or the internal of the luminaire.

3. Lighting Contactor Panels

a. Lighting contactor panels shall be provided for the control of luminaires where specifically indicated on the Contract Drawings. The panel control and devices shall be arranged for proper operation in accordance with the control schematics shown on the Contract Drawings.

b. The panel enclosures shall be steel, single door type. Enclosures shall be NEMA 12 for dry, indoor areas and NEMA 4X for wet or corrosive areas. Each enclosure shall be equipped with a control fuse with mounting block and 300 volt screw type terminal blocks.

c. Contactors shall be mechanically held type suitable for 120 volt operation and switching ballast type lighting. Contactor voltage, ampere, number of poles and quantities within each panel shall be as shown on the Contract Drawings.

d. Where indicated on the Contract Drawings, the lighting contactor panels shall be provided with selector switches and control relays. Selector switches and control relays shall be heavy duty industrial type.

4. Receptacle and Switches

a. General:

1) Receptacles and switches shall be provided in accordance with the Detailed Specification and as shown on the Contract Drawings. The receptacles and switches shall be complete and shall include all accessories for proper installation.

2) Outlet boxes for receptacles and switches shall be in accordance with Section 26 05 33 – Raceway and Boxes for Electrical Systems.

5. Receptacles:

a. Receptacles shall be duplex grounding type, two pole, three wire, 125 volt AC, 20 ampere. . Where shown on the Contract Drawings, receptacles shall be ground fault type or surge suppression type.

b. Where shown on the Contract Drawings, other special receptacles with number of poles, voltage and current rating shall be provided. Matching plugs shall be provided for each special receptacle.

c. Receptacles for indoor dry, dusty locations shall be heavy duty, straight blade type, with reinforced polyester base and impact resistant nylon face.

d. Receptacles for wet and corrosive locations shall be marine duty, straight blade type, with heat resistant melamine body, weatherproof while use type. Special receptacles in wet and corrosive locations shall be Type 316 stainless steel.

e. Receptacles for hazardous locations shall be factory sealed and shall be in accordance with the following:

1) Explosion-proof type receptacles shall be of the delayed action type requiring the turning of a plug shell on withdrawal to allow time for extinction of arcs.

2) Surface mounted explosion-proof receptacles shall be provided with cast iron or cast aluminum angle type covers with hinged flaps.

3) Flush mounted explosion-proof receptacles shall be provided with brass, chromium plated, flush plates with double hinged flaps.

4) Plugs shall be provided where required for each type of explosion-proof receptacle. Plugs shall be of explosion-proof construction, and shall have steel bodies with corrosion resistant finish. Plugs shall be fitted with aluminum alloy cable clamps and chloroprene cable bushings.

f. Receptacles for installation in floors shall be in accordance with the following:

1) Floor receptacles shall comprise a watertight unit consisting of a cast iron box with an adjustable top, permitting permanent angular and vertical adjustment, brass cover plate and 3/4 inch brass floor extension. The extension shall be of an approved height and shall be surmounted with a brass head arranged for a duplex receptacle. Exposed metal parts shall be finished to match adjacent metal finish.

2) For low voltage signal and telephone work, floor outlets shall be equal to those specified above for floor installation, except that the interiors shall be designed for cable extension as approved.

g. Fan or clock outlets shall be single receptacles with molded composition or bakelite bodies. Rating shall be 15 amperes, 125 volts. Fan outlets shall be furnished with stud supports. Clock outlets shall be of the recessed type and shall be furnished with yokes for clock support.

h. 480 volt receptacles in non-hazardous areas shall be a mechanically interlocked type with circuit breaker disconnect. The disconnect cannot be closed until the plug is fully inserted and the plug cannot be withdrawn or inserted unless the switch is open. The receptacle enclosure shall be copper - free aluminum with stainless steel parts.

6. Switches:

a. Switches shall be industrial-heavy duty, AC toggle quiet type. Switches shall be rated 120/277 volt, 20 ampere. Poles and switching shall be as shown on the Contract Drawings.

b. Switches for hazardous locations shall be factory sealed tumbler type. The switch body and cover shall be cast gray iron alloy or cast malleable iron with zinc electroplate finish.

7. Plates and Covers:

a. Stainless steel plates shall be furnished for devices in indoor dry, dusty locations. They shall have beveled edges and shall be made of Type 316, stainless steel.

b. Plates shall have satin finish. Attachment screws shall have matching head finish.

c. For wet and corrosive locations neoprene gasketed covers shall be used. Covers shall be 316 stainless steel in wet and corrosive locations. Covers shall be equipped with gasketed spring doors for receptacles and an external operating mechanism for switches.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Luminaires

1. Luminaires shall be installed at locations shown on the Contract Drawings. Luminaire locations shall be adjusted where necessary to clear conflicts and obstructions.

2. All luminaires shall be installed complete with all hardware, and supporting devices necessary to make a safe complete and fully operative installation.

3. The Contractor shall obtain from the manufacturer for each luminaire, diagrams, illustrations and other installation instructions. The Contractor shall install in strict conformance with such instructions and the requirements of NYCEC.

4. Recessed fixtures shall be installed in suspended ceiling openings in conformance with manufacturer's recommendations and to suit the architectural details of the area involved. Independent supports from structural members of the building shall be provided.

5. Every linear luminaire shall have at least two supports, and continuous lines of fluorescent luminaire shall be supported at 4 foot intervals.

6. Pendent mounted fixtures shall be installed with pendants 1/2 inch for stems up to 5 feet and 3/4 inch for longer lengths.

7. All pendant stem hangers shall be furnished with suitable aligner canopies or outlet box covers so that the luminaires hang vertical to the finished floor irrespective of the angle of the surface from which they are suspended.

When luminaires or hanger canopies are mounted flush to the ceiling or wall, and where raceways and outlet boxes serving the luminaires are surface mounted to the ceiling or wall, finishing rings shall be provided to conceal the outlet box. All visible hanging devices and appurtenances shall have the same finish as the luminaire.

8. Reflectors, lenses, diffusers, louvers and decorative elements of luminaires shall not be installed until completion of plastering, ceiling tile work, painting, and general clean-up in the area.

B. Lighting Contactor Panels:

1. Panels shall be mounted rigidly and securely to the building structure or to supporting devices which are rigidly and securely supported to the building structure.

2. Panels shall be fastened with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units and with machine screws or welded studs on metal.

3. All panels shall be mounted parallel or perpendicular to walls, such that panels are installed in a neat and professional manner.

C. Receptacles and Switches:

1. Receptacles and switches shall be installed within outlet boxes at locations indicated on the Contract Drawings and in accordance with code requirements.

2. Receptacles shall be mounted 2 feet above the finished floor, except in hazardous locations where receptacles shall be mounted 4 feet-6 inches above the finished floor.

3. Switches shall be mounted 4 feet 6 inches above the finished floor.

4. Where devices are grouped they shall be mounted under a common plate. Where directed or where space conditions limit gang mounting, tandem or tandem gang arrangement shall be provided.

5. Where four or more switches controlling fixtures that are not visible from the switch location are grouped, the switch plate shall be engraved and filled with colored material or otherwise suitably marked to designate the control of each switch.

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Tests

1. After installation, the completed lighting system and receptacle devices shall be field tested for operation and conformance. The field tests shall be witnessed by the Engineer and certified by the Contractor. The Contractor shall provide testing consisting of the following:

a. Wiring continuity test shall be performed.

b. Branch circuit load balance test shall be performed.

c. Fixture and control operation test shall be performed.

d. Receptacle polarity and grounding.

B. Reports

1. The Contractor shall provide a field test report. The report shall identify the test performed and the results obtained.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Cleaning of Luminaries

1. Luminaires shall be cleaned inside and out to remove construction dust prior to the start of Field Tests and again prior to substantial completion at the direction of the Engineer.

2. Fixtures shall be relamped prior to substantial completion.

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing outdoor lighting. Outdoor lighting shall be provided in accordance with the requirements under this Section, the Specifications and the Contract Drawings.

B. The outdoor lighting system shall be complete and include all luminaires, poles, pole bases, reinforced concrete foundations and accessories as required for the installation of the outdoor lighting.

C. The Contractor shall perform all excavations, complete all forms, and do backfilling and tamping as required, unless specifically shown otherwise on the Contract Drawings.

D. The following index of this Section is included for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 03 30 10 - Low Carbon Cast-in-Place Concrete

B. Section 03 21 11 - Reinforcing Steel

C. Section 26 05 27 - Grounding

D. Section 26 05 29 - Hangers and Supports for Electrical Systems

E. Section 26 05 33 - Raceways and Boxes for Electrical Systems

F. Section 26 05 53 - Identification for Electrical Systems

G. Section 31 23 16 - Excavation

H. Section 31 23 23 - Fill

1.04 REFERENCES

A. Outdoor lighting shall comply with the latest applicable provisions and recommendations of the following even if not specifically listed in this Section:

1. DLC PR - DesignLights Consortium Premium Technical Requirements
2. EISA 2007 - Energy Independence and Security Act of 2007
3. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Sold State Lighting Products
4. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules
5. IES TM-21 - Technical Memorandum on Projecting Long Term Lumen Maintenance of LED Light Sources
6. NEMA SSL-1 - Electronic Drivers for LED Devices, Arrays, or Systems.
7. NYCEC - New York City Electrical Code.
8. UL 1598 - Luminaires
9. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products.

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. General

1. Luminaires shall be UL listed and approved for use in the City of New York and comply with NYCEC.
2. The types of luminaires are noted within the fixture schedule which is shown on the Contract Drawings. The descriptions and catalog numbers serve to establish the quality, appearance and performance of the specified luminaires.
3. Luminaires shall comply with DLC PR.
4. All outdoor lighting luminaires, poles and associated equipment shall be the products of lighting equipment manufacturers and manufacturers who have previously demonstrated, by performance and reputation, the ability to manufacture products of the quality specified and shall have a minimum of 5 years' experience manufacturing the specified products. Such manufacturers must maintain an organization and manufacturing facility capable of actually manufacturing the specified luminaires, poles and associated equipment. For the purpose of inspection, Contractor shall assure the Engineer, free and easy access to the manufacturing facilities and inventories of any manufacturer whose equipment the Contractor proposes to supply.
5. Outdoor lighting system shall use stainless steel bolts, nuts, washers and screws.
6. Contractor shall ensure that all metals used for poles, bases, support hardware, bolts, nuts washers and screws are of similar material composition and where different, steps are taken to mitigate the effects of corrosion.

B. Field Testing

1. The outdoor lighting system shall be field tested. The field testing shall be performed in accordance with the requirements specified under this Section.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittal shall include, but not be limited to:

1. A list of proposed manufacturers with the products they produce proposed for the contract.
2. Manufacturer's catalog cuts and drawings showing all technical information, and construction details for luminaires, including dimensions, type of wiring, weight, size, installation methods and provisions for relamping luminaires from the ground.
3. Photometric data developed for each fixture including IES BUG ratings, isolux diagrams and IES lighting classification.
4. Lamp type and technical information.

5. Ballast type and technical information including power factor, input watts and ballast factor.

6. Driver type for LED and technical information including input voltage, power factor, Crest Factor and THD.

7. Pole and base construction details. For poles submit wind loading, complete dimensions and finish, include anchor bolt sizing and circle diameter.

8. Scaled Shop drawings showing the locations of all luminaires and shall include the proposed routing of supply conduits.

9. Bills of material.

B. Reports:

1. Field test reports shall be submitted.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Outdoor lighting equipment shall be delivered, stored and handled in accordance with this Section, the Specifications and the manufacturer's instructions.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Spare Parts

1. The Contractor shall furnish and deliver to the Engineer, at that part of the site and at such time as the Engineer may direct, spare parts for the outdoor lighting in accordance with this section and the Specifications.

2. The spare parts shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the manufacturer's part number with complete information for use and reordering.

3. The following spare parts shall be furnished, with all fractions rounded up to the next number:

a. 10 percent lamps, lamp module or array shall be provided of each wattage of each type of lamp, lamp module or array but not less than the requirement for two luminaires.

b. Where the lamp, lamp module or array is an integral part of the luminaire and the lamp, lamp module or array is not normally replaceable provide spare luminaires instead.

c. 5 percent ballasts or drivers shall be provided of each type of type ballast or driver, but not less than two.

d. 10 percent fuses shall be provided of each size and type, but not less than two.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Luminaires

1. Manufactures of luminaires shall be in accordance with Section 26 51 11 – Lighting Fixtures, Devices and Schedules.

B. Breakaway In-Line Streetlight connectors shall be as manufactured by:

1. Buchanan, Hackettstown, NJ;
2. Ideal Industries, Sycamore, IL;
3. Ilsco, Cincinnati, OH;
4. Or Approved Equal.

2.02 MATERIALS / EQUIPMENT

A. Luminaires

1. Luminaires shall be provided for each lighting fixture symbol shown on the Contract Drawings and in accordance with the lighting fixture schedule shown on the Contract Drawings.
2. Heights of all outdoor luminaires shall be as shown on the Contract Drawings.
3. Fixtures controlled by photocell shall include an on-off switch to overide the photocell as shown on the Contract Drawings.

B. Poles and Bases

1. Poles and bases shall be provided in accordance with the details shown on the Contract Drawings.
2. Poles shall have a wind load rating of at least 90 mph with a gust factor of 1.3.
3. Where shown on the Contract Drawings, bases shall be provided with plug receptacles, fuses, cut-outs, switches or other devices for protection and ease of maintenance. Devices shall be in accordance with the following:
   a. Receptacles shall be housed in stainless steel boxes and shall be watertight, heavy duty type with screwed caps.
   b. Switches shall be enclosed in stainless steel boxes. Where shown on the Contract Drawings switches shall be provided with fuses.

c. Where shown on the Contract Drawings, fused applications shall be provided with breakaway watertight, in-line fuse kits.

C. Reinforced Concrete

1. Concrete for pole foundations shall be in accordance with Section 03 30 10 – Low Carbon Cast-in-Place Concrete, and the concrete steel reinforcement shall be in accordance with Section 05 12 00 - Structural Steel Framing.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Luminaires shall be installed at locations indicated on the Contract Drawings. Fixture locations shall be adjusted where necessary to clear conflicts and obstructions.

B. Excavation for luminaire poles shall be in accordance with the requirements of Section 31 23 16 - Excavation.

C. Backfilling for fixture poles shall be in accordance with the requirements of Section 31 23 23 - Fill.

D. Luminaire poles shall be installed on reinforced concrete foundations as shown on the Contract Drawings. Poles shall be installed in accordance with standard procedures and as recommended by the manufacturer.

E. Poles shall be wired with strain relief provided. A green grounding conductor shall be installed with each circuit, grounding by conduit method shall not be permitted

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Tests

1. After installation, the completed outdoor lighting system shall be field tested for operation and conformance.

2. The field tests shall be witnessed by the Engineer and certified by the Contractor. The Contractor shall provide testing consisting of the following:

a. Wiring continuity test shall be performed.

b. Branch circuit load balance test shall be performed.

c. Fixture and photo cell operation test shall be performed.

B. Report

1. The Contractor shall provide a field test report.
2. The report shall identify the tests performed and the results obtained.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Cleaning of Outdoor Lighting

1. Luminaires shall be cleaned inside and out to remove construction dust prior to substantial completion.

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. Contractor shall provide all labor, material, equipment and incidentals as shown, specified and required to furnish, install, test and place into satisfactory operation a Process Monitoring Camera System as specified herein. This system shall be comprised of a Closed Circuit Television (CCTV) Surveillance System.

B. Contractor shall employ the services of a Process Monitoring Camera System Supplier with proven experience in the field. The Process Monitoring Camera Supplier shall assume full responsibility for the selection of equipment and components required. Specifically this shall include defining the required system components, preparing detailed system schematics, interconnecting wiring diagrams, field debugging, calibrating, and configuring the system as well as instructing plant personnel on the care and use of the system.

C. The CCTV systems provided shall be turnkey system solutions, wherein each component is seamlessly integrated with the overall system. The CCTV System shall employ common controls communications protocol and video signal formats throughout.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s), or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 40 61 13 - PMCS General Requirements

B. Section 40 61 26 - PMCS Training

C. Section 40 61 96 - PMCS Control Strategies

D. Section 40 63 53 - PMCS Network Equipment

E. Section 40 67 16 - PMCS Panels and Enclosures

F. Section 40 78 90 - PMCS Panel Mounted Instruments and Devices

G. Section 40 80 01 - PMCS Factory Testing

H. Section 40 80 82 - PMCS Startup and Field Testing

1.04 REFERENCES

A. Reference Standards:

1. International Electrotechnical Commission (IEC) 60529: 1989+AMD1:1999+AMD2:2013 CSV -
2. NYCEC - NYC Electrical Code
3. NYCCC - NYC Construction Code
4. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Minimum)
5. ONVIF - Profile G, Profile, M, Profile S, and Profile T
6. UL 508 - Industrial Control Equipment
7. UL Standard - 486A-486B - Wire Connectors

1.05 DESCRIPTION

A. The CCTV system shall provide surveillance of the facilities as shown on the Contract Drawings. The system shall include the following:

1. Power Over Ethernet (PoE) pan-tilt-zoom (PTZ) camera contained in outdoor enclosures at the TI-010 Dechlorination Facility and TI-011 Disinfection Facility with quantities as shown on the Contract Drawings.
2. Power Over Ethernet (PoE) fixed camera contained in environmental enclosure, for installation inside the Chemical Room, and Electrical Room for the TI-011 Dechlorination Facility and TI-011 Disinfection Facility with quantities as shown on the Contract Drawings.

3. Infrared (IR) lights.
4. Monitoring capabilities from existing SCADA computers.
5. Ethernet cable, 24V power supplies, mounting assemblies, and all necessary appurtenances for a fully functional CCTV system.

B. Configuration of the Process Monitoring Camera System shall be coordinated with the DEP and the Engineer. At a minimum, the system shall be configured as follows:

1. For all cameras, video monitoring shall be continuous.
2. IP Addresses and port configurations shall be coordinated with the Engineer and DEP during construction.

C. Control Description: CCTV Surveillance System provided under this project shall be implemented in such a way that live video feeds from the CCTV cameras shall be viewed on the existing SCADA workstations over the DEP's CCFISS network. PoE cameras shall be connected to the ethernet switch in the CCTV-CP-10D at TI-010D Dechlorination Facility, and CCTV-CP-11 at TI-011 Disinfection Facility, with communication to the relevant Programmable Logic Controller (PLC) Panels at the respective sites, as shown in Contract Drawings. Provide support to Systems Integrator, and coordinate work required to integrate the cameras on the CCFISS network.

D. Suitably regulated electrical power shall be provided to all equipment and components furnished under this Section. Contractor shall furnish alternate power supplies, as required, suitable to drive components utilizing different voltages. Surge arrestors shall be provided, as required, to protect all equipment from power surges and voltage spikes.

E. Managed ethernet switches, Network Video Recorders, Uninterruptible Power Supplies, Keyboard-Video-Mouse Switch, control panel enclosures, panel appurtenances, and other required appurtenances for the CCTV Surveillance System.

1.06 QUALITY ASSURANCE

A. In order to ensure standardization, proper interfacing and compatibility, it is required that all equipment offered under this Section be furnished by a single Supplier who shall provide all equipment required for a proper installation and coordinate all Shop Drawings.

B. The Process Monitoring Camera System Supplier shall have a minimum of five years' experience in the production of similar equipment and shall show evidence of at least five installations in satisfactory operation for at least three continuous years.

C. The Process Monitoring Camera System Supplier shall be responsible for providing all components and software for the surveillance control systems.

D. All items of equipment, including wire and cable, shall be compatible.

E. The Process Monitoring Camera System Supplier shall provide on-site manufacturer's representatives to oversee installation and to verify that installation of all equipment is in compliance with manufacturer requirements. Supplier shall provide a written report verifying that the installation is complete, fully functional, and in compliance with all manufacturer requirements.

F. Shall have a UL approved panel shop.

G. The Supplier shall be responsible for providing a panel enclosure for the required equipment and appurtenances to interface with the cameras at the respective sites. Panel build requirements shall be as specified in Section 40 67 16 – PMCS Panels and Enclosures.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Product Data:

1) Manufacturer's literature, illustrations, specifications and engineering data including:

a) General arrangement

b) Outline drawings

c) Dimensions

d) Materials

e) Size

f) Weight

g) Performance data

b. Product information for panels including layout drawings, wiring schematics, logic diagrams, and equipment required to interface with the cameras in accordance with the requirements of Section 40 61 13 – PMCS General Requirements, Section 40 63 53 – PMCS Network Equipment, and Section 40 67 16 – PMCS Panels and Enclosures. Wiring schematics shall show required ethernet communication cable interface with process control panel(s) provided under Division 40.

c. Shop Drawings:

1) Fabrication, assembly, and installation drawings.

2) Complete riser diagrams clearly labeling all conduit and wire.

3) Layout drawings with conduit and equipment numbers.

2. Information Submittals:
   a. Certificates:
      1) Certificates of Compliance/Manufacture.
      2) Experience Certificates.
   b. Supplier Instructions:
      1) Installation Instructions.
   c. Source Quality Control Submittals:
      1) Submit reports for all required shop tests.
   d. Site Quality Control Submittals:
      1) Submit reports for all required field-tests.
      2) Submit reports for all manufacturer's site visits.
3. Closeout Submittals:
   a. Operation and Maintenance Manuals:
      1) Submit complete installation, operation and maintenance manuals including test reports, maintenance data and schedules, description of operation and spare parts information.
      2) Furnish operation and maintenance manuals in conformance with the requirements of Section 01 78 23, Operation and Maintenance Data.
   b. Software:
      1) Software Manuals.
4. Maintenance Materials Submittals:
   a. Spare Parts:
      1) Manufacturer’s recommended spare parts and maintenance materials:
   b. Tools:
      1) List of all special tools required for routine maintenance.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents.
   1. Security and process monitoring equipment shall be inspected by the Contractor for shipping damage or loose parts when received. Evidence of water, which may have entered equipment during transit, shall be checked.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents.

1. Equipment shall be stored in a clean, dry location in which a uniform temperature is maintained. Equipment shall be protected with coverings and maintain air circulation.

2. Where dampness or condensation may be encountered, heaters shall be provided for equipment to prevent moisture damage.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Contractor shall furnish and deliver the spare parts as outlined below, all of which shall be identical and interchangeable with similar parts furnished under this specification.

B. The following shall constitute the minimum spare parts:

1. Five (5) LED light subassemblies / bulbs for the explosion proof camera.

C. Spare parts shall be packed in sturdy containers with clear indelible identification markings and shall be stored in a dry, warm location until transferred to the DEP at the conclusion of the Project.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide Weather Proof (Outdoor) PTZ Camera as manufactured by:

1. Pelco Model S7230L-PW

2. No alternate manufacturer or product will be accepted.

B. Provide Environmental Enclosure PTZ (Interior Location) Camera as manufactured by:

1. Pelco Model IMP231-1ES .

2. No alternate manufacturer or product will be accepted.

C. Provide Video Storage Server as manufactured by:

1. Pelco Model VXP-E3-4-J-S.

2. Genetec, Inc. Streamvault.

3. Or approved equal.

D. Provide Keyboard-Video-Mouse Switch as manufactured by:

1. IOGear .

2. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Cameras:

1. General:

a. Provide PTZ Cameras as shown.

b. The Weather Proof PTZ camera system shall consist of an outdoor camera and housing designed specifically for use in moderate to severe climate conditions and shall include l IP 67 water resistant, NEMA 4X enclosure rating for wind-blown dust, water, and corrosion resistance along with any accessories which may be required for a complete Weather Proof camera system.

c. The interior Environmental Enclosure PTZ camera shall consist of an indoor camera and housing designed specifically for use in corrosive environments.

d. The camera system shall be able to transmit/receive video, and data over a single ethernet cable. All mounting hardware shall be furnished with the system. Cameras and mounting hardware type shall be as shown or specified. Manufacturer shall provide system with one 100BASE-TX, RJ45 connector.

2. Weather Proof PTZ Camera Features:

a. Type: High Speed PTZ.

b. Lens: f/1.6~f/4.4, focal length 4.5 mm (wide), ~135.0 mm (tele) .

c. Signal Format: Ethernet, Pelco API, or Onvif Profile.

d. Sensitivity: 0.035 lux for color (33 ms).

e. Iris Control: Auto iris with manual override .

f. Electrical:

1) Powered Over Ethernet (PoE). Contractor to provide CAT 6 ethernet cabling to network switch (which shall be for POE injector) as required.

g. Mounting Brackets:

1) All mounting brackets shall be of aluminum painted, corrosion-resistant construction and shall be load rated to support camera and accessories specified herein. Mounting heads shall be adjustable.

h. Environmental Enclosure:

1) Weather Proof, NEMA 4 and IP67 rated.

2) Material: Aluminum.

3) Operating Temperature: -60° to 140°F (-51° to 60°C).

4) Electrical Ports/Connections: RJ-45 connector for 100 Base-TX and 1000 Base-TX, Auto MDI/MDI-X, Auto negotiate/manual setting

3. Environmental Enclosure PTZ Camera Features:

a. Type: High Speed PTZ.

b. Lens: f/1.4, focal length 2.8 – 12 mm nominal.

c. Signal Format: Ethernet, Pelco API, or Onvif Profile.

d. Sensitivity: 0.0169 lux at 33 ms.

e. Iris Control: Auto iris with DC-Iris.

f. Field of View: Diagonal - 123º-40º, Horizontal - 103º-35º, Vertical - 54º-20º

g. Electrical:

1) Powered Over Ethernet (PoE). Contractor to provide CAT 6 ethernet cabling to network switch (which shall be for POE injector) as required.

h. Mounting Brackets:

1) All mounting brackets shall be of aluminum body, corrosion-resistant construction and shall be load rated to support camera and accessories specified herein. Mounting heads shall be adjustable.

i. Environmental Enclosure:

1) Weather Proof, NEMA 4 and IP66/67 rated.

2) Material: Ruggedized aluminum, anodized.

3) Operating Temperature: -40° to 140°F (-40° to 60°C).

4) Operating Humidity: 5% to 95%, RH condensing

4. Surge Protection:

a. Each camera shall be protected with lightning arrestor at each end of the cable, at the camera site and the head end equipment where the cabling is connected to the fiber-optic backbone.

b. The connections to the surge protection devices shall be made with BNC connectors.

B. Video Storage Server

1. General: The Video Storage Server shall function as a Network Video Recorder (NVR) and shall manage archiving and streaming videos from IP

cameras and encoders over an IP network. Video feeds from all new IP cameras and shall be directly recorded into this Video Storage Server.

2. Features:

   a. Shall support minimum of 32 standard or high definition IP video channels over a 1000/10G Base-T network interface expandable to 128 standard or high definition IP video channels, total system quantity based on a total system recording bandwidth of 250 Mbps.

   b. Shall support video recording of JPEG, MPEG-4, and H.264 streams from CCTV cameras using NTSC or PAL format.

   c. Recording frame rate and resolution shall be configurable independently for each camera.

   d. The system shall support Pelco and third-party H.264 Megapixel (MPx) video streams up to 10 (MPx) resolution with quantities based on a total system recording bandwidth of 280 Mbps.

   e. The system shall have a fully open architecture with support for both IP-specific camera drivers as well as cameras with ONIVIF compliance.

   f. The system shall support automatic detection of Pelco IP cameras. Third-party IP cameras may also be automatically detected dependent on IP driver versions and manufacturers specifications.

   g. The system shall operate on 2nd generation Intel Core i5-9500™ processor or higher with minimum of 8GB RAM.

   h. Operating system: Microsoft Windows 10 IoT Enterprise 64-bit, latest service pack or higher.

   i. Storage: minimum 4 TB internal and expandable up to 32 TB.

   j. The system shall allow archival of video data to computers or SAN storage devices over a network connection with the optional DS Archive Utility. The archival schedule shall be either automatic at user-defined intervals or manual and shall be configurable per connected camera.

      1) Software will be licensed based per archived recorder

      2) Software will require a single archive server for search, playback, clip, and maintenance

      3) Each archive software shall support up to five recorders

      4) Video shall only be copied for archive; existing video will remain on the recorder until over-written

   k. The system shall support network health and monitoring utilizing third-party SNMP monitoring tools.

l. The system shall indicate system performance and operation status utilizing a variety of HTML reports.

m. The system shall display system health monitoring data utilizing front panel LED displays and display pop-ups.

n. The system shall provide the capability of running a client application in additional to the video management system.

o. A client computer with system compatible software shall be the user interface for viewing one or more systems. Live and recorded video and current event video shall be displayed on any client computer using a proper login and password. The client computer shall be able to connect to an unlimited number of recorders simultaneously to display live and recorded video.

p. Client Software shall be provided from the same manufacturer and shall be license-free and available to be installed on as many clients as required by the user.

q. Connectors:

1) Two high-speed USB 3.0 ports, three USB 3.1 Type-C ports.

2) 4x Mini Display Port (DP++) 1.4

3) 1x1Gigabit Ethernet (1000 Base-T),1x10 Gigabit Ethernet (10GBase-T)

4) DisplayPort audio ports

r. Operating environment: 50° to 95°F (10° to 35°C) at 10 to 85 percent non-condensing humidity.

s. Power:

1) Input Voltage 100 to 240 VAC ±10%, 50/60 Hz

2) Power Consumption 550 W maximum

C. CCTV Control Panel(s)

1. Provide Control Panels to house the required network equipment, and recorder devices interfacing with the camera(s) at the respective locations, as noted on the System Architecture drawings. Panels shall be NEMA 12 and built in accordance with the requirements of Section 40 67 16 – PMCS Panels and Enclosures.

2. Provide managed ethernet switch to interface with the network video recorder, Keyboard-Video-Mouse (KVM) Switch and associated cameras. Managed ethernet switch shall be in accordance with the requirements of Section 40 63 53 – PMCS Network Equipment.

3. Provide Uninterruptible Power Supply (UPS) in each CCTV Control Panel in accordance with the requirements of Section 40 78 90 – PMCS Panel Mounted Instruments and Devices.

4. Panel nomenclature shall be in accordance with the list provided in Section 40 67 16 – PMCS Panels and Enclosures. Provide required tagging and nameplates in accordance with the requirements of the same Specification Section.

5. All panel appurtenances shall be provided in accordance with the requirements of Division 40.

D. Keyboard-Video-Mouse Switch

1. General:

a. Provide a UL-certified keyboard-video-mouse (KVM) switch that will enable the operators to access the Video Storage Server from the DEP CCFISS Network.

2. Features:

a. KVM switch shall have capability to communicate over Ethernet network.

b. KVM switch shall be a single port over IP with both USB and PS2 connectors for the server and client connections.

c. KVM shall be equipped with dual 10/100 Ethernet and a local KVM interface for direct access.

d. Power: 1 x AC (110 -240V) input to +12V DC (1 amp) external power adapter (detachable regional plug)

e. Security: AES 256-bit encryption for all transmitted data, RSA 1024-bit encryption for authentication

f. Connectors:

1) 2 x RJ-45 10/100 UTP Ethernet (HUB)

2) 2 x USB Host Connectors (Keyboard, mouse)

3) 1 x HD-15 - for local KVM - 3 in 1 cable 11" (28 cm)

4) 1 x Integrated 3 in 1 KVM cable to host server 22.5" (57 cm)

5) 1 x mini USB device connector (virtual media) and device cable

6) 1 x RJ-45 RS232 Connector (with PC DB-9 adapter cable)

7) 1 x DC Jack for +12V DC input power

8) 1 x Reset Button

9) 1 x Rack Mounting Adapter Plate

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Contractor shall examine the conditions under which the Work is to be installed and notify the Engineer, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Manufacturer's Representative:

1. Contractor shall furnish the services of a qualified manufacturer's service representative to assist in the installation of security system equipment, check the installation before it is placed into operation, assist in the performance of field tests, observe and assist initial operations and train the plant operations and maintenance staff in the care, operation and maintenance of the equipment.

2. Contractor shall arrange with the equipment manufacturer or approved representative to provide direct supervision of all final connections between equipment and the wiring system.

B. Reports: Contractor shall submit a report from the manufacturer of each visit to the Site. Contractor shall provide complete information on time, schedule, tasks performed, persons contacted, problems corrected, test results, training, instruction, and all other pertinent information.

1. The services of the manufacturer's representative shall be furnished for installation supervision for at least the following number of days:

Visit:	Purpose:	Number of Visits:	Person-days per Visit:
No. 1	Installation Supervision	2	1

2. Should additional days of service be necessary for a successful installation, such services shall be provided by the Contractor at no additional cost to the City.

C. Install in conformance with the requirements of National Electrical Code.

D. Install all security equipment at the locations as shown and in accordance with the manufacturer's recommendations.

E. Contractor shall ensure that adequate strain relief is provided in the installation of cameras to prevent premature damage to cables caused by continual flexing in pan/tilt applications.

F. The CCTV System shall be installed and wired completely as shown by Contractor who shall utilize the services of a qualified installer.

3.03 FIELD TESTING / QUALITY CONTROL

A. Integrated System Field Test:

1. After installation of the equipment, controls and all appurtenances, Contractor shall field test the equipment for system operation and conformance to the specified performance parameters.

2. Contractor, under the observation of the Engineer, shall provide the services of factory-trained technicians to perform the following:

a. Check and approve the installation of all components of the CCTV monitoring system and all cable connections between various components prior to placing the components into operation.

b. Conduct a complete system checkout and adjust cameras, check operational functions of all of the equipment supplied under this Contract. All problems encountered shall be promptly corrected to prevent any delays in start-up.

1) Confirm focus is set and image is acceptable.

3. Contractor shall provide all test equipment necessary to perform the testing during system checkout and testing.

4. Contractor shall be responsible for initial system operation and shall make any changes, adjustments or replacements of any or all components, within the warranty period, if required, until the equipment supplied performs satisfactorily as intended.

5. Contractor shall furnish to the Engineer certified copies of set-up and adjustment reports for all specified devices.

6. Contractor shall furnish the Engineer an installation and inspection report certifying that all equipment has been installed correctly and is operating properly. The report shall be signed by the authorized representatives of Contractor and the system supplier.

B. The Contractor shall provide the services of the manufacturer's representative at such times and for such durations of time as are needed to perform the field testing tasks required of the representative:

1. The services of a manufacturer's representative shall be furnished for field testing for at least the following number of days:

Visit	Purpose:	Number of Visits:	Person-days per Visit:

No. 2	Field Testing	2	1

3.04 STARTUP / DEMONSTRATION

A. Operational Availability Demonstration:

1. Operational Availability Demonstration (OAD) shall begin following completion of the Integrated System Field Test as specified above and shall continue until a time frame has been achieved wherein the system hardware, communications and functionality availability meets or exceeds 99.8 percent for 60 consecutive days and no system failures have occurred which result in starting the OAD over again. During the OAD the Security System shall be available for use in normal security operations at the Plant.

2. For the purpose of the Operational Availability Demonstration, the system will be defined as consisting of the following systems and components:

   a. CCTV System.

   b. Integrated functionality, both monitoring and control, with the existing security systems on site.

3. The conditions listed below constitute system failures which are considered critical to the operability and maintainability of the system.

4. The Operational Availability Demonstration shall be terminated if one or more of these conditions occur. Following correction of the problem, a new 60 consecutive day OAD shall begin"

   a. Failure to repair a hardware problem within 120 consecutive hours from the time of notification of a system failure.

   b. Recurrent hardware problems: the same type of problem occurs three times or more.

5. Each of the following conditions constitutes a system failure in determining the system availability:

   a. Failure of hardware.

   b. Loss of communications between devices.

   c. Failure of one or more devices simultaneously.

   d. Failure of five field devices.

   e. Failure of backup power supply or failure of the backup supply to operate properly and maintain supply power shall constitute a system failure.

6. The system availability shall be calculated based on the following equation:

$$A = \frac{TTO}{TTO + TTR} \times 100 \text{ percent}$$

where, A = system availability in percent
TTO = total time in operation
TTR = total time to repair

7. Time to repair shall be the period between the time that Contractor is notified of a system failure and the time that the system has been restored to proper operation in terms of hours with an allowance for the following dead times which shall not be counted as part of the time to repair period

   a. Actual travel time for service personnel to get to the Plant - up to 6 hours per incident from the time Contractor is notified of a system failure.

   b. Time for receipt of spare parts to the Plant once requested up to 24 hours per incident. No work shall be done on the system while waiting for delivery of spare parts.

8. Dead time shall not be counted as part of the system test period. The dead time shall be recorded and the duration of the OAD extended for an amount of time equal to the total dead time.

9. Completion of a 60 consecutive day period without any restarts of the OAD and with system availability in excess of that specified will constitute acceptance of the system by DEP.

10. All parts and maintenance materials required to repair the system prior to completion of the OAD shall be supplied by Contractor at no additional cost to DEP. If parts are obtained from the required plant spare parts inventory, they shall be replaced to provide a full complement of parts as specified.

11. Malfunction/Repair Reporting Form shall be completed by the Plant personnel and Engineer to document system failures, to record Contractor notification, arrival and repair times and Contractor repair actions. Format of the form shall be developed and agreed upon prior to the start of the OAD.

B. Furnish the services of a qualified manufacturer's representative to assist in the start-up of the equipment and train DEP operations and maintenance staff in the care, operation, and maintenance of the equipment in accordance with the requirements of the Contract Documents. In addition:

1. Contractor shall make all adjustments required to place Work in proper operating condition.

2. Contractor shall include in training of DEP personnel instruction on care and maintenance of the materials and equipment.

3. In the event of trouble with the equipment during startup / initial operation, the manufacturer's representative shall revisit the Site as often as required until all troubles are corrected and the installation is entirely satisfactory.

C. At a minimum, the services of the manufacturer's representative shall be provided as indicated, below. The number of visits and person-days per visit indicated, below, shall be understood as referring to the total required services for equipment provided under this Section.

Visit:	Purpose:	Number of Visits:	Person-days per visit:
No. 3	Startup / Initial Operation	2	1
No. 4	Training	4	1

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 31 09 16.10 - DYNAMIC PILE TESTING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish all equipment, materials and services for driving and removal, if required, of test pile(s) and dynamic pile hammer testing by an independent testing agency employed by the Contractor.

B. Installation of drive-test piles as indicated on the Contract Drawings, specified or approved to complete the Work.

C. Modifying pile driving system or replacing hammer if test results show that the pile driving system does not meet the minimum energy requirements for selected piles.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

B. The cost of providing additional dynamic pile hammer testing due to failure of hammer to meet the minimum transferred energy requirement, or due to a change in pile hammer, shall be borne by the Contractor.

SECTION 31 09 16.10 - DYNAMIC PILE TESTING
CONTRACT CSO-FC-DF

1.03 RELATED SECTIONS

A. Section 31 09 16.20 -Pile Load Tests, Compressive, Lateral and Uplift Loads

1.04 REFERENCES

A. ASTM D4945 - Test Method for High Strain Dynamic Testing of Piles

1.05 DESCRIPTION

A. Performance Requirements

1. The working load of the piles shall be as shown on the Contract Drawings.

2. Tested piles shall be sacrificial; and non-production piles. The Contractor shall obtain the Engineer's approval for each pile so tested and so reset.

3. Piles which do not meet test requirements for the working load of the piles shall be rejected and additional testing shall be performed on other piles at no additional cost to the City.

B. Schedule of Operation

1. Dynamic pile testing shall be scheduled sufficiently in advance of production pile driving to prevent delay in the progress of the Work.

2. No production piles shall be driven until the dynamic pile testing is approved by the Engineer.

C. Vibration Monitoring

1. When driving piling, the Contractor shall monitor vibration using seismograph at locations shown on the Contract Drawings.

D. Dynamic Pile Testing

1. Dynamic pile testing on drive-test piles shall be in accordance with ASTM D4945. The testing shall be performed at locations shown on the Contract Drawings. driving resistance, testing and recording of data shall be under the direct supervision of the registered Professional Engineer engaged by the Contractor. A report shall be submitted as specified in this Section.

1.06 QUALITY ASSURANCE

A. Dynamic pile hammer testing and drive testing shall be performed in the presence of the Engineer.

B. Dynamic pile hammer testing shall be performed by an independent testing agency with a minimum of five years of experience in testing and instrumentation of same type of work.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Pre-Construction Submittals, submitted no less than three (3) weeks prior to start of work:

a. Experience and qualifications of Dynamic Testing Contractor.

b. Pile Driving Equipment Data:

1) Submit detailed information regarding make and model of pile hammer and driving equipment three weeks prior to commencement of indicator pile driving activities. Submit details of driving helmets, cap-blocks, hammer cushions, and driving heads. Include weight, dimensions, stiffness and coefficient of restitution of cap block assembly (helmet, hammer cushion materials, and driving head).

2) Do not commence pile driving activities until complete pile hammer and driving equipment submittals have been received and accepted by the Engineer.

c. Pile driving layout and sequence plan:

1) Description of installation and dynamic test procedures including locations of tests, anticipated driving resistance and methods including redriving, restriking.

2) Show the location, identification, order and orientation in which piles will be driven, and describe how the sequence will minimize piles from being displaced laterally when driving subsequent piles.

3) Results of Wave Equation Analyses of the piles and pile driving equipment proposed by the Contractor indicating the driving stresses in the pile and confirming the pile set (in blows per inch) and pile hammer energy needed to obtain the required pile capacities at the end of initial drive and upon restrike. Wave Equation Analyses shall also include a drivability analysis. The Wave Equation Analyses and calculations shall be signed and sealed by a Professional Engineer licensed in the State of New York.

d. Manufacturer's or vendor's data on transducers, computers, wiring and schematic drawings for the dynamic testing equipment.

e. Sample of the dynamic testing apparatus output. Output shall include recorded input, reduced data and analysis.

2. Sample of pile driving record/report.

3. Detailed description of testing sequence and procedure, evaluation of results and planned reports.

4. After completion of dynamic pile tests and drive tests, perform a refined wave equation analysis and submit a test report for review and approval by the Engineer. The test report shall include information specified in ASTM D4945 and recommendations for production pile lengths and driving criteria.

5. Submittals pertaining to the piles, pile driving equipment and static load tests shall be as specified in the relevant pile Specification Sections.

B. Construction Submittals:

1. New or modified pile driving system or installation procedures, as applicable.

2. The Contractor shall also submit a complete preliminary report to the Engineer at the completion of each dynamic pile test within 24 hours of the completion of each test. The Contractor shall engage the services of a Professional Engineer, subject to the approval of the Commissioner, licensed in the State of New York, experienced in dynamic pile testing and test analysis for the supervision of dynamic testing procedures and preparation of the report. The report shall include, but not be limited to:

a. Pile identification and location.

b. A description of the pile driving equipment.

c. Driving records for test piles.

d. Complete test data.

e. Available kinetic energy developed by the hammer.

f. Transferred energy (efficiency) from hammer to pile;

g. Predicted ultimate static bearing capacity using three or more methods;

h. Maximum compressive force in pile;

i. Maximum tension force in pile;

j. Maximum impact velocity at pile top;

k. Maximum acceleration at pile top.

l. Analysis of test data.

m. Recommended allowable design loads based on the pile test data.

n. Description of subsurface conditions.

o. Recommended pile installation criteria.

C. Contractor shall submit a summary report prepared by its dynamic testing agency subcontractor. Summary report shall include all finalized data from all piles tested.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Dynamic monitoring shall be performed using a Pile Driving Analyzer. All equipment necessary for the dynamic monitoring such as sensors, cables, etc., shall be furnished by Dynamic Testing Contractor. The equipment shall conform to the requirements of ASTM D4945.

B. The Pile Driving Analyzer (PDA) instrumentation equipment shall include at least two accelerometers and two strain gauges and the pile driving analyzer. The accelerometers and strain gauges are attached to the test piles with bolts through pre-drilled and threaded holes. Wires from each gauge are collected at a connection box that hangs from the pile hammer using a chain. A single cable runs from the connection box to the Pile Driving Analyzer located on the ground. Wireless technology also may be used.

C. Provide power capable of operating an electric drill to install sensor attachment holes in the test piles. Provide a 12 to 24 volt D.C. power source (e.g. car battery) for operating the Pile Driving Analyzer.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examination of Site

1. Prior to starting operations, an examination of the site shall be performed in accordance with Section 31 62 23.13 - Concrete-filled Steel Piles .

3.02 IMPLEMENTATION

A. Test Pile Program

1. A minimum of twenty-one (21) calendar days prior to installing drive-test piles, the Contractor shall submit its testing agency's initial wave equation analysis for the pile-hammer system to be used and taking into consideration the soils in which the pile will be embedded in accordance with the Section 1.07.A.3.C. The submittal shall include estimated static capacity versus driving resistance and pile stress versus driving resistance.

2. The Contractor shall provide and install test piles where shown on the Contract Drawings or as directed by the Engineer to determine lengths of production piles to be furnished to achieve twice the pile design load. At

each test pile location, the Contractor will provide driving records for the test pile.

3. Piles located at Contract pile locations can become part of the completed structure provided they are approved as conforming to requirements specified for production piles. The Contractor shall assist the Engineer in verifying measurements and driving characteristics, as necessary, to aid in the analysis of the piles.

4. Install all test piles with the same type and model of equipment and methods to be used to install production piles.

5. Redriving of test piles to assess setup may be required as determined by the Engineer. The Contractor shall assume that a redrive will be required at intervals on each test pile within a 24-hour period after completion of driving. Should the driving period fall on the last workday of a week, then the redrive will occur on the next workday.

B. Dynamic Pile Hammer Testing

1. During redriving of the test pile, the pile hammer shall be dynamically tested by the testing agency to verify that the hammer is delivering the minimum specified energy to the pile.

2. During pile driving operations, dynamic measurements shall be taken by the testing agency at the tops of selected piles chosen at random by the Engineer. All Work associated with providing and installing the instrumentation and obtaining the measurements shall be performed by the testing agency.

3. The Engineer shall have access to the test piles. Measurements to be obtained will consist of the following information:

   a. Transferred energy (efficiency) from hammer to pile.

   b. Predicted ultimate static bearing capacity.

   c. Maximum compressive force in pile.

   d. Maximum tension force in pile.

   e. Maximum impact velocity at pile top.

   f. Maximum acceleration at pile top.

4. If dynamic measurements indicate that the pile driving system does not provide the minimum specified transferred energy, the Contractor shall either replace the hammer or make whatever modifications to the pile driving system that are necessary, subject to approval of the Engineer, to provide the minimum energy.

5. The testing agency shall perform the monitoring work and obtain the required analyses.

6. The minimum required transferred energy between the hammer and pile shall be at least 50 percent of the rated energy for each type of hammer used in pile driving operations.

7. Piles which are subjected to static pile load tests will be subject to dynamic testing and analyses during driving and during redriving.

8. Perform dynamic pile testing on drive-test piles in accordance with ASTM D4945 and prepare a written report of the drive test pile program. This report shall utilize the results from the static pile load tests and shall contain a discussion of the pile capacity and driving characteristics. Report shall explain any unusual conditions encountered during driving and explanation and recommendations when established driving criteria cannot be met.

9. Analyses of the dynamic pile testing shall be performed on data obtained from the initial driving and the restrike of the drive test piles.

10. The Contractor's testing agency shall perform refined wave equation analyses using the results of each drive test pile and incorporate the refined wave equation in driving of subsequent drive test piles. Refined wave equation analyses shall be based upon the variations in the subsurface conditions and/or drive system performance observed in the drive test pile program results.

11. The Contractor's testing agency shall use the information to perform a wave equation analysis using a computer program as approved by the Engineer.

12. The Contractor's testing agency shall prepare a summary report of the wave equation results. The report shall include test details, hammer and driving system details, soil conditions, instrumentation, test sequence and observations, discussions of test results (e.g. hammer performance, driving stresses and pile integrity, pile capacity, etc.), conclusions and recommendations.

13. Restrike Criteria: The restrike driving sequence shall be performed using the Dynamic Testing Apparatus with a hammer at normal operating temperature and shall consist of striking the pile for 50 blows or until the pile penetrates an additional three (3) inches, whichever occurs first. In the event the pile movement is less than 0.25 inch after 20 blows during restrike, the restrike may be terminated.

3.03 FIELD TESTING / QUALITY CONTROL

A. Witnessing

1. The test program shall be witnessed by the Engineer designated for controlled inspection.

2. The Engineer designated for controlled inspection shall keep records for confirmation of the test data in accordance with Specification Section 31 09 16.20 – Pile Load Tests, Compressive, Lateral, and Uplift Loads.

3. The agency designated for controlled inspection will be employed by the DEP.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Cleanup

1. Upon completion of the test program, the Contractor shall remove all equipment and remove or cutoff piles not in permanent locations or rejected and restore the site to a condition satisfactory to the Engineer.

2. Test piles and reaction piles which are driven at non-permanent pile locations shall be removed or cutoff at least 18 inches below the bottom of the foundation and abandoned.

END OF SECTION

SECTION 31 09 16.20 - PILE LOAD TESTS, COMPRESSIVE, LATERAL AND UPLIFT LOADS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all equipment, labor, materials and incidental items necessary to perform the pile load tests as shown on the Contract Drawings, specified or otherwise as approved to complete work.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

B. Test piles shall be considered sacrificial piles.

1.03 RELATED SECTIONS

A. Section 31 62 23.13 – Concrete Filled Steel Pipe Piles

1.04 REFERENCES

A. ASTM D1143 - Test Method for Piles Under Static Axial Compressive Load

B. ASTM D3966 - Test Method for Piles Under Lateral Loads

C. New York City Building Code (NYCBC)

1.05 DESCRIPTION

A. Performance Requirements

1. Pile load tests shall conform to the New York City Building Code and this specification. Where the requirements of this specification are more rigorous, they shall be adhered to.

2. The working load of the piles shall be as specified herein or shown on the Contract Drawings.

3. Tested piles which pass the load tests and are within tolerance at permanent locations shall be reset for use as permanent piles. The Contractor shall obtain the Engineer's approval for each pile so tested and so reset.

4. Piles which do not meet the requirements for the working load of the piles shall be rejected and additional testing shall be performed on other piles at no additional cost to the City.

B. Vibration Monitoring

1. When driving piling, the Contractor shall monitor vibration using seismograph at locations shown on the Contract Drawings.

C. Compressive Pile Load Test

1. Compressive pile load tests shall be in accordance with ASTM D1143 and NYBC. The load tests at locations shown on the Contract Drawings or specified herein shall be made on test piles placed to the tip elevation and/or driving resistance used for establishing lengths of piles, unless otherwise directed by the Engineer. Loading, testing and recording of data shall be under the direct supervision of the registered Professional Engineer engaged by the Contractor. A report shall be submitted in accordance with Article 1.06., Submittals.

2. Load Tests:

a. The Contractor shall drive test piles of the same size and materials as the permanent piles. Test piles shall be driven with the same equipment and in the same manner as the permanent piles.

b. In cases where test piles will develop resistance during testing by non-bearing materials to be excavated, the test pile shall be cased off in that material(s).

c. Permanent piles may not be used as reaction piles.

3. The Contractor shall provide all equipment, instruments, personnel, accessories and appurtenances required for the tests. The Contractor shall place reaction piles and beams, as required, to transmit load into the test pile. Calibrated pressure gauges shall be used to determine the actual load

placed on the test pile. Calibrations shall have been made within three (3) months of load testing.

a. The Contractor shall prepare complete detailed shop drawings showing how the test will be performed, how the reaction piles will be placed, and how the jacking beams will be anchored to the test piles and the reaction piles.

b. The Contractor's shop drawings shall include date and calibration curves on all instruments and accessories used in the tests.

c. The entire test setup and test procedure shall be subject to the approval of the Engineer.

d. A table of pile loads and test pressures for each test shall be submitted.

e. A foundation stability analysis where dead weights are used for test reactions shall be submitted.

4. Test loads shall be applied by direct weight or by means of a hydraulic jack. The loading platform or box shall be carefully constructed to provide a concentric load on the pile.

a. If direct weight is employed, the loading increments shall be applied without impact or jar. The weight of the loading platform or box shall be obtained prior to the test, and this weight shall be considered as the first increment of load.

b. If a hydraulic jack is employed, equipment for maintaining each increment of desired load constant under increasing settlement shall be provided. The gauge and the jack shall be calibrated as a unit and have a rated capacity to achieve twice the maximum test pile load.

5. The test load shall be as shown on the Contract Drawings. Axial compression load test shall be performed in accordance with ASTM D 1143, Procedure B – Maintained Test and as shown on the Contract Drawings.

6. Under each load increment, settlement observations shall be made and recorded at 1/2 minute, 1 minute, 4 minute, and each 4 minutes thereafter after application of load increment, except in the instance of the total load where, after the 4-minute reading, the time interval shall be successively doubled until the final settlement limitation is reached and the load is removed.

7. The maximum allowable pile load shall be such that 50 percent of the applied load shall not cause a net settlement of the pile of more than 0.01 inch per ton of total applied load or shall be 50 percent of the applied load which causes a gross settlement of 1 inch, whichever is less.

D. Pile Lateral Load Tests

1. Pile lateral load tests shall be in accordance with ASTM D3966 and NYBC. The load tests at locations shown on the Contract Drawings or specified herein shall be made on test piles placed to the tip elevation and/or driving criteria used for establishing lengths of piles, unless otherwise directed by the Engineer. Loading, testing and recording of data shall be under the direct supervision of the registered Professional Engineer engaged by the Contractor. A report shall be submitted in accordance with Article 1.10, Submittals.

2. The proposed testing apparatus and structures to be used in making the pile load tests shall be designed by the Professional Engineer engaged by the Contractor. The Contractor shall prepare complete detailed working drawings showing how the lateral load test will be performed including the layout of reaction, jack, and test pile. The drawings shall include date and calibration curves of all equipment and instruments. The entire test setup and procedure will be subject to the approval of the Engineer.

3. Piles shall be tested as free-head piles. Lateral load tests shall be conducted in accordance with Section 6.1 of ASTM D3966 until either 1 inch of gross lateral movement has occurred or the test load has reached 200 percent of the design load. For both cases, the allowable lateral pile load shall be 50 percent of the test value.

   a. Reaction for the lateral load test may be an adjacent pile.

   b. Movement shall be measured with dial gages to the nearest 0.001 inch referenced to a beam which is supported at least 10 feet away from the test pile and reactions.

   c. For H-piles, the direction of the test shall be as specified herein or shown on the Contract Drawings.

1.06 QUALITY ASSURANCE

A. Qualifications

1. The work shall be performed by the Contractor or a specialty subcontractor employed by the Contractor and having minimum of 5 years of experience in performing pile load tests and installation of the specified piling system under similar subsurface conditions.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Approval by the Engineer shall not relieve the Contractor of his complete responsibility for the adequacy of the pile load test setup. Submittals shall include, but not be limited to:

1. Full description of test method and equipment.

2. Load type and loading equipment.

3. Safety devices.

4. Calibration equipment.

B. The Contractor shall also submit a complete report to the Engineer at the completion of each pile load test. The Contractor shall engage the services of a Professional Engineer, subject to the approval of the Commissioner, licensed in the State of New York, experienced in pile load testing and load test analysis for the supervision of load test procedures and preparation of the report. The report shall include, but not be limited to:

1. Pile identification and location.
2. A description of the pile driving equipment.
3. Driving records for both test piles and reaction piles.
4. Complete test data.
5. Analysis of test data.
6. Recommended allowable design loads based on the pile test reports.
7. Description of subsurface conditions.
8. Recommended pile installation criteria.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Compressive Load Testing Apparatus: The proposed testing apparatus and structures to be used in making the pile load tests shall be designed by a Professional Engineer licensed in the State of New York engaged by the Contractor.

1. Load tests shall be performed by a method that will maintain constant concentric load under increasing settlement.
2. Settlement observations shall be made by means of dial extensometers. A minimum of three (3) extensometers shall be used. The extensometers shall provide readings to the nearest 0.001 inch. In addition, settlement observations shall be taken using an engineer's level reading to 0.001 feet properly referenced to a well-established benchmark.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examination of the Site

1. Prior to starting operations, an examination of the site shall be performed in accordance with the relevant pile Specification Sections.

B. Schedule of Operation

1. Load tests of piles shall be scheduled sufficiently in advance of production pile driving to prevent delay in the progress of the work.

2. No production piles shall be driven until the load test report is approved by the Engineer.

3.02 IMPLEMENTATION

A. Installation of Production Piles

1. The method of installing the permanent piles shall be the same as that used to install the test piles, except where a change in procedure is ordered by the Engineer.

2. The installation procedure established in the test program shall not be changed without the written approval of the Engineer.

3.03 FIELD TESTING / QUALITY CONTROL

A. Witnessing

1. The pile installation and test program will be witnessed by the Engineer designated for controlled inspection.

2. The Engineer designated for controlled inspection shall keep records for confirmation of the test pile driving. The Contractor shall cooperate with the Engineer so that all necessary data may be obtained. The data will include the following:

a. Type and dimensions of the pile.

b. Location and pile number.

c. Type and size of hammer.

d. Steam or air pressure used to activate hammer.

e. Type and dimensions of the cushion block.

f. Actual number of blows per minute delivered by the hammer.

g. Number of blows required for each foot of penetration, and blows per inch for last six (6) inches.

h. Elevation of ground.

i. Elevation to which the pile penetrated under its own weight and under the weight of the hammer.

j. Final elevation of tip of pile.

k. Length of delays due to splicing or for any other reason and elevation of pile tip at such time.

l. Location of pile splices.

m. Such other information as the Engineer may deem necessary.

3. The agency designated for controlled inspection will be employed by the DEP.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Clean Up

1. Upon completion of the test program, the Contractor shall remove all equipment, and remove or cutoff piles not in permanent locations or rejected and restore the site to a condition satisfactory to the Engineer.

2. Test piles and reaction piles which are driven at non-permanent pile locations shall be removed or cut off at least 18 inches below the bottom of the foundation and abandoned.

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, tools, equipment, materials and incidental items required to perform site clearing of all designated areas within the Contract limits and as shown on the Contract Drawings, including work specified in permits and other agreements, in accordance with the requirements of the Contract Documents

B. If applicable, the Contractor shall develop and implement an Emerald Ash Borer (EAB) Management Plan that provides for compliance with the latest EAB Quarantine Order(s), as applicable to the location of work. Work includes, but is not limited to, the performance of a Site survey by an appropriately qualified professional when the site is located in an EAB Quarantine Zone, and written protocol for the management of EAB Regulated Articles.

C. If applicable, the Contractor shall develop and implement an Asian Longhorned Beetle (ALB) Management Plan that provides for compliance with 7 CFR 301.51 and NYCRR Title 1 Part 139, as applicable to the location of work. Work includes, but is not limited to, the performance of a site survey by an appropriately qualified professional when the Site is located in an ALB Quarantine Zone, and written protocol for the management of ALB Regulated Articles.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 27 00 - Measurement and Payment

B. Section 31 23 16 - Excavation

C. Section 31 23 23 - Fill

D. Section 31 25 10 - Dust, Soil Erosion and Sediment Control

E. Section 32 90 00 - Planting

F. Section 32 90 05 - Soil Mixes

1.04 REFERENCES

A. Definitions

1. Asian Longhorned Beetle (ALB): The insect known as the Asian Longhorned Beetle (Anoplophora glabripennis) in any stage of development.

2. ALB Compliance Agreement: A written agreement between United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) and a person engaged in growing, handling, or moving regulated articles that are moved within an ALB Quarantine Zone, in which the person agrees to comply with the provisions of 7 CFR 301.51.

3. ALB Limited Permit: A document in which a USDA APHIS inspector affirms that the ALB Regulated Article is eligible for movement only to a specified destination and in accordance with conditions specified on the permit.

4. ALB Regulated Article: The term applies to: (1) Firewood (all hardwood species), and green lumber and other material living, dead, cut or fallen, inclusive of nursery stock, logs, stumps, roots, branches, and debris of half an inch or more in diameter of the following genera: Acer (maple), Aesculus (horse chestnut), Albizia (mimosa), Betula (birch), Celtis (hackberry), Cercidiphyllum (katsura), Fraxinus (ash), Platanus (sycamore), Populus (poplar), Salix (willow), Sorbus (mountain ash), and Ulmus (elm); (2) Any other article, product, or means of conveyance not covered in (1) of this definition if a USDA APHIS inspector determines that it presents a risk of spreading Asian Longhorned Beetle and notifies the person in possession of the article, product, or means of conveyance that it is subject to the restrictions of 7 CFR 301.51. This definition is subject to change and should be verified by consulting 7 CFR 301.51 prior to the start of work.

5. Caliper: An instrument used to measure the diameter of a tree.

6. Clearing: The removal from the ground surface within the designated areas and disposal of trees, brush, shrubs, down timber, decayed wood, other vegetation, rubbish, trash, scrap metal, debris and miscellaneous other structures not covered under other Sections as shown on the Contract Drawings, specified or otherwise required to permit construction of the new Work.

7. Emerald Ash Borer (EAB): The insect known as the Emerald Ash Borer in any stage of development.

8. EAB Compliance Agreement: An approved document, executed by persons or firms, covering the restricted movement, processing, handling or utilization of regulated articles not eligible for certification for intrastate movement. USDA APHIS controls the issuance of EAB Compliance Agreements for movement of regulated articles interstate. For movement of regulated articles intrastate, New York State Department of Agriculture and Markets (NYSDAM) controls the issuance of EAB Compliance Agreements.

9. EAB Regulated Article: The term applies to: (1) entire ash trees of any size, inclusive of nursery stock; (2) any part of ash trees, including leaves, bark, stumps, limbs, branches, and roots (i.e., living, dead, cut or fallen); (3) ash lumber or ash logs of any length; (4) any item made from or containing ash wood; (5) any article, product or means of conveyance determined by the USDA APHIS, NYSDAM or New York State Department of Environmental Conservation (NYSDEC) to present risk of spreading the EAB infestation; (6) firewood from any tree species; and, (7) wood chips and bark mulch from any tree species, larger than 1 inch in two dimensions, whether composted or uncomposted. This definition is subject to change. The relevant EAB Quarantine Order should be consulted for the current definition.

10. Grubbing: The removal and disposal of all stumps, buried logs, roots larger than 2 inches, matted roots and organic materials.

B. Reference Standards

1. Federal regulations, 7 CFR 301.51- Asian Longhorned Beetle

2. NYCRR Title 1 Part 139 – Control of the Asian Long Horned Beetle

3. NYCRR Title 1 Part 141 – Control of the Emerald Ash Borer

4. Federal regulations, 7 CFR 301.53 – Emerald Ash Borer

1.05 DESCRIPTION

A. Project/Site Conditions

1. Streets, roads, adjacent property and other works and structures shall be protected throughout the entire project. Contractor shall return to original

condition, satisfactory to the Engineer, facilities damaged by the Contractor's operations.

2. If the project site is in an Emerald Ash Borer Quarantine Zone established by the NYSDEC and NYSDAM, New York State prohibits the movement of regulated articles beyond the quarantined counties without an EAB Compliance Agreement.

3. If the project site is in an Asian Longhorned Beetle Quarantine Zone, USDA APHIS prohibits the movement of regulated articles beyond the quarantine zone without an ALB Compliance Agreement.

1.06 QUALITY ASSURANCE

A. Codes and Standards: State and local laws and code requirements shall govern the hauling and disposal of trees, shrubs, stumps, roots, rubbish, debris and other matter.

B. The Contractor or subcontractor responsible for work of any kind affecting EAB Regulated Articles within the Emerald Ash Borer Quarantine Zone must have EAB First Detectors training as certified by Cornell Cooperative Extension, or an approved equal. Work includes, but is not limited to planting trees, transplanting trees, pruning trees, fertilizing trees, removing trees and stumps, and Clearing and Grubbing trees or roots.

C. The Contractor or subcontractor responsible for work of any kind affecting ALB Regulated Articles within the Asian Longhorned Beetle Quarantine Zone must have an ALB Compliance Agreement. Work includes, but is not limited to planting trees, transplanting trees, pruning trees, fertilizing trees, removing trees and stumps, and Clearing and Grubbing trees or roots.

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval by the Engineer. Shop Drawings shall identify all trees designated for removal and those that shall remain and require protection, as directed by the Engineer.

B. Tree Protection Plan

1. The Contractor shall submit a Tree Protection Plan to the Engineer for approval prior to performing any work on trees or shrubs to be saved or in the vicinity of such trees and shrubs. The Plan must be approved prior to any such work being performed.

a. The Plan shall be prepared in consultation with the Engineer.

1) The Plan should include, but not necessarily be limited to, the location of temporary wooden tree guards, construction fence, temporary snow fence boundary, range fencing, micro tunneling, soil erosion and sediment control, hand and/or pneumatic excavation, soil compaction prevention and mitigation requirements, impact of trenching and/or cut and fill operations and pruning and fertilization schedule. Soil

testing and fertilization schedule, as well as other applicable methods of tree protection shall be as required by Sections 32 90 00 - Planting and 32 90 05 – Soil Mixes.

2) In addition, the Plan should address the Contractor's operations, including designated staging areas, site access and stockpiling of materials.

3) Mandatory provisions of the Plan always include, but are not limited to, the following provisions:

a) The Contractor shall not be permitted to park vehicles or equipment or to stockpile materials of any nature under the drip line of trees and shrubs in order to minimize surface and subsurface root damage and soil compaction. This directive shall apply to all areas within or outside the contract limit line.

C. Emerald Ash Borer Management Plan

1. The Contractor responsible for site clearing and grubbing shall submit an EAB Management Plan to the Engineer for approval prior to removal of any trees or vegetation from the construction site. The Plan shall identify each work site and all transportation routes, haulers, processing and disposal facilities including full contact information. The Plan shall confirm whether any debris will be generated, transported, processed or disposed in an EAB Quarantine Zone. If the construction site, transportation routes, processing and disposal facilities are not within an EAB Quarantine Zone, no further details are required in the Plan.

2. If EAB Regulated Articles are generated at a site that is not located within an EAB Quarantine Zone, but the materials will be transported into or through a Quarantine Zone for processing or disposal, the Plan shall also include:

a. A copy of the EAB Compliance Agreement for the transportation of EAB Regulated Articles into or through an EAB Quarantine Zone.

3. If the site is located within an EAB Quarantine Zone, the Plan shall also include the following:

a. A description of the survey methods to identify any EAB infestation and EAB Regulated Articles. The survey shall be performed by a professional in possession of a Cornell Cooperative Extension EAB First Detectors Certificate, or an approved equal, and shall be performed after felling trees and prior to removing any EAB Regulated Articles from the site. Evidence of certification shall be provided in the Plan. The results of the survey shall be summarized in an EAB survey report and provided to the Engineer prior to removing any EAB Regulated Articles from the site.

b. Provisions for notifying the Engineer and a NYSDAM horticultural inspector immediately upon the discovery of an EAB infestation. If an EAB infestation is confirmed by NYSDAM, the Contractor will be required to enter into an EAB Compliance Agreement. The EAB Compliance Agreement will dictate how the EAB and Regulated Articles must be managed and treated prior to removal from the site.

4. Unless the survey report specifically confirms the absence of ash trees (*Fraxinus* spp.), the Plan shall also include the following:

a. Schedule for conducting activities affected by EAB Regulated Articles

b. Identification and anticipated quantity of EAB Regulated Articles and proposed handling methods

1) If the EAB Regulated Articles are destined for a processing facility, the facility shall identify whether the materials will be recycled for resale or disposed.

2) If the EAB Regulated Articles are to be processed for resale by the Contractor, Subcontractor or processing facility, the Plan shall include a copy of the facility's EAB Compliance Agreement for handling Regulated Articles.

3) If the EAB Regulated Articles are to be transported out of the EAB Quarantine Zone, a copy of the Contractor's EAB Compliance Agreement for transporting Regulated Articles out of an EAB Quarantine Zone shall be included in the Plan.

c. Storage location for EAB Regulated Articles

d. Treatment methods if the Contractor elects to treat EAB Regulated Articles onsite such that they are no longer regulated. Onsite treatment requires that the responsible party be in possession of a Cornell Cooperative Extension EAB First Detectors Certificate, or an approved equal, and requires coordination with NYSDAM for inspection and verification. Evidence of the responsible party's certification shall be provided in the Plan.

e. Protocol for tracking the shipment of EAB Regulated Articles using a bill of lading or manifest that identifies the site, transporter, truck identification number and provides for signature upon receipt at the Processing or Disposal Facility. Payment of the removal of EAB Regulated Articles will not be made until signed copies of the bill of lading or manifest are provided to the Engineer.

D. EAB Survey Report

1. The Contractor responsible for site clearing and grubbing within an EAB Quarantine Zone is required to have the site surveyed for the presence of EAB by a professional in possession of a Cornell Cooperative Extension EAB First Detectors Certificate, or an approved equal. The Contractor shall

submit an EAB Survey Report to the Engineer within two weeks of survey completion. Regulated Articles may not be moved offsite without Engineer approval of the EAB Survey Report. The EAB Survey Report shall be signed by the certified professional and shall include documentation of the surveyor's credentials.

E. Asian Longhorned Beetle Management Plan

1. The Contractor responsible for site clearing and grubbing shall submit an ALB Management Plan to the Engineer for approval prior to removal of any trees or vegetation from the construction site. The Plan shall identify each work site and all transportation routes, haulers, processing and disposal facilities including full contact information. The Plan shall confirm whether any debris will be generated, transported, processed or disposed in an ALB Quarantine Zone. If the construction site, transportation routes, processing and disposal facilities are not within an ALB Quarantine Zone, no further details are required in the Plan.

2. If ALB Regulated Articles are generated at a site that is not located within an ALB Quarantine Zone, but the materials will be transported into or through a quarantine zone for processing or disposal, the Plan shall also include:

   a. For Interstate Movement - A copy of the ALB Limited Permit authorizing such movement or specific procedures for ensuring compliance with 7 CFR 301.51-4 which regulates the movement of Regulated Articles.

   b. For Intrastate Movement - Identification of the origin and destination of the regulated article in accordance with NYCRR Title 1 Part 139.

   c. A copy of the processing or disposal facility's ALB Compliance Agreement.

3. If the site is located within an ALB Quarantine Zone, the Plan shall also include the following:

   a. A copy of the Contractor's ALB Compliance Agreement with USDA APHIS.

   b. A description of the survey methods to identify any ALB infestation and ALB Regulated Articles. The survey shall be performed by a professional in possession of an ALB Compliance Agreement and shall be performed prior to felling trees and removing any ALB Regulated Articles from the site. Evidence of the professional's ALB Compliance Agreement shall be provided in the Plan. The results of the survey shall be summarized in an ALB survey report and provided to the Engineer prior to removing any ALB Regulated Articles from the site.

c. Provisions for notifying the Engineer and a USDA APHIS inspector immediately upon the discovery of an ALB infestation. If an ALB infestation is discovered, the Contractor shall stop all site Clearing and Grubbing until permission to resume work has been given in writing by a USDA APHIS Inspector. A copy of the permission to resume work shall be provided to the Engineer.

4. Unless the survey report specifically confirms the absence of Regulated Articles, the Plan shall also include the following:

a. Schedule for conducting activities affected by ALB Regulated Articles

b. Identification and anticipated quantity of ALB Regulated Articles and proposed handling methods

1) If the ALB Regulated Articles are destined for a processing facility, the facility shall be in possession of an ALB Compliance Agreement. The Plan shall include a copy of the facility's ALB Compliance Agreement for handling Regulated Articles.

2) If the ALB Regulated Articles are to be transported out of the ALB Quarantine Zone, a copy of the Contractor's ALB Compliance Agreement for transporting Regulated Articles out of an ALB Quarantine Zone shall be included in the Plan.

c. Storage location for ALB Regulated Articles

d. Treatment methods if the Contractor elects to treat ALB Regulated Articles onsite such that they are no longer regulated. Onsite treatment requires that the responsible party be in possession of an ALB Compliance Agreement and requires coordination with USDA APHIS or a professional in possession of an ALB Compliance Agreement with USDA APHIS for inspection and verification. A copy of the responsible party's ALB Compliance Agreement shall be provided in the Plan.

e. Protocol for tracking the shipment of ALB Regulated Articles using a bill of lading or manifest that identifies the site, transporter, truck identification number and provides for signature upon receipt at the processing or disposal facility. Payment of the removal of ALB Regulated Articles will not be made until signed copies of the bill of lading or manifest are provided to the Engineer.

F. ALB Survey Report

1. The Contractor responsible for site clearing and grubbing within an ALB Quarantine Zone is required to have the site surveyed for the presence of ALB by a professional in possession of an ALB Compliance Agreement. The Contractor shall submit an ALB Survey Report to the Engineer within two weeks of survey completion. Regulated Articles may not be moved

offsite without Engineer approval of the ALB Survey Report. The ALB Survey Report shall be signed by the professional and shall include a copy of the surveyor's ALB Compliance Agreement.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall guarantee that work performed under this Section will not permanently damage trees, shrubs, turf or plants designated to remain, or other adjacent work or facilities. If damage resulting from Contractor's operations appears during the period up to 12 months after completion of the project, the damaged items shall be replaced as directed by DEP at no expense to the City, to the satisfaction of the DEP.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Trees and Shrubs to be Saved

1. Protection: The Contractor shall protect from defacement, injury and destruction all trees and shrubs within the construction site that are so delineated or are marked in the field to be saved. Trees, shrubs and grassed areas which are to remain shall be protected by fences, barricades, wrapping or other methods as shown on the Contract Drawings, specified or approved by the Engineer.

a. Within the limits of the area from the tree trunk up to 3 to 4 feet outside of the tree drip line, work shall be performed with extreme care using either hand tools or equipment that will not cause damage to trees.

1) Do not disturb or cut roots unnecessarily. Do not cut roots 2 inches or larger unless approved.

2) Immediately backfill around tree roots after completion of construction in the vicinity of trees.

3) Do not operate any wheeled or tracked equipment within drip line.

b. Vegetation shall be protected from damage caused by emissions from engine-powered equipment.

c. During working operations, the trunk, foliage and root system of all trees to be saved shall be protected with boards or other guards placed as shown on the Contract Drawings and as required to prevent damage, injury and defacement.

1) Excavated materials shall not be piled within the drip line or adjacent to the trunks of trees. Equipment, stockpiles, etc. shall not be permitted within the drip line.

2) Do not allow runoff to accumulate around trunks of trees.

3) Ropes, cables, or guy wires shall not be fastened or attached to trees without permission. When such permission is granted, protect the tree before making fastening or attachments by providing burlap wrapping and softwood cleats.

4) The use of axes or climbing spurs for trimming will not be permitted.

5) Provide climbing ropes during trimming.

d. When directed by the Engineer, shrubs to be saved shall be removed by taking a sufficient earth ball with the roots to maintain the shrub.

1) Temporarily replant, if required, and replace at the completion of construction in a condition equaling that which existed prior to removal.

2) Replace in kind if the transplant fails. Provide transplanting, planting, and watering and guarantee as specified in Section 32 90 00 – Planting.

e. When directed by the Engineer, emergency repair to damaged trees and to trees that pose imminent danger shall be performed within 24 hours.

f. Damage Assessment

1) Tree damage. For trees that are damaged during the course of construction, a monetary credit shall be taken. The monetary assessment shall be the difference between the tree's condition rating, as per the International Society of

Arboriculture appraisal method, before and after the damage. The damage assessment shall be determined by the Engineer.

2) Tree Destruction. Any trees irreparably damaged during the course of construction, as determined by the Engineer shall be removed at the Contractor's sole expense. Restitution shall be made according to the Caliper Area Replacement formula, as determined by the Engineer. Restitution can be met by the Contractor through the following options:

a) Direct planting by the Contractor or its subcontractor of the required equivalent number of replacement trees at locations determined by the Engineer; or

b) A monetary credit for the value of the tree destroyed; or

c) A combination of (1) and (2) above, as determined by the Engineer. If the Contractor plants replacement trees, a monetary credit shall be taken for the difference between the full value of the destroyed tree and the value of the number of replacement trees planted.

3) Tree Removal. Restitution for any prohibited tree removals shall be made according to the Caliper Area Replacement formula, with adjustments for tree condition as per the International Society of Arboriculture appraisal method, as determined by the Engineer.

B. Air pollution caused by dust and dirt shall be controlled, complying with governing regulations. Dust control shall be as specified in Section 31 25 10 – Dust, Soil Erosion and Sediment Control.

C. Stripping Topsoil

1. The Contractor shall strip existing topsoil as described in Section 31 23 16 – Excavation. Heavy growths of grass shall be removed from areas before stripping the topsoil.

3.02 IMPLEMENTATION

A. Removal of Trees and Shrubs

1. Tree Removal within Property Limits:

a. Only those trees designated on the Contract Drawings for removal shall be removed.

b. Tree and shrub removal shall be conducted in a manner so as to avoid damage to those trees and shrubs which will remain.

c. Do not cut or damage trees or shrubs outside of the Contract limit lines. Damage outside the Contract limit lines caused by the Contractor's operations shall be corrected at the Contractor's expense.

d. All trees shall be calipered at four and one-half feet above existing grade prior to removal. All trees shall be "topped" and "limbed" previous to felling unless otherwise directed by the Engineer.

e. In areas of major construction, the stumps and roots of all trees designated for removal shall be grubbed and excavated to a depth of three (3) feet below the ground surface except in areas of fill greater than three (3) feet, where such trees may be cut flush with the ground surface.

B. Emerald Ash Borer Quarantine Zone

1. The EAB is a destructive wood boring insect that solely infests ash (*Fraxinus* spp.) trees and has killed tens of millions of trees across the US. EAB feed upon the cambium and phloem and kill a tree within two years. From a seedling to full grown trees, all parts of an ash tree are subject to infestation. In an effort to control the spread of EAB to other areas, quarantine orders have been imposed on a number of counties within New York State.

a. A current map of the geographic area included in the quarantine zones within New York State is available at the following website: https://www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs/pests-and-diseases/emerald-ash-borer/emerald-ash-borer.

2. Any Contractor and Subcontractor performing tree work of any kind within the EAB Quarantine Zone shall comply with the relevant NYSDEC Quarantine Order. Tree work includes, but is not limited to planting trees, transplanting trees, pruning and fertilizing trees, removing trees and stumps, and Clearing and Grubbing trees or roots.

a. Additional information is available at the following website: http://www.dec.ny.gov/animals/7253.html

C. Asian Longhorned Beetle Quarantine Zone

1. The Asian Longhorned Beetle (ALB) is a destructive wood boring insect. It can cause serious damage to healthy trees by boring into their heartwood and eventually killing them. Nursery stock, logs, green lumber, firewood, stumps, roots, branches and debris of one-half (½") inch or more in diameter are subject to infestation. In an effort to control the spread of the beetle to other areas, a quarantine has been imposed by USDA APHIS on large portions of the City of New York as per Part 139 of Title 1 NYCRR.

2. Any Contractor or subcontractor performing tree work of any kind within the ALB Quarantine Zone must have an ALB Compliance Agreement and

will be held responsible for compliance with USDA APHIS. Tree work includes, but is not limited to planting trees, transplanting trees, pruning and fertilizing trees, removing trees and stumps, and Clearing and Grubbing trees or roots.

a. A current map of the geographic area included in the ALB Quarantine Zone within New York City is available at the following website: https://www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs/pests-and-diseases/asian-longhorned-beetle/ct_alb_maps

b. Additional information is available at the following website: http://www.dec.ny.gov/animals/7255.html

D. Clearing and Grubbing

1. Clearing: The Contractor shall clear all items specified to the Contract limit lines shown on the Contract Drawings and shall remove cleared and grubbed materials from the site to an authorized disposal site.

a. Do not start earthwork operations in areas where Clearing and Grubbing is not complete, except that stumps and large roots may be removed concurrent with excavation.

b. Comply with erosion, sediment control and storm management measures as specified in Section 31 25 10 - Dust, Soil Erosion and Sediment Control.

2. Grubbing: The Contractor shall Clear and Grub areas to be excavated, areas receiving less than 3 feet of fill and areas upon which structures are to be constructed.

a. Stumps and root mats in these areas shall be removed to a depth of not less than 1 foot below the subgrade of sloped surfaces.

b. All depressions made by the removal of stumps or roots shall be filled with material suitable for backfill as specified in Section 31 23 23 - Fill.

3. Limited Clearing: The Contractor shall clear areas receiving more than 3 feet of fill by cutting trees and shrubs as close as practical to the existing ground. Grubbing will not be required.

4. Disposal:

a. All disposals off-site shall be in complete accordance with rules and regulations of the authorities having jurisdiction.

b. Burning of cleared and grubbed materials is not allowed within the property limits.

5. Explosives shall not be used.

6. No cleared or grubbed material may be used in backfills or structural embankments.

7. Cleared and grubbed items shall be removed from the site and disposed of in accordance with the applicable regulations and requirements of this Contract.

3.03 FIELD TESTING / QUALITY CONTROL

A. Certified Arborist

1. All tree pruning, tree repair, and tree removal is to be performed by competent workers only, under the supervision of an arborist holding certification from the International Society of Arboriculture (ISA), or registered with the American Society of Consulting Arborists or equivalent education and experience.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes excavation Work and reuse or disposal of all material as specified herein, shown on the Contract Drawings or required by the Engineer, for any purpose pertinent to the construction of the Work.

B. Excavation Work includes stripping and stockpiling of topsoil; sheeting and bracing; excavation over the Site; excavation for roads, pipelines and structures; removal and control of water in and around excavations; segregation and stockpiling of excavated material; disposal of unsuitable material and excess excavated material; reuse of suitable material; and trimming, shaping and grading of excavations.

C. This Section includes the excavation of soils, including Support of Excavation (SOE) spoils, classified, in accordance with 6 NYCRR Part 360.13 (f), Table 2, Fill Material Beneficial Reuse, as Fill Type F4, and soils classified as non-hazardous Solid Waste based on the results of the design phase soil sampling, and as described in Section 02 24 20 – Soil Sampling and Analysis.

1. Soils are suitable for off-site beneficial use at out-of-state beneficial use facilities as they meet the New Jersey Non-Residential Soil Cleanup criteria and the Pennsylvania Clean and Regulated Fill Concentration Limits, as per Tables 7 and 8, included in their respective Soil and Groundwater Investigation reports, dated June 2025.

D. The Contractor's Qualified Environmental Professional (QEP) shall oversee the excavation of fill material to ensure that soil sampling data is representative of the final excavation footprints, that fill material with different classifications are not commingled, and that hot spots or suspect soils are segregated for offsite reuse or additional testing, as necessary.

E. The following index of this Section is presented for convenience:

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F. The following attachments, attached after the End of Section designation, are a part of this Section:

1. Attachment A, Minimum Load Diagram for Non-Water Tight Sheet Sheeting Design During Excavation (refer to Article 1.05)

2. Attachment B, Minimum Load Diagram for Water Tight Sheeting Design During Excavation (refer to Article 1.05).

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 35 45 - Hazardous Materials Control

B. Section 02 24 20 - Soil Sampling and Analysis

C. Section 05 12 00 - Structural Steel Framing

D. Section 31 10 10 - Site Clearing

E. Section 31 23 19 - Dewatering

F. Section 31 23 23 - Fill

G. Section 31 25 10 - Dust, Soil Erosion and Sediment Control

H. Section 31 40 00 - Shoring and Underpinning

I. Section 32 31 15 - Chain Link Fence

J. Section 32 90 05 - Soil Mixes

1.04 REFERENCES

A. Definitions:

1. Case-Specific Beneficial Use Determination (BUD): Under 6 NYCRR Part 360, Section 360.12(d), NYSDEC sets forth the requirements for petitioning NYSDEC to obtain a Case-Specific BUD, and the criteria for reviewing, granting, or denying of the BUD. For reuse of a solid waste to be determined

a beneficial use, the petition must satisfy all criteria outlined under 6 NYCRR Part 360, Section 360.12(d).

2. Excavated Material: All material regardless of its nature, except rock or boulders that have been excavated. The requirements for excavation of rock and boulders are set forth in Section 31 23 25 - Rock Excavation.

3. Fill: Soil and similar material excavated or brought to the Project Site for the purposes of construction. All fill material must meet the requirements of Section 31 23 23 – Fill. Material to be excavated and proposed for reuse as fill under Pre-Determined Beneficial Use must meet the requirements of 6 NYCRR Part 360, Section 360.13 (a), Applicability, Section 360.13 (b), Waste Cessation, or Section 360.12(c)(1)(iv)(a), Material ceases to be waste when used as backfill in the same excavation or for grade adjustment on the site of generation. If these criteria cannot be met, such material shall meet Section 360.12(d), Case-specific beneficial use determinations - general. Fill that is imported from another DEP Project Site must specifically meet Fill Type 2 maximum concentration levels. Fill from any other off-site source shall be non-hazardous and shall also meet Fill Type 2 maximum concentration levels.

4. New York City Metropolitan Area Waste Impact Zone: The area encompassing the City of New York and the counties of Nassau, Suffolk, Putnam and Westchester, as per 6 NYCRR Part 360.2 Definitions.

5. Pre-Determined Beneficial Use for fill material: Under 6 NYCRR Part 360, Section 360.13(b) Waste cessation. "Excavated material ceases to be solid waste in accordance with the following:

   a. Fill Type 1 generated outside of the New York City Metropolitan Area Waste Impact Zone (NYCMAWIZ) – once a determination has been made that the material is Fill Type 1;

   b. Fill Type 1 generated within Nassau, Suffolk, Westchester and Putnam Counties – once the material is delivered to the site of reuse;

   c. Fill Type 1 cannot be generated within the City of New York;

   d. Fill Type 2 and Fill Type 3 generated outside of the NYCMAWIZ – once a determination has been made that the material is Fill Type 2 or Fill Type 3;

   e. Fill Type 2 and Fill Type 3 generated within the NYCMAWIZ – once the material is delivered to the site of reuse;

   f. Fill Type 4 and Fill Type 5 – Once the material is delivered to the site of reuse."

   g. Under 6 NYCRR Part 360, Section 360.12(c)(1)(iv)(a), "Excavated material used to backfill the same excavation or as grade adjustment in areas of similar physical characteristics on the site of generation. If the material exhibits visual or historical evidence of contamination (including odors) and will be used in an area with

public access, the material must be covered with pavement, foundation, or with a minimum of 12 inches of soil or fill that meets the criteria to be used as Fill Type 1 and Fill Type 2" as defined in Subdivision 360.13, Special requirements for pre-determined beneficial use of excavated material. Refer to Section 02 24 20 - Soil Sampling and Analysis for sampling requirements, including a list of parameters to be analyzed for soils to be reused on-site, or soils to be reused or disposed off-site.

h. As per 6 NYCRR Part 360, Section 360.13.(c), Notification requirements in the City of New York. For fill types 2 through 5, NYSDEC shall be notified at least five (5) days before the first load greater than ten (10) cubic yards is planned to be transported from the site of excavation directly to a site of reuse within New York State. Notifications shall be made on forms acceptable to NYSDEC and shall include all associated analytical data reports.

i. Notification of fill placement. For Fill Types 4 and 5 generated outside the City of New York, NYSDEC shall be notified at least five days before the first load greater than ten (10) cubic yards is planned to be transported directly from the site of excavation to the site of reuse within New York State. Notifications shall be made on forms acceptable to NYSDEC and shall include all associated analytical data reports.

6. Suitable Material: Any material whose composition is satisfactory for use as fill. Any mineral (inorganic) soil, blasted or broken rock and similar materials of natural or man-made (i.e. recycled) origin, including mixtures thereof, are considered suitable materials. Determinations of whether a specific natural material is suitable shall be made by the Engineer on the above basis.

7. Topsoil: Topsoil shall consist of natural loam, free from subsoil, obtained from an area which has never been stripped. Topsoil is friable clay loam surface soil found in a depth of not less than 4 inches, and is substantially free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material. Topsoil shall be as further defined under Section 32 90 05 – Soil Mixes. Topsoil meeting this definition and Section 32 90 05 – Soil Mixes shall be considered suitable for use on-site.

8. Unsuitable Materials: Any material containing vegetable or organic matter such as muck, peat, organic silt, topsoil or sod, that is not satisfactory for the use as fill material.

B. Reference Standards:

1. ASTM D1557 - Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3)

2. Occupational Safety and Health Administration (OSHA); OSHA 1926 Subpart P-Excavations
3. U.S. Department of Labor (DOL)
4. Industrial Board of Appeals, N.Y.S. Department of Labor, Part 23 Protection in Construction, Demolition and Excavation Operations latest editions
5. New York City Rules and Regulations (RCNY)
6. New York State Department of Transportation (NYSDOT)
7. New York City Department of Transportation (NYCDOT)
8. New York State Department of Environmental Conservation (NYSDEC)
9. U.S. Department of Transportation, Federal Highway Administration
10. U.S. Environmental Protection Agency (EPA)
11. NYSDEC regulations, 6 NYCRR Part 375, Environmental Remediation Programs
12. NYSDEC regulations, 6 NYCRR Part 360, Solid Waste Management Facilities General Requirements
13. New York City Building Code

1.05 DESCRIPTION

A. Design Requirements:

1. In designing the sheeting, take note of the minimum load diagram requirements of the DEP, shown in Attachments A and B (located after the "End of Section" designation), unless otherwise shown on the Contract Drawings. However, when it is anticipated that heavier crane or equipment loads will fall within the influence line of the excavation, increase design loads accordingly.
2. The Contractor's operations shall conform to the requirements of Section 31 25 10 - Dust, Soil Erosion and Sediment Control.
3. Site Conditions:
   a. Actual Conditions: Perform any geotechnical investigations deemed necessary to determine actual Site conditions. Geotechnical data reports, if they are available, will be provided in the Contract Documents.
   b. Underground Utilities: Locate and identify all existing underground utilities prior to the commencement of work.

B. Regulatory Requirements:

1. General: Before proceeding with any excavation, obtain all necessary permits required by agencies having jurisdiction and consents from owners of private property where their interests may be affected by the Work, such

as for temporary or permanent occupation, for disposal or storage of materials, or other encroachment except where temporary easements may have been obtained by the City in connection with permanent easements or otherwise.

2. Excavation operations and related Work shall be performed in strict compliance with the applicable sections of OSHA 1926 Subpart P-Excavations, New York City Department of Buildings Regulations and N.Y.S. Department of Labor, Industrial Board of Appeals, Part 23 Protection in Construction, Demolition and Excavation Operations latest editions.

3. In the period of 2 to 10 days prior to starting excavation, notify all utilities of intended Work locations and have utility locations marked. In NYC locations, the New York City Long Island One Call Center (800-272-4480) is available for this use. Upstate locations are served by Dig Safely NY (800 962-7962 or 811).

4. Recycled materials that the Engineer has evaluated and approved for general use shall be considered to be Suitable Material subject to the conditions for use as determined by the City. In general, the use of recycled materials must be sanctioned by NYSDEC, usually in the form of a BUD. See definition above.

C. Excess soils not reused onsite shall be reused offsite to the extent possible in the following hierarchal locations:

1. Other DEP projects that need available, excess suitable materials;

2. The NYC Clean Soil Bank managed by the Mayor's Office of Environmental Remediation (OER);

3. New York State beneficial use facilities;

4. Or outside of New York State at other applicable out-of-state agency beneficial use facilities.

1.06 QUALITY ASSURANCE

A. Certification of Laboratory Services:

1. For certification of Laboratory Services see Section 02 24 20 - Soil Sampling and Analysis.

1.07 SUBMITTALS

A. Sheeting and Bracing: Before commencing any excavating operations, submit for approval Shop Drawings of all sheeting and bracing, cofferdams, bridging, decking, soldier beams and lagging, and other temporary or permanent supporting structures. Shoring and underpinning submittals shall be as required by Section 31 40 00 – Shoring and Underpinning.

1. Shop Drawings shall show types of materials, dimensions and details of the entire bracing system, including wale splices and corner connections,

stressing/jacking methods, reaction systems, posting and rebracing, if necessary.

2. Provide plans, details and procedures for jacking-in preload at struts.

3. For sheeting and shoring not shown on the Contract Drawings submit engineering calculations and design assumptions for determination of loads and stresses acting in the wall and lateral supports during installation, as well as final conditions. Show locations at which the temporary or permanent supporting structures will be used. The proposed design shall take into account the excavation procedures, dewatering operations, surcharge loading, soil properties, material stresses, temperatures, permanent construction, stages of work and all other conditions which could affect the excavation support system and the permanent structure. These drawings and calculations shall be prepared and stamped by a Professional Engineer licensed in the State of New York.

B. Soil Excavation, Reuse, Transport and Disposal Plan (SERTD Plan): Submit a SERTD Plan to the Engineer for approval at least 30 calendar days prior to the start of excavation. The SERTD Plan shall include two protocols: the Excavation Protocol and the Reuse, Transport and Disposal Protocol.

1. The Excavation Protocol shall include, but not be limited to, the following:

   a. Limits of excavation

   b. Excavation methods

   c. Protection methods:

      1) Sheeting and bracing

      2) Fencing, bridging and decking

2. The Reuse, Transport and Disposal Protocol shall address the following waste classifications defined in Section 02 24 20 – Soil Sampling and Analysis: hazardous solid waste; non-hazardous contaminated waste; non-hazardous petroleum-contaminated waste; non-regulated solid waste, and construction and demolition (C&D) debris. The Protocol shall include the following:

   a. Details on proposed reuse:

      1) Identities of beneficial use facility (ies) with copy (ies) of their regulatory approvals, as applicable. Unless otherwise reused under Pre-Determined Beneficial Use, details shall include all supporting back-up information sent to and received from NYSDEC or other applicable out-of-state agency. See Section 02 24 20 - Soil Sampling and Analysis for on-site reuse criteria. When reusing soils on site, details of temporary (stockpile) storage and the location(s) of reuse shall be identified.

2) As applicable, the requirements of each beneficial use facility / treatment, storage, and disposal facility (TSDF) for sampling, including analytical parameters, frequencies, protocols, and minimum detection limits.

b. Transportation details:

1) Identities of waste transporters; supporting NYSDEC Part 364 Waste Transporter Permit(s) and other out-of-state transporter permits required to transport the wastes to the TSDFs; or for use of public roadways if temporary off-site storage becomes necessary.

c. Disposal details:

1) Identities of TSDFs solicited including names and locations, insurance certificate, permit documentation including the types of materials allowed and not allowed, and chemical and physical material acceptance criteria. If no concentrations are indicated, then the facility must indicate the types of material that it is allowed to accept under its permit. Treatment, storage, or disposal of any waste generated by excavation Work shall be at a facility permitted to accept such waste by an authorized state or local government agency, or the EPA, as applicable.

3. The SERTD Plan shall be coordinated with the Field Sampling Plan (FSP), including beneficial use facilities/TSDF selection, and associated materials acceptance requirements specified in Section 02 24 20 – Soil Sampling and Analysis, as applicable.

4. The SERTD Plan shall be prepared in accordance with all applicable Federal, State and local hauling and disposal codes and regulations

5. Reuse of excavation spoils either on-site or off-site must be prioritized over disposal. TSDFs shall only be approved where reuse options are not available.

6. Under separate cover, additional waste disposal documentation submittals for DEP signature as generator. The Contractor shall provide waste profiles, facility letters of acceptance of DEP waste, advance copies of waste manifest(s), and Land Disposal Restriction (LDR) Notification and Certification Form (if hazardous waste) for the Engineer's review and approval and DEP signature as generator, where applicable.

C. Manifest Requirements and Submittals: Manifests shall include measurements of the volume of all excavated material to be removed from the site prior to transporting to an approved beneficial use facility/ TSDF. The Contractor shall also prepare all vehicles and manifests necessary for transporting all material. The Contractor shall comply with all Federal, State and local regulations regarding the transport of hazardous and non-hazardous waste.

1. Applicable Regulations: All Contract Work that concerns the transport of hazardous and non-hazardous waste shall comply with the appropriate EPA and NYSDEC regulations, and DOT hazardous material transportation regulations.

2. EPA Hazardous Waste Manifest: The Contractor shall obtain an appropriate number of hazardous waste manifest forms (EPA Form 8700-22 (Rev. 3-05) or latest version), sequentially numbered for this Contract based on the quantity of hazardous waste to be removed from site. The name of the generator, transporter and TSDF, and their appropriate EPA identification number, shall be typed on each form. All other pertinent information shall be included on the manifest. A copy of the partially completed manifest including the above information shall be submitted for approval at least 3 weeks prior to commencement of excavation.

    a. Routing: The Contractor shall provide a map and written description of the route which will be taken to the approved TSDF by the hazardous waste transporter.

3. Non-hazardous Waste Manifest: Manifests shall be provided for each truckload of non-hazardous waste removed from the site, including soils destined for reuse. The form of the manifest shall be approved by the Engineer. Non-hazardous waste shall be transported in accordance with all applicable local, State and Federal DOT regulations by properly licensed and permitted waste haulers.

    a. Routing: The Contractor shall provide a map and written description of the route which will be taken to the approved beneficial use facility / TSDF by the non-hazardous waste transporter.

4. The Contractor shall submit written evidence that selected beneficial use facilities / TSDFs have accepted or will accept the materials generated during excavation. The Contractor shall also submit copies of the completed manifest, signed and dated by the initial transporter, in accordance with Federal and State requirements and with associated documentation (e.g., waste profile and Hazardous Waste LDR Notification and Certification Form, as applicable). Copies of completed and signed waste manifests from beneficial use facilities / TSDFs shall be provided to the Engineer within 30 days of waste shipment off-site.

5. Bill of Lading: Bills of Lading shall be provided for all uncontaminated soils destined for reuse off-site. Uncontaminated soil shall be removed by a properly licensed hauler.

6. Notification to the NYSDEC must be made prior to the first load greater than 10 cubic yards is planned to be transported from the site of excavation directly to the site of reuse.

    a. At least five days in advance of transfers of Fill Types 2, 3, 4 and 5 generated in, imported to, or relocated within the City of New York.

b. At least five days in advance of transfers of Fill Type 4 and Fill Type 5 anywhere in the State of New York.

The Notification of Fill Transfer for Reuse form (NYSDEC Division of Materials Management, version 03/24 or latest) will be sent to the NYSDEC Regional Office in which the destination is located. The form must be certified by a Qualified Environmental Professional (QEP). In the event the QEP is not a Professional Engineer or Geologist licensed in New York State, the QEP's basis for credential must be attached to the form.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Steel for struts, braces, and whalers shall meet the requirements of Section 05 12 00 – Structural Steel Framing and the Contract Drawings.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. General: No excavation Work below the water table shall begin before the Dewatering Plan is approved, as specified in Section 31 23 19 - Dewatering.

B. Clearing and Grubbing: Clear and grub the site of all open cut excavations and all areas shown on the Contract Drawings and specified. The Contractor shall comply with the requirements of Section 31 10 10 - Site Clearing.

C. Stripping: Completely strip all topsoil and earth containing roots away from areas which have been cleared and grubbed. Topsoil which is determined by the Engineer to be suitable for future reuse by the City shall be stripped separately and stockpiled at locations on the Site as directed by the Engineer. Topsoil to be reused on-site shall comply with the requirements of Section 32 90 05 – Soil Mixes. Topsoil to be

reused on-site or off-site may require testing to meet the requirements for NYSDEC Pre-Determined Beneficial Use or a Case-Specific BUD per 6 NYCRR Part 360, or other applicable out-of-state agency's requirements for a Case-Specific BUD. For further discussion on topsoil reuse refer to Section 02 24 20 – Soil Sampling and Analysis and Section 31 23 23 – Fill.

D. Sheeting and Bracing:

1. The Contractor shall provide all labor, equipment, materials and incidental items and services necessary to perform sheeting and bracing as indicated on the Contract Drawings and specified herein. Sheeting and bracing shall include but not limited to:

   a. Furnish, install, preload and maintain a system of wales, struts, kickers and bracing appurtenances to shore portions of the earth support walls as shown on the Contract Drawings.

   b. After support is provided, including installation of base slabs, unload and remove wales, struts, kickers and bracing as required.

   c. The arrangement, construction, testing and maintenance of the lateral bracing system shall be the responsibility of the Contractor.

2. All excavations shall be excavated with vertical sides and properly sheeted and braced for the full depth of the excavations, unless otherwise shown on the Contract Drawings, specified or ordered in writing by the Engineer. All excavation shall be shored and braced in accordance with 29 CFR 1926 Subsection P requirements and New York City Department of Buildings regulations

3. Pilot cuts for excavations shall not exceed 5 feet in depth and shall be made with equipment approved by the Engineer. The equipment to be used and the method to be employed in starting the sheeting operation shall be submitted for approval and must be approved in writing by the Engineer before the start of Work.

4. Exception: Excavation for structures or pipe lines 5 feet in depth or less need not be sheeted and braced except where excavation is in close proximity to existing footings or conduits and where unsupported sides may be unstable.

5. Design and install sheeting and bracing in excavations for pipe lines so that at no time shall sheeting be braced or blocked against the sides of pipe or conduit. Do not drive sheeting for pipelines below the elevation of the bottom of the pipe. If it is necessary to drive the sheeting below that elevation in order to obtain a dry trench or satisfactory working conditions, cut off the sheeting and leave in place below the top of the pipe at no additional cost to the City.

   a. Contractor shall design and provide additional and supplemental sheeting and bracing as needed to perform the excavation.

b. Adjust field locations of wales, rakers, struts and braces as required and approved by the Engineer to avoid interference with new Work and provide sufficient bearing. Block between wales and sheets with steel shims immediately after installing braces.

c. Struts shall be wedged, posted and tied to form a stiff support. Rakers and struts to be preloaded shall be jacked to the loads shown on the Contract Drawings. Rakers and struts shall be preloaded in the presence of the Engineer.

d. Provide web stiffeners, plates or angles as needed to prevent rotation, crimping or buckling of connections and points of bearing between structural steel members and/or jacks occasioned by eccentricities caused by field fabrication, assembly or conditions.

e. Protect bracing members from damage by construction equipment and other causes. Repair any damage promptly and erect temporary barriers to secure area of damage, as required.

6. Where permitted or ordered in writing by the Engineer, slope the sides of the excavation to elevations approved by the Engineer and excavate below such elevations with vertical sides, properly sheeted and braced. Side slopes must be stable. Banks more than 5 feet high shall be shored and sloped to the angle of repose in accordance with current OSHA standards to furnish safe working conditions, to prevent shifting of material, to prevent damage to structures or other work and to avoid delay to the Work, all in compliance with U.S. Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 and under Contract Work Hours and Safety Standards Act, as amended. The minimum shoring, sheeting and bracing for trench excavations shall meet the general trenching requirements of the applicable safety and health regulations. However, in no case shall the sides of trench excavations for pipe or conduit be sloped to elevations lower than 2 feet above the top of the pipe or conduit.

7. Removal of sheeting:

a. When the sheeting and bracing for the vertical sides of such trench excavations is not required to be left in place, such sheeting and bracing shall be removed, and backfill shall be placed and compacted to an elevation at least 1'-6" above the top of the pipe or conduit. This requirement shall be met unless an exception is provided elsewhere in the Contract Documents.

b. Where sheeting and bracing is removed, it shall be done as the excavation is refilled in a manner to avoid the caving in of the bank or disturbance to adjacent areas or structures, except as otherwise shown on the Contract Drawings or directed. Carefully fill voids left by the withdrawal of the sheeting by ramming or otherwise as directed by the Engineer.

c. Obtain permission of the Engineer before the removal of any shoring, sheeting or bracing. Such permission by the Engineer shall not relieve the Contractor of responsibility for injury to structures or to other property or persons resulting from failure to leave such sheeting and bracing in place.

d. Load from rakers, struts and corner braces shall be released in a controlled fashion by cutting kickers and removing wedges and shims, as approved by the Engineer.

8. Credit: Sheeting and bracing required to be provided by the Contract Drawings or the Sections and subsequently allowed or ordered in writing by the Engineer to be omitted shall be subject to suitable credit to the City. Measurement of sheeting and bracing limits subject to suitable credit shall extend from the subgrade to within 18 inches of the ground surface in the case of vertical sides, regardless of stages; and shall extend from the subgrade to 12 inches above the junction of the vertical and sloping sides in the case of excavations with sloped sides above and vertical sides below. Sheeting and bracing indicated to be omitted on the Contract Drawings will not be subject to credit.

9. Width: The width of trenches, between inner faces of sheeting or rock, as the case may be, shall not exceed the width of the structure to be installed by more than 3 feet. Where two or more stages of sheeting are used, the width of trench shall not exceed the width of structure by 3 feet at the lowest stage of sheeting to a point 2 feet above the top of pipe or conduit.

10. In cases where sheeting and bracing will not adequately protect adjacent structures from damage and settlement, the Contractor shall employ other methods, such as underpinning. The Contractor shall hold the City harmless from all claims for damage arising from failure to adequately protect all structures. The Contractor will be presumed to have fully examined and inspected the buildings before estimating the costs and hazards involved.

11. If, in the opinion of the Engineer, any of the approved temporary or permanent supporting structures are inadequate or unsuitable for the actual conditions in the field, the Engineer may direct the Contractor to strengthen the supporting structures at no additional cost to the City. The Contractor shall be responsible for the sufficiency of all temporary and permanent supporting structures whether or not directed by the Engineer to strengthen them.

E. Protection of Plants and Structures: Before starting excavation, clear away all obstructions which are to be removed or relocated. Properly brace and protect trees, shrubs, poles and other structures which are to be preserved. Comply with the requirements of Section 31 10 10 - Site Clearing.

F. Frost Prevention: Protection shall be provided against the penetration of frost into material below the bearing level during work in the winter months. This protection

shall consist of a temporary blanket of straw or salt hay covered with a plastic membrane or other approved means

G. Removal of Water:

1. Conform to the requirements of Sections 31 23 19 - Dewatering and 31 25 10 - Dust, Soil Erosion and Sediment Control.

2. Care of Water: At all times during the Work, including final inspection, provide and maintain ample means and suitable equipment with which to promptly remove and properly dispose of all water entering excavations or other parts of the Work. Keep all excavations dry at all times until the structures to be built therein are completed and backfilled to approximately final grades except where otherwise approved by the Engineer in writing. Do not permit sewage from existing sewers and house connections to flow into excavations.

3. To prevent flotation or uplift of the structure or portions of the structure under construction, provide approved dewatering or freezing methods which shall operate under supervision 24 hours per day, including holidays and weekends. Maintain this dewatering or other system in continuous operation until the structure or portions of the structure are substantially completed to a gravity load 10 percent greater than the upward load caused by the ground water uplift pressure measured and computed from the original ground water level. Place backfill and mechanically compact it to approximately final grade after the structure has achieved the required strength, except where otherwise approved by the Engineer in writing. In addition, provide and have available at the work site suitable standby equipment for prompt replacement during breakdowns of operating equipment.

4. The dewatering system shall be maintained in operation as required in Section 31 23 19 – Dewatering.

5. Obtain written approval from the Engineer before discontinuing the dewatering or other groundwater control system.

6. Where water or sewage has accumulated or is flowing in the completed or partly completed structures, remove and dispose of such water or sewage during the time covered by the Contract, unless otherwise directed by the Engineer.

7. The Contractor shall take care of all sewer drainage interfered with by his operations to the satisfaction of the Engineer. Drainage into trench excavations is expressly prohibited.

3.02 IMPLEMENTATION

A. Structure Excavation:

1. Excavations shall be of sufficient size to permit the Work to be safely and properly constructed in the manner and of the size specified, except where limits of excavation are provided on the Contract Drawings. The bottom of

the excavation in earth and rock shall have the shape and dimensions of the underside of the structure with allowance for the concrete work mat or compacted aggregate base layer.

2. Exercise care to prevent disturbing or loosening of the soil in the excavation. Densify the bearing surface for all structures with an approved type vibratory compactor to 95 percent of the maximum dry density obtainable by ASTM D1557 before the construction of any foundations. Where the depth of disturbed or loosened soils is greater than 12 inches or; as determined by the Engineer, that it will require special compaction; the Contractor shall propose the appropriate method of compaction and submit to the Engineer for approval. All disturbed or loosened soils as determined by the Engineer that should be removed shall be replaced in accordance with the requirements of Paragraph 3.03D "Unauthorized Excavation".

3. Whenever abandoned existing piles are encountered during excavation, they shall be cut off at least 18 inches below the bottom of new footings, unless otherwise indicated on the Contract Drawings, and shall not be pulled.

B. Site Excavation:

1. Excavate over the site within the limits of site grading to conform to finished site grades. Arrange the excavation work to permit continuous surface drainage off the site, eliminate low spots and surface ponding, and prevent runoff from flowing into the surrounding areas.

C. Trench Excavation:

1. Maintain the minimum trench width adequate to place, joint and backfill the pipe or conduit properly. The clear width of the trench at the level of the top of the pipe shall not exceed the sum of the outside diameter of the pipe barrel plus 20 inches for pipe 4 through 24 inches in diameter nor the outside diameter of the pipe barrel plus 2 feet for pipe more than 24 inches in diameter, unless otherwise approved by the Engineer. The banks of pipe trenches shall be as near to vertical as practicable.

2. Length of Excavation: Make excavation for the sewers, drains, ducts, conduits or pipe lines only a reasonable distance in advance of pipe laying, at the discretion of the Engineer, and as may be indicated by the supply of materials on hand.

3. In sheeted trenches, measure the clear width of the trench at the level of the top of the pipe to the inside of the sheeting.

   a. Pipes placed in trenches wider than specified above shall be provided with concrete cradle or encasement as directed by the Engineer. No separate payment will be made for such cradles or encasement.

   b. Do not overexcavate the bottom of the trenches. The bottom of trenches shall be graded accurately to provide uniform bearing and

support for each section of the pipe on undisturbed soil at every point along its entire length (except for the portions of the pipe sections where it is necessary to excavate for bell hole, for the proper sealing of pipe joints, and as hereinafter specified).

c. Dig bell holes and depressions for joints after the trench bottom has been graded. In order that the pipe rests on the prepared bottom for as nearly its full length as practicable, make bell holes and depressions only of such length, depth, and width as required for properly making the particular type of joint. Remove stones as necessary to avoid point bearing. Except as hereinafter specified for wet or otherwise unstable material, backfill overdepths with materials specified for backfilling the lower portion of trenches. Whenever wet or otherwise unstable material that is incapable of properly supporting the pipe is encountered in the bottom of the trench, over excavate such material (a minimum of 2 feet below pipe) to a depth to allow for construction of stable pipe bedding. Backfill the trench to the proper grade with suitable approved materials as per Section 31 23 23 - Fill.

d. If unstable material is exposed at the level of the bottom of the trench excavation, it shall be excavated in accordance with Paragraph 3.03C "Authorized Additional Excavation". When the Engineer judges that the unstable material extends to an excessive depth, he may advise the Contractor, in writing, to stabilize the trench bottom with additional select fill or pipe bedding material or to ensure firm support for the pipe or electrical duct by other suitable methods. Payment for such trench stabilization will be made as described for "Authorized Additional Excavation."

e. The open, excavated trench preceding the pipe laying operation and the unfilled trench with pipe in place shall be kept to a minimum length, causing the least possible disturbance. Means of egress shall be located so as to require no more than 25 feet of lateral travel by employees. Ladders shall extend a minimum of 36 inches above the top of the sheeting or be tied down with a grabrail provided.

f. No water shall be allowed to rise in the trench excavation until sufficient backfill has been placed to prevent pipe flotation.

D. Lines and Grades:

1. Excavate for sewers, drains, conduits, pipe lines, walls, foundations, footings, and other structures, including any excavating indicated on the Contract Drawings or necessary, to the lines and grades shown on the Contract Drawings, specified or required.

2. Demolition: Cut pavements, curbs and sidewalks with non-impact tools or other equipment approved by the Engineer. Breaking of pavements, curbs and sidewalks by impact, such as with the use of a ball, is not permitted.

When removing sections next to sections that are to remain, sawcut the full depth of the concrete and asphalt.

3. Adequate Space: Do all trimming, grading and other incidental work to the grades and slopes shown on the Contract Drawings, specified or required as approved by the Engineer. Perform all excavations of sufficient size for the proper execution and inspection of the work. Keep excavation in good condition at all times and fill all voids which may endanger existing structures to the satisfaction of the Engineer.

3.03 FIELD TESTING / QUALITY CONTROL

A. Subgrade Consolidation:

1. Consolidating Suitable Materials: Materials used in the bottom of excavation to replace boggy and other yielding or unsuitable materials, for providing solid and firm foundations for the structures to be built thereon, where approved in writing, may be either select fill or lean concrete.

B. Explosives: Do not use explosives for any clearing, grubbing or excavation work as per Section 31 10 10 – Site Clearing.

C. Authorized Additional Excavation: In case the materials encountered at the elevations shown on the Contract Drawings are not suitable, or in case it is found desirable or necessary to go to an additional depth or to an additional depth and width, carry the excavation to such additional depth and width as the Engineer may direct in writing. Refill such excavated space with either 2,500 psi concrete or compacted select fill materials, as ordered. Where necessary, compact fill materials to avoid future settlement. Use select fill materials meeting the requirements of Section 31 23 23 – Fill and compact to attain a minimum degree of compaction of 95 percent of the maximum dry density as determined by ASTM D1557. Place backfill in lifts not exceeding 9 inches in loose thickness.

D. Unauthorized Excavation: Wherever the excavation is carried beyond or below the lines and grades shown on the Contract Drawings or given by the Engineer, except as specified in Paragraph 3.03C "Authorized Additional Excavation", refill all such excavated space with such material and in such a manner as may be directed by the Engineer to insure the stability of the various structures. Areas excavated beneath all manholes, structures, pipelines or conduits without authority shall be refilled by the Contractor at its own expense with 2,500 psi concrete or compacted select fill material and properly compacted as ordered by the Engineer.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Fencing, Bridging, and Decking

1. All excavations or openings made under this Contract in any public street, park or place, or in any adjoining property, shall be immediately enclosed by a guard fence constructed in a neat and workmanlike manner in

accordance with the requirements of Section 32 31 15 – Chain Link Fence. Where a tight board fence is specified, no guard fence will be required, provided there is no delay in the erection of the tight board fence.

2. Wherever a driveway occurs, construct a bridge of adequate strength and width and provide with side railings to span the excavation.

3. Wherever the distance between available crossings over the excavation is, in the opinion of the Engineer, excessive, he may order a temporary foot bridge with side rails to be constructed.

4. At all street intersections, excavations made from the surface shall be decked over in a substantial manner so that traffic can be maintained at all times except as herein provided for. The removal of the pavement and the placing of the decking shall be done during the hours of a day or night which will cause the least inconvenience to adjoining property owners and to public traffic in general. During certain designated hours of the day or night, sections of planking not more than 10 feet in length may be temporarily removed for the purpose of removing excavated material, receiving materials of construction or for backfilling.

B. Segregation, Storage, and Disposal of Materials:

1. Segregating:

a. All unsuitable material which may be excavated by the Contractor shall be kept separated from suitable excavated material which may be reused on-site or off-site under NYSDEC Pre-Determined Beneficial Use or a Case-Specific BUD per 6 NYCRR Part 360, or other applicable out-of-state agency's Case-Specific BUD, or disposed off-site.

b. Soil sample results greater than 5 ppm lead by TCLP shall be reported to the Engineer immediately. (See Section 01 35 45 – Hazardous Materials Control for implementation of a Community Air Monitoring Program (CAMP) in the event that hazardous levels of lead are detected in soil.)

2. Stockpiling:

a. Excavated material to be used for backfilling on-site under NYSDEC Pre-Determined Beneficial Use or Case-Specific BUD shall be so piled and placed as not to encumber sidewalks or roadways, or wash away or obstruct the free flow of surface or drainage water. Excavated material shall not be placed closer to the edge of an excavation than a distance equal to 1-1/2 times the depth of the excavation, unless the excavation is in rock or the sides of the excavation have been sloped or sheeted and shored to withstand the lateral forces imposed by such superimposed loads.

b. Stockpile cover and liner material and installation requirements should be as specified in Section 31 25 10 - Dust, Soil Erosion and Sediment Control.

c. Storage before beneficial use shall not exceed 365 days per 6 NYCRR Part 360.12(d)(2)(vii)(a)(2), unless a different time period for storage is approved by NYSDEC.

3. Excess Materials: The Contractor shall make arrangements for transportation and reuse of the soil on-site or off-site under NYSDEC Pre-Determined Beneficial Use or a Case-Specific BUD per 6 NYCRR Part 360, or applicable out-of-state agency's Case-Specific BUD. If reuse is not an option, only then may the Contractor dispose of excess materials.

C. Sheeting and Bracing Left in Place:

1. All sheeting and bracing in excavations for sewer pipelines, including manholes and chambers, shall be left in place except where otherwise shown on the Contract Drawings, specified or ordered in writing by the Engineer. Sheeting left in place shall be cut off at the elevation shown on the Contract Drawings, or at least 18 inches below final grade. Bracing remaining in place shall be driven up tight.

2. Where it is necessary to remove cross braces to make way for sewer pipe, manholes, and chambers, rebrace the sheeting in a manner approved by the Engineer, but in no case shall sheeting be braced against the sides of pipe or structures, unless approved in writing by the Engineer.

3. Leave sheeting and bracing in place in excavations for structures other than pipe lines where shown on the Contract Drawings, specified or ordered in writing by the Engineer to be left in place. Where such sheeting is to be left in place, the original braces shall not be removed and the sheeting shall be rebraced against the structure unless it is approved by the Engineer.

4. Sheeting and bracing to be left in place shall include all elements of the sheeting and bracing regardless of the type used, except such braces required to be removed to make way for the structure or pipeline being constructed. Where lagging and "soldier" beams are used, the "soldier" beams shall also be left in place.

5. In excavations with vertical sides for the full depth, cut off sheeting left in place at the elevations provided in writing by the Engineer, but in general, such cutoffs shall not be less than 18 inches below the existing ground surface. In excavations with sloped sides above and vertical sides below, cut off sheeting at the top of the vertical sides of the excavation. Cut off timber sheeting by sawing, and steel sheeting or "soldier" beams by burning. Breaking off sheeting will not be permitted.

6. Do not remove sheeting and bracing not shown on the Contract Drawings or specified to be left in place without first obtaining a statement in writing from the Engineer that such sheeting may be removed.

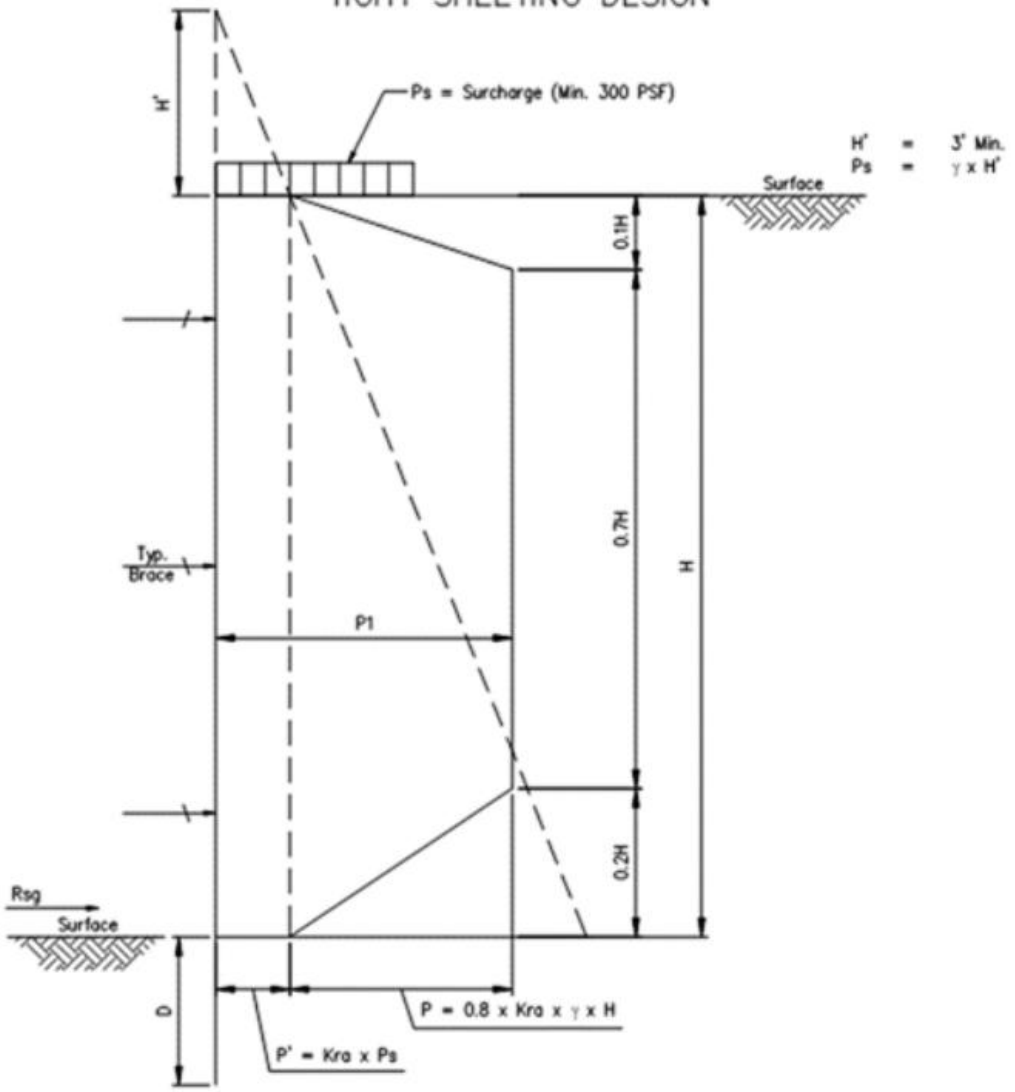
7. No separate payment will be made for sheeting and bracing left in place, the cost thereof shall be included in the price or prices bid for the Work under this Contract, except when separate payment for sheeting and bracing ordered in writing by the Engineer to be left in place is provided for in the Contract Documents.

END OF SECTION

Attachment A

(Revised 10/22)

MINIMUM LOAD DIAGRAM FOR NON–WATER TIGHT SHEETING DESIGN



δ = Unit Weight of Soil

δw = Unit Weight of Water

δs = Unit Weight of Submerged Soil

ø = Angle of Internal Friction of Soil

$Kra = \frac{(1 - \sin ø)}{(1 + \sin ø)}$ For Active Earth Pressure

$Krp = \frac{(1 + \sin ø)}{(1 - \sin ø)}$ For Passive Earth Pressure

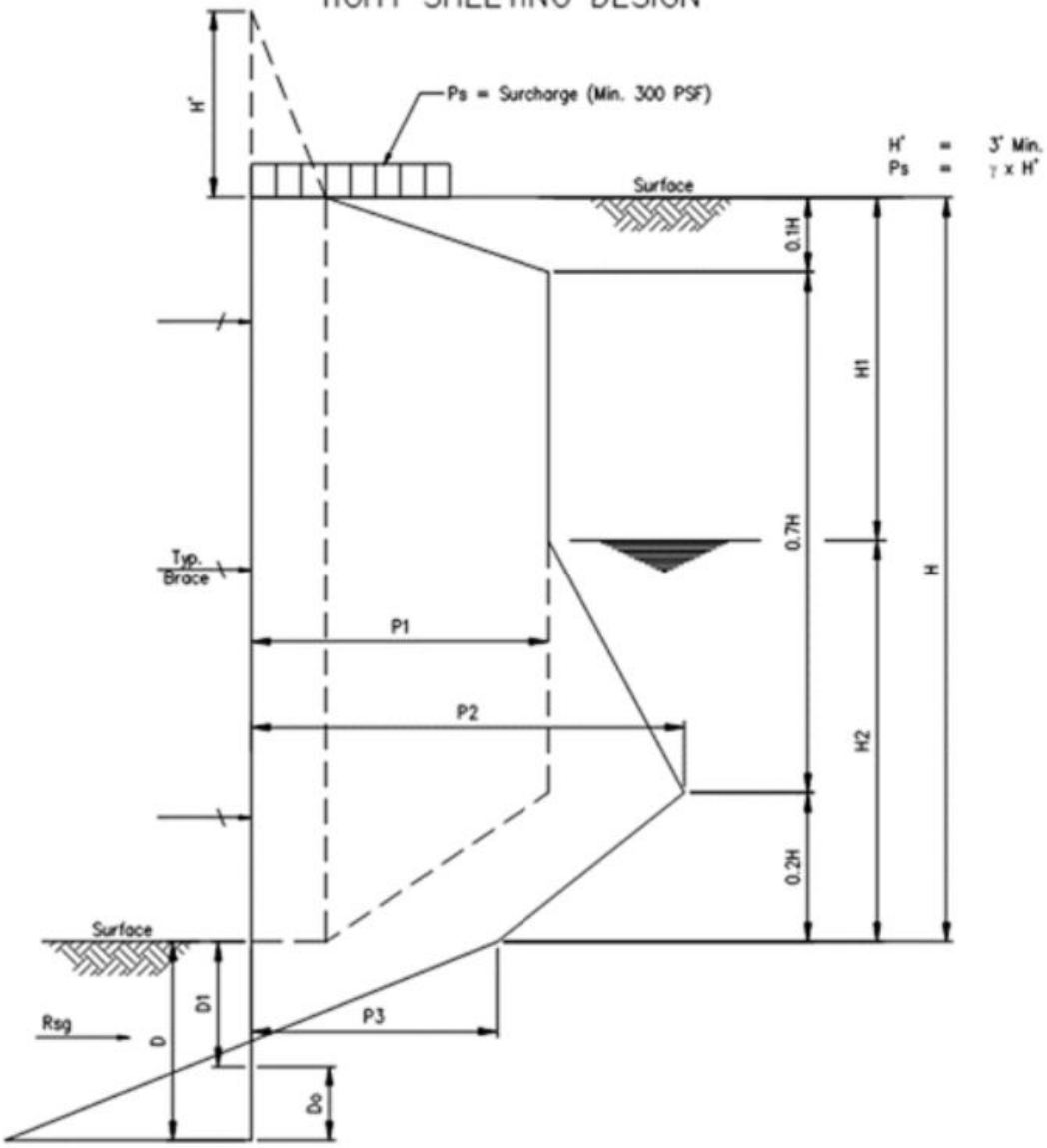
$D = \sqrt{\frac{2\ Rsg}{\delta(Krp - Kra)}}$ (1.3)

(Min. 2'–0")

Attachment B

(Revised 10/22)

MINIMUM LOAD DIAGRAM FOR WATER TIGHT SHEETING DESIGN



$$P' = Kra \times Ps$$

$$P1 = P' + 0.8 \times Kra \times (\delta H1 + \delta sH2)$$

$$P2 = P1 + \delta w\ (H2 - 0.2H)$$

$$P3 = \delta w \times H2$$

$$D1 = \frac{P3}{\delta s\ (Krp - Kra)}$$

$$Do = \sqrt{\frac{2\ Rsg}{\delta s\ (Krp - Kra)}}$$

$$D = (D1 + Do)\ (1.3)$$

SECTION 31 23 19 – DEWATERING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish, install, operate and maintain dewatering equipment and systems as specified, shown on the Contract Drawings, or required during the Contract.

B. Groundwater sampling results from the Design Phase subsurface investigations are provided in Tables 11, 16, and 21, attached to Section 01 35 45 – Hazardous Materials Control, and in the following reports.

1. Soil and Groundwater Investigation Report for TI-010 Chlorination, June 2025, prepared by Bidwell Environmental, LLC;
2. Soil and Groundwater Investigation Report for TI-010 Dechlorination, June 2025, prepared by Bidwell Environmental, LLC; and
3. Soil and Groundwater Investigation Report for TI-011 Disinfection, June 2025, prepared by Bidwell Environmental, LLC.

C. The Contractor shall provide standby equipment and power supply for maintaining uninterrupted construction dewatering.

D. The Contractor shall install groundwater monitoring wells/piezometers and measure, record and report the levels/hydraulic head of groundwater as required during the project.

E. The Contractor shall obtain and comply with all necessary permits from State and local agencies required for operation of the dewatering system, monitoring groundwater, and disposal of dewatering effluent.

F. The Contractor shall collect samples of the dewatering effluent as required by the applicable State and local permits and provide the services of a laboratory certified under the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) for the analyses of the samples collected to determine the quality of dewatering effluent prior to disposal.

G. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 02 24 20 - Soil Sampling and Analysis

B. Section 31 23 16 - Excavation

C. Section 31 25 00 - Dust, Soil Erosion and Sediment Control

1.04 REFERENCES

A. Definitions

1. Construction Dewatering: Controlling groundwater levels, hydrostatic pressures and controlling surface water, such that excavation required on the Contract Drawings can be performed to required depths in substantially dry and stable conditions.

2. Dewatering System: System of wells, well points, sumps, ejectors, pumps, piping, power supply, effluent treatment equipment and other equipment designed by the Contractor, submitted to and approved by the Engineer prior to dewatering, that will effectively dewater the site as required herein. Adequate monitoring wells/piezometers shall be included in the dewatering system to verify drawdown levels inside the excavation area and monitor groundwater levels outside the limits of the excavation near adjacent structures.

B. Reference Standards

1. 6 NYCRR Part 750, State Pollutant Discharge Elimination System (SPDES) Permits

2. 6 NYCRR Part 601, Water Withdrawal Permitting, Reporting and Registration (Exclusive of Long Island Wells Regulated Under Part 602 of This Title)

3. 6 NYCRR Part 602, Applications for Long Island Wells

4. 6 NYCRR Part 621, Uniform Procedures

5. Water and Sewer Forms, New York City Department of Environmental Protection; (http://www.nyc.gov/html/dep/html/forms_and_permits/wsforms.shtml)

6. New York City Construction Code

7. ASTM standards applicable to piping, equipment and other items required for a complete dewatering system

1.05 DESCRIPTION

A. Design Requirements

1. The Contractor shall design, install, operate, maintain and remove the dewatering system as necessary to:

   a. Lower and maintain groundwater levels and hydrostatic pressures to 2 feet below the prevailing excavation level or to a point no higher than 2 feet above the top of an impermeable stratum, if the subgrade is in the impermeable stratum. Groundwater levels shall be lowered for a time period as deemed necessary by the Engineer to ensure adequate factor of safety for the constructed structure.

   b. Maintain stable slopes and subgrade.

   c. Control and remove seepage and surface water into excavations.

   d. Allow subsequent work to be safely performed and not result in damage to adjacent properties, buildings, structures, utilities and other work.

   e. The Contractor shall provide primary and standby power, including all costs for installation, energy and fuel.

   f. The Engineer will perform inspections and witnessing of:

      1) Testing of sand and silt from dewatering wells.

      2) Drawdown and performance testing of Dewatering System.

      3) Performance testing of standby power source and backup Dewatering System.

2. The method of dewatering and control of water both inside and outside the excavation shall be selected by the Contractor who shall be solely responsible for the location, arrangement and depth of any system(s) selected to accomplish the Work. The Contractor shall construct protective works as necessary to dewater, cut off porous zones of fill and direct the flow of water from whatever source away from the excavations and adjacent areas. Protective works shall include slurry methods, grouting, clay seepage plugs, toe drains with appropriate filters, deep wells, well points, sumps, dikes, ditches and all supporting features as required, but not specifically shown on the Contract Drawings.

   a. The dewatering system shall be designed and implemented so as to maintain a minimum factor of safety against the uplift groundwater pressures in any soil strata. The factor of safety shall be calculated by considering the stabilizing pressure to consist of overburden soil weight alone. The dewatering system shall be maintained operational until the dead weight of the overburden soil plus any completed portion of the structure is able to provide the required factor of safety at static (normal) groundwater level / pressure.

3. The dewatering system shall be designed to treat dewatering effluent to comply with all necessary permits and/or applications for disposal of dewatering effluent.

B. Regulatory requirements

1. The Contractor shall manage and dispose of all groundwater removed during dewatering activities in accordance with either New York State Pollutant Discharge Elimination System (SPDES) standards set by the New York State DEC for discharge to surface water, or New York City DEP Sewer Discharge Criteria for discharge to the City wastewater collection system. The Contractor shall acquire, and update as necessary, all permits and/or applications for water withdrawal and disposal of dewatering effluent. It shall be the Contractor's responsibility to update permits to match their final dewatering system design.

2. For discharge to the City wastewater collection system, a comparison of the site groundwater quality data (before and after any treatment proposed by the Contractor) with the NYCDEP Limitations for Effluent to Sanitary or Combined Sewers (latest version issued by the Division of Pollution Control and Monitoring, Bureau of Wastewater Treatment) shall be required prior to and during effluent discharge.

1.06 QUALITY ASSURANCE

A. The dewatering Work shall be performed by an entity specializing in and having experience with installing and operating dewatering systems in similar subsurface conditions for at least 5 years.

B. The dewatering system shall be designed by a Professional Engineer registered in the State of New York having experience in designing a system in similar site conditions.

C. Well drillers shall be licensed in the State of New York.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and the following for the approval by the Engineer:

1. Pre-construction Submittals: A Dewatering Plan shall be submitted to the Engineer for approval, at least 30 calendar days prior to the scheduled date for commencement of the dewatering Work, and to the NYSDEC, as applicable. Approval of the Dewatering Plan by the Engineer or City shall not in any way relieve the Contractor from full responsibility for the complete and adequate design and performance of the dewatering system to provide the necessary construction dewatering. At a minimum, the Dewatering Plan shall include the following:

a. Design calculations confirming the adequacy of the proposed dewatering system, including depths to groundwater within the excavation limits.

b. Calculations and requisite technical data on well screens and filter materials and gradations to demonstrate the adequacy of proposed systems to prevent the pumping of fines.

c. Shop drawings showing the proposed types and planned locations of surface water control and the dewatering system to be used.

d. Shop drawings shall include the arrangements, locations and depths of the dewatering system, a complete description of equipment and materials to be used and the procedures to be followed in installation, operation and maintenance in relation to the proposed sequence of excavation, foundation construction and backfilling.

e. The standby equipment and standby power supply details.

f. The proposed locations and sizes of effluent treatment equipment, effluent flow equalization tanks and discharge of water.

g. Location and size of sumps, ditches and water discharge lines, including their relation to water disposal points.

h. Submittals shall also include discharge details, metering, and monitoring schedules and the details of the settling tank and oil/water separator.

i. Methods and equipment to be used for drilling, construction, and development of wells and piezometers.

j. Protocols to be followed for the sampling and analysis of dewatering effluent, and the name and qualifications of the laboratory that will be testing the quality of dewatering effluent prior to disposal.

k. Protocols to be followed for treatment of effluent in conformance with the requirements of the applicable permits.

2. As required in Section 02 24 20 - Soil Sampling and Analysis, the Contractor shall submit a completed EH&S Drilling and Boring Checklist for approval to the Engineer

3. As-built Submittals: Prior to the start of construction dewatering, submit as-built conditions of the dewatering system. As-built data are to include but are not limited to:

a. Plans and sections showing as-built locations, and surveyed elevations of the dewatering system and its components.

b. Drawings to indicate changes made to the original shop drawings to accommodate field conditions and to comply with design standards.

c. Details of installation including dimensions and materials used, description and drawings of all installations, all procedures, soil strata encountered and logs with descriptions of soil samples and stratification.

d. Details of each sump, well, well point, observation well, and piezometer installed, including, but not limited to, the diameters of the borehole and the components, screen type, screen opening size, screen top and bottom elevations, details of filter, seal and grout, pump type, and capacity if installed within. These details should be provided to the Engineer within a week of installation of each entity. The details shall be re-submitted if any part of the entity changes during construction.

e. Details of abandoning each sump, well, well point, observation well, and piezometer after its use has been completed.

4. Regulatory Compliance: Prior to the start of construction dewatering, submit a report comparing site groundwater quality data with the water quality standards to be complied with under permit(s) as applicable to the project. The permitting requirements to be considered under the Work of this section include, but may not be limited to:

   a. NYCDEP Dewatering Permit for temporary groundwater discharge into the public sewers of the City.

      1) Wastewater Quality Control Application and Letter of Approval, if applicable, from the Inspection & Permitting Section, Industrial Pollution Prevention (IPP) Program, Division of Pollution Control and Monitoring, Bureau of Wastewater Treatment (BWT).

      2) Letter of Approval from the Division of Connection and Permitting, Bureau of Water & Sewer Operations (BWSO), if applicable.

      3) NYC DEP Bureau of Customer Service Permit

   b. NYSDEC SPDES Discharge Permit(s) - General or Individual Permits - for dewatering effluent or storm water discharges from construction activities at the project site.

   c. Water Withdrawal and Long Island Well Permits, if applicable, in association with construction dewatering.

   d. The Contractor shall be responsible for compliance with all dewatering permit requirements including renewals once construction dewatering begins.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The settling tank shall be concrete or steel as manufactured by Rockford, Belvidere, IL or an approved equal,

B. The oil/water separator shall be concrete or steel as manufactured by Rockford, Belvidere, IL or an approved equal.

2.02 MATERIALS / EQUIPMENT

A. Materials and equipment used in the dewatering system shall adhere to accepted industry standards and be in good operating condition and able to perform satisfactorily over the required duration of construction dewatering.

B. Back up equipment for the dewatering system shall be identical to the primary equipment and shall be available in operating condition at all times.

C. Pipes and well screens shall consist of Schedule 40 PVC or stronger.

D. Sand shall consist of clean, single-size filter sand of adequate gradation.

E. Grout shall consist of cement-bentonite grout of adequate mix proportion and consistency. Seals shall consist of bentonite pellets.

F. Pumps, meters, hoses and controls shall be suitable for the intended purpose and application.

G. Power supply and effluent discharge are included in this Work.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Construction dewatering is required to protect foundation subgrades and to maintain dry and stable conditions for construction. The Contractor shall maintain a continuous and completely effective Dewatering System for the required time as specified in Section 31 23 16 - Excavation.

B. The Contractor shall obtain and pay for all permits, applications and licenses required by law that are associated with the disposal of dewatering effluent, including but not limited to the NYSDEC SPDES Permit, if applicable. The Contractor shall coordinate with the CM and DEP to obtain or modify permit(s), if necessary, sufficiently in advance of dewatering system startup. The Contractor shall also maintain the permits by applying for and following up on the applications for modifying or renewing the permits, if necessary, during the period of performance.

C. The Contractor shall coordinate the operation of the dewatering system with any other Work.

D. The Contractor is responsible for monitoring dewatering efforts to determine if the Contract and related permit requirements are being met. The Contractor shall provide observation wells and other means to monitor the dewatering as detailed in the Dewatering Plan.

E. Surface areas adjacent to the excavation shall be graded and/or curbed to prevent flow of surface water into the excavation.

F. Open pumping with sumps and ditches resulting in boils, loss of fines, softening of the ground or instability of slopes will not be permitted.

G. The Contractor shall select and supply Personal Protective Equipment (PPE) in accordance with the Contractor's Site Health and Safety Plan.

3.02 IMPLEMENTATION

A. The dewatering system shall provide for an uninterrupted flow of pumped water and shall be maintained and pumped as necessary to drawdown and maintain the groundwater levels as

specified. Unless otherwise specified, pumping shall maintain those depressed levels until the permanent under drainage system has been installed, tested, accepted and is operational or until the permanent structure, or a portion thereof, is capable of withstanding hydrostatic pressures as determined by the Engineer.

B. The Contractor shall furnish, operate and maintain sufficient drainage and pumping facilities to dewater the site and its underlying soil. Dewatering operations shall operate in such a manner so that the excavation can proceed while maintaining stable slopes and the designed lateral support for the perimeter support of excavation walls, without disturbing the bearing subgrades for the structure and provide stable conditions. The ground water level as measured in observation wells shall be lowered and maintained at least two feet below the prevailing excavation level, or it shall be lowered to a point no higher than 2 feet above the top of impermeable stratum if the subgrade is in the impermeable stratum.

C. The dewatering system shall be installed and operated in such a manner as to avoid the movement of fines or loss of ground below the bearing level and shall not influence the stability of surrounding areas. Well points and deep wells shall be properly sanded in and sumps shall be sheeted and provided with proper filter material.

D. Any sign of subgrade disturbance due to seepage or unaccountable reduction in effluent flow rate shall be immediately reported to the Engineer and steps immediately taken to correct the condition.

E. The Contractor shall install observation wells / piezometers and monitor groundwater lowering at nearby structures due to construction dewatering. Any damage caused to nearby structures due to construction dewatering shall be repaired by the Contractor at no cost to the City.

F. Surface Water

1. Surface water on and around the site shall be collected into local sumps by means of trenches, pipes, or other means. The Contractor shall discharge the water into the City wastewater collection system. Direct surface water to minimize surface erosion, ponding and softening of slopes and berms, including haul roads and equipment working stations. Slope protection by means of polyethylene sheets, held in place by tires or otherwise, shall be provided locally as required. At the perimeter of the excavation, surface water is to be directed into the storm sewer system and not permitted to enter the excavation. Curbs shall be maintained and, where necessary, extended across intersections, curb cuts and defective curb sections. Surface cracks in the adjacent streets are to be sealed and re-sealed as necessary. Should adjacent settlement occur during the work, curbs shall be raised or water-tight mounds shall be installed as directed by the Engineer to prevent flow into the site. Measures for preventing the pollution of and discharging storm water shall be in accordance with Section 31 25 10 - Dust, Soil Erosion and Sediment Control.

    a. If surface water flows to a point across a potentially contaminated surface (e.g., contaminated or hazardous soils) or otherwise unsuitable/impermeable surface (e.g., mud mat), removal of said water via pumping to storm sewers shall require the appropriate dewatering permits from the NYSDEC or NYCDEP Bureau of Water and Sewer Operations (BWSO) Division of Permitting and Connections. The Contractor shall obtain all necessary permits in a timely manner so as not to delay the Work.

G. Pretreatment of dewatering effluent

1. The Contractor shall provide appropriately sized settling tanks to collect and store dewatering effluent commensurate with dewatering discharge rates to allow for settlement of suspended solids and sampling as required by disposal/discharge criteria. The tanks shall be equipped with an overflow collection system to prevent accidental release of dewatering effluent. Routine inspection of the tanks shall be carried out daily to ensure that tank integrity is being maintained, and that all valves or tank openings are properly locked out to avoid accidental discharge. Settling tanks shall be cleaned frequently to prevent excess deposition of solids which could overflow from the tank. Removed solids shall be classified and disposed of in accordance with the requirements of Section 02 24 20 - Soil Sampling and Analysis. Transportation and Disposal including waste manifests shall be in accordance with Section 31 23 16 - Excavation).

   a. The settling tank shall be sized based upon the maximum groundwater flow times a 1.5 safety factor.

2. The Contractor shall provide appropriately sized oil/water separators to prevent discharge of hydrocarbons, grease and other floatable materials to surface water or the sewer system. Oil/water separators shall be cleaned frequently and collected materials classified and disposed of in accordance with Sections 02 24 20 - Soil Sampling and Analysis and 31 23 16 - Excavation requirements for manifests and material transport and disposal.

   a. The oil/water separator shall be sized based upon the maximum groundwater flow times a 1.5 safety factor.

3. The Contractor shall provide treatment for, or remove from the site to an approved disposal facility, all dewatering effluent or groundwater which exceeds any limit set for surface water or sewer discharge, whichever is applicable. Classification and disposal shall conform to Sections 02 24 20 - Soil Sampling and Analysis and 31 23 16 - Excavation requirements for manifests and material transport and disposal.

H. Disposal of Dewatering Effluent

1. Dewatering effluent may be affected by rainfall. The Contractor shall provide adequate equalization and holding tanks to allow work to proceed in the case of restricted discharge capability during rain events.

2. The Contractor shall provide sufficient clean water to flush all sewers and drains when necessary. If any sewer, drain, catch basin, or inlet becomes filled or partially filled with sediment or debris, the Contractor shall promptly and satisfactorily remove such deposits.

3. The Contractor shall collect dewatering effluent samples as required by the permits and the Dewatering Plan. If pretreatment, other than oil/water separators and settling tanks, is required, the Contractor shall continue to collect effluent samples during dewatering operations, and analyze for all listed parameters at intervals based on dewatering discharge volume as a verification of discharge compliance. Intervals will be as defined in the Dewatering Plan. A copy of all analytical results shall be submitted to the Engineer for review and approval, no later than one day after receipt of such data.

The Contractor shall provide for prompt sampling and turn-around times so as not to delay the project, but in no case shall turn-around time be longer than 5 calendar days.

3.03 FIELD TESTING / QUALITY CONTROL

A. The Contractor shall determine the presence of contaminants in dewatering effluent, including the quantity of fines in the pumped water, by sampling and analyzing in accordance with permit requirements, or once every two weeks, whichever is more frequent.

B. The fines content should be measured in each sump, well or well point being pumped. The permissible maximum fines content is 5 parts per million (ppm) as measured by the Rossum Sand Content tester. If the fines content is exceeded, the Contractor shall modify or re-install the well or wellpoint to satisfy the requirements.

C. The Contractor shall measure water levels periodically in observation wells / piezometers installed adjacent to nearby structures to ensure drawdown outside the excavation is within allowable limits in accordance with applicable permits.

D. A sufficient number of observation wells shall be installed and water levels monitored by the Contractor, at least weekly, to demonstrate that the goals of the Dewatering System are being met. If applicable, the Contractor may make use of existing observation wells as shown on the Contract Drawings.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. The Contractor shall be prepared to modify the dewatering system and methods as required by actual field conditions encountered during construction, at no additional cost to the City. Any component of the dewatering system that malfunctions or is damaged during its operation shall be promptly repaired or replaced by the Contractor at no additional cost to the City.

B. All wells and piezometers shall be abandoned at the completion of the work, except as directed by the Engineer, in accordance with NYSDEC guidelines.

C. All wells shall be abandoned in place and all other portions of the dewatering system shall be removed by the Contractor after completion of dewatering activities and in accordance with NYSDEC requirements.

END OF SECTION

SECTION 31 23 23 - FILL
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Fill Work includes furnishing, placing and compacting all fill material necessary to bring excavations and site work to final grade as shown, specified or required.

B. Clean fill material from an off-site source shall be non-hazardous and shall meet the requirements of this Section.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 74 20 - Construction Waste Management

B. Section 02 24 20 – Soil Sampling and Analysis

C. Section 03 30 00 - Cast-in-Place Concrete

D. Section 31 25 10 - Dust, Soil Erosion and Sediment Control

E. Section 32 90 00 - Planting

1.04 REFERENCES

A. Definitions

1. Case-Specific Beneficial Use Determination (BUD): Under 6 NYCRR Part 360, Section 360.12(d), NYSDEC sets forth the requirements for petitioning NYSDEC to obtain a Case-Specific BUD, and the criteria for reviewing, granting, or denying of the BUD. For reuse of a solid waste to be determined a beneficial use, the petition must satisfy all criteria outlined under 6 NYCRR Part 360, Section 360.12(d).

2. Fill: Soil and similar material excavated or brought to the project site for the purposes of construction. All fill material must meet the requirements of this Section. It does not include overburden generated from mining operations.

3. New York City Metropolitan Area Waste Impact Zone: The area encompassing the City of New York and the counties of Nassau, Suffolk, Putnam and Westchester, as per 6 NYCRR Part 360.2 Definitions.

4. Pre-Determined Beneficial Use for fill material: Under 6 NYCRR Part 360, Section 360.13(b) Waste cessation. "Excavated material ceases to be solid waste in accordance with the following:

   a. Fill Type 1 generated outside of the New York City Metropolitan Area Waste Impact Zone (NYCMAWIZ) – once a determination has been made that the material is Fill Type 1;

   b. Fill Type 1 generated within Nassau, Suffolk, Westchester and Putnam Counties – once the material is delivered to the site of reuse;

   c. Fill Type 1 cannot be generated within the City of New York;

   d. Fill Type 2 and Fill Type 3 generated outside of the NYCMAWIZ – once a determination has been made that the material is Fill Type 2 or Fill Type 3;

   e. Fill Type 2 and Fill Type 3 generated within the NYCMAWIZ – once the material is delivered to the site of reuse;

   f. Fill Type 4 and Fill Type 5 – Once the material is delivered to the site of reuse."

   g. Under 6 NYCRR Part 360, Section 360.12(c)(1)(iv)(a), Excavated material used to backfill the same excavation or as grade adjustment in areas of similar physical characteristics on the site of generation. If the material exhibits visual or historical evidence of contamination (including odors) and will be used in an area with public access, the material must be covered with pavement, foundation, or with a minimum of 12 inches of soil or fill that meets

the criteria to be used as Fill Type 1 and Fill Type 2 as defined in Subdivision 360.13, Special requirements for pre-determined beneficial use of excavated material. Refer to Section 02 24 20 - Soil Sampling and Analysis for sampling requirements, including a list of parameters to be analyzed for soils to be reused on-site, or soils to be reused or disposed off-site.

5. Suitable Material: Any material whose composition is satisfactory for use as fill. Any mineral (inorganic) soil, blasted or broken rock and similar materials of natural or man-made (i.e. recycled) origin, including mixtures thereof, are considered suitable materials. Determinations of whether a specific natural material is suitable shall be made by the Engineer on the above basis.

6. Unsuitable Materials: any material containing vegetable or organic matter such as muck, peat, organic silt, topsoil or sod, that is not satisfactory for use as fill material.

B. Reference Standards

1. ASTM C131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

2. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete

3. ASTM C330 - Lightweight Aggregates for Structural Concrete

4. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils

5. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))

6. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

7. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft (2,700 kN-m/m^3))

8. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method

9. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils

10. ASTM D4832 - Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Cylinders

11. ASTM D6023 - Standard Test Method for Density (Unit Weight), Yield, Cement Content, and Air Content (Gravimetric) of Controlled Low Strength Material (CLSM)

12. ASTM D6024 - Test Method for Ball Drop on Controlled Low Strength Material (CLSM) to Determine Suitability for Load Application
13. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
14. NYSDEC regulations, 6 NYCRR Part 375, Environmental Remediation Programs
15. NYSDEC regulations, 6 NYCRR Part 360, Solid Waste Management Facilities General Requirements
16. NYC Building Code

1.05 DESCRIPTION

A. Recycled materials that the Engineer has evaluated and approved for general use shall be considered to be Suitable Material subject to the conditions for use as determined by the City. In general, the use of recycled materials must be sanctioned by NYSDEC, usually in the form of a BUD. See definition above.

B. Suitable fill material from an off-site source shall be non-hazardous and shall come from the following hierarchical sources:

1. Other DEP projects that have available, excess suitable materials;
2. The NYC Clean Soil Bank, located at 830 Forbell Street, Brooklyn, and managed by the Mayor's Office of Environmental Remediation (OER);
3. Beneficial Use Facilities; and
4. Commercial Facilities.

1.06 QUALITY ASSURANCE

A. Testing: The Contractor shall retain the services of an independent materials testing laboratory to perform the following laboratory and field tests.

B. All materials used in construction, whether brought to the site or developed from on-site sources, shall be tested for optimum moisture-maximum density curve, and reports of the test results for each source shall be submitted promptly. The tests shall be as follows:

Test	ASTM Standard	Tests Per Volume Delivered
Gradation	D422	1 per 200 C.Y.
Compaction or Density	D1557	1 per 200 C.Y.

C. Acceptability of completed compaction shall be demonstrated by tests performed by the Contractor and accepted by the Engineer. The minimum number of tests shall be determined by quantity of material placed, and reports of the test results shall be submitted promptly. The Contractor shall perform either of the following tests subject to the approval of the Engineer:

Test	ASTM Standard	Tests Per Volume Placed
In-Place Density	D2167 D6938	1 per 200 cy

D. The Contractor shall engage the services of a testing laboratory, with the qualifications required by Section 03 30 00 - Cast-in-Place Concrete and experienced in design and testing of flowable fill materials and mixes, to perform material evaluation tests and to design mixes for flowable fill. A trial mix shall be performed to verify the flowable fill mix design. The trial mix shall also report slump, air content, yield, cement content, and dry unit weight per ASTM C143 and ASTM D6023.

E. Any fill material being brought to the site that is composed of soil or a mixture of soil (excluding gravel, crushed stone, limestone screenings, other granular materials or flowable fill), as well as any soil being used for drainage fill, common fill and pipe bedding for small piping, must comply with the following protocol:

1. Testing shall be performed on all soil brought on-site (fill and topsoil) and shall demonstrate chemical quality meeting 6 NYCRR Part 360, Section 360.13(f), Table 2: Fill Material Beneficial Use, specifically Fill Type 2 maximum concentration levels.

2. Chemical analyses shall include the 6 NYCRR Part 375-6.8(b) compounds, including volatile organic compounds and asbestos, as detailed in Section 02 24 20 - Soil Sampling and Analysis. All analyses shall be performed by a testing laboratory certified by the New York State Department of Health Environmental Laboratory Accreditation Program (NYSDOH-ELAP). Based on visual observation, the volume of physical contaminants, if present, shall also be recorded

3. The frequency of testing per volume of fill shall be in accordance with 6 NYCRR Part 360.13 (e)(1), Table 1, Minimum Analysis Frequency for Fill purchased from a registered/permitted processing or recycling facility.

4. Notification to the NYSDEC must be made prior to the first load greater than 10 cubic yards is planned to be transported from the site of excavation directly to the site of reuse.

   a. At least five days in advance of transfers of Fill Types 2, 3, 4 and 5 generated in, imported to, or relocated within the City of New York.

   b. At least five days in advance of transfers of Fill Type 4 and Fill Type 5 anywhere in the State of New York.

   c. The Notification of Fill Transfer for Reuse form (NYSDEC Division of Materials Management, version 03/24 or latest) will be sent to the NYSDEC Regional Office in which the destination is located. The form must be certified by a Qualified Environmental Professional (QEP). In the event the QEP is not a Professional Engineer or Geologist licensed in New York State, the QEP's basis for credential must be attached to the form.

F. When testing is required to confirm the reuse of on-site excavation spoils under a Case-Specific BUD, sample the soils in accordance with NYSDEC requirements.

1.07 SUBMITTALS

A. The Contractor shall submit shop drawings for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Name and location of all suppliers.
2. Certificate of compliance with standard specified for each source of material.
3. The Contractor shall submit all laboratory analytical reports, which shall include a Summary Table listing the analytical results with highlighted exceedances as defined in 6 NYCRR Part 360, Section 360.13 (f), Table 2: Fill Material Beneficial Use, as applicable.
4. Prior to stockpiling or placing of select fill materials at the job site, submit for approval approximately 100-pound samples representative of the fill at the proposed borrow source. In addition, submit documentation of the availability of the required fill quantities at any proposed borrow source.
5. Submit optimum moisture – maximum density curves and reports for all fill materials before placement of fill.
6. Results of all compaction tests for fill placement.
7. Mix design for flowable fill, including all materials used and trial mix test results.
8. Certification by the lightweight fill producer of the gradation, dry loose unit weight, dry compacted unit weight and Los Angeles Abrasion Test lost for the proposed lightweight fill source.

B. Prior to the transfer of fill, the Contractor shall submit the Notification of Fill Transfer for Reuse form for review prior to being sent to the NYSDEC. The form must be certified by a Qualified Environmental Professional (QEP). In the event the QEP is not a Professional Engineer or Geologist licensed in New York State, the QEP's basis for credential must be attached to the form. NYSDEC must receive notification at least five days in advance of transfers of Fill Types 2, 3, 4 and 5 generated in, imported to, or relocated within the City of New York and at least five days in advance of transfers of Fill Type 4 and Fill Type 5 anywhere in the State of New York.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Materials delivered to the site shall be stored in a manner to prevent contamination and segregation.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. General

1. Backfill shall be composed of suitable materials as defined in this Section.

a. On-site Materials: Material to be excavated and proposed for reuse as fill under Pre-Determined Beneficial Use must meet the requirements of 6 NYCRR Part 360, Section 360.13 (a), Applicability, Section 360.13 (b), Waste Cessation, or 360.12(c)(1)(iv)(a), Excavated material used to backfill the same excavation or as grade adjustment in areas of similar physical characteristics on the site of generation. If these criteria cannot be met, material shall meet Section 360.12(d), Case-specific beneficial use determinations - general. Fill may require sampling and analyses in accordance with Section 02 24 20 – Soil Sampling and Analysis designed and implemented by or under the direction of a qualified environmental professional (QEP). The Contractor shall maximize reuse of soil on-site for backfilling rather than import soil from other sources.

b. Off-site Imported Materials: Fill that is brought on site to be used as backfill must meet the requirements of 6 NYCRR Part 360, Section 360.13 (f), Table 2: Fill Material Beneficial Use for General Fill.

2. Follow common fill requirements whenever drainage or select fill is not specified. Determine and obtain the approval of the Engineer for the appropriate test method where more than one compaction test method is specified.

3. Do not use wet or frozen material for backfilling.

4. The maximum stone size shall be two-thirds of the thickness of the backfill lift, but in no case shall material containing stones over 10 inches in the largest dimension be used for backfill.

B. Drainage Fill

1. Use clean gravel, crushed stone, or other suitable material conforming to the gradation specified for drainage fill. Clay and fine particles are unacceptable in drainage fill. Provide drainage fill that complies with the following gradation limits:

U.S. Standard Sieve	Percent Passing By Weight
1-1/2 inch	100
1 inch	95-100
1/2 inch	45-65
#4	5-15
#16	0-4

C. Select Fill

1. Use gravel, crushed stone, limestone screenings or other granular or similar materials, as approved, which can be readily and thoroughly compacted to not less than 95 percent of the maximum dry density obtainable by ASTM D1557. Very fine sand, uniformly graded sands and gravels, or other materials that have tendency to flow under pressure when wet are unacceptable as select fill. Provide select fill that complies with the following gradation limits:

U.S. Standard Sieve	Percent Passing By Weight
2 inch	100
1-1/2 inch	90-100
1 inch	75-95
1/2 inch	45-70
#4	25-50
#10	15-40
#200	5-15

D. Common Fill

1. Material from on-site excavation may be used as common fill provided that it can be readily compacted to not less than 90 percent of the maximum dry density obtainable by ASTM D1557, and does not contain unsuitable material as per Article 1.04.A.5 Select fill may be used as common fill at no change in the Contract Price.

2. Granular on-site material that complies with the following gradation limits may be used as granular common fill:

U.S. Standard Sieve	Percent Passing By Weight
3 inch	100
#10	50-100
#60	20-90

U.S. Standard Sieve	Percent Passing By Weight
#200	0-20

3. Cohesive site material may be used as common fill as follows:
   a. The gradation requirements do not apply to cohesive common fill.
   b. Use material having a liquid limit less than or equal to 40 and a plasticity index less than or equal to 20, as determined by ASTM D4318.
4. All material used as common fill is subject to approval by the Engineer. If there is insufficient suitable material on site, import whatever additional material is required which conforms to the sections, at no additional cost to the City.

E. Pipe Bedding

1. Gradation for Small Piping: For pipe 18 inches or less in diameter, use pipe bedding material of which 90 percent will be retained on a No. 8 sieve and 100 percent of which will pass a 1/2-inch sieve and be well graded between those limits.
2. Gradation for Large Piping: For pipe larger than 18 inches in diameter, use the same pipe bedding material as specified for smaller pipe or use a similar well graded material of which 90 percent will be retained on a No. 8 sieve, 100 percent will pass a 1-inch sieve, and will be well graded between those limits.

F. Lightweight Fill

1. Lightweight fill shall be a lightweight aggregate produced by the rotary kiln method and meeting the requirements of ASTM C330. No byproduct slags or cinders are permitted.
2. The material shall meet the grading requirements of ASTM C330, Table 1, Coarse Aggregate: 3/4 inch to No. 4.
3. Dry loose unit weight shall be maximum of 55 pcf. Dry compacted unit weight shall be a maximum of 60 pcf when measured by a one-point test performed in accordance with ASTM D698.
4. Maximum Los Angeles Abrasion Test loss of 50 percent when tested in accordance with ASTM C131 (B grading).

G. Flowable Fill

1. Flowable fill (also known as controlled low strength material) shall be a uniform mixture of sand, Type II Portland cement, fly ash, slag, admixtures, and water. The mix design shall produce a flowable material with little or no bleed water which produces a minimum compressive strength of 50 psi and maximum compressive strength of 100 psi at 56 days. The cured

material shall be excavatable and have a maximum dry unit weight of 100 pounds per cubic foot. Slump shall be from 7 inches to 10 inches.

2. Admixtures specifically designed for flowable fill shall be used to improve flowability, reduce unit weight, control strength development, reduce settlement and reduce bleed water. Admixtures shall be:

   a. Rheocell-Rheofill manufactured by BASF;

   b. DaraFill manufactured by W.R. Grace Construction Products;

   c. Or an approved equal.

3. All other materials shall be as specified in Section 03 30 00 - Cast-in-Place Concrete.

H. Compaction Equipment

1. Equipment and Methods: Perform all compaction with suitable approved equipment and methods.

2. Compact clay and other cohesive material with sheep's-foot rollers or similar equipment where practicable. Use handheld pneumatic tampers elsewhere for compaction of cohesive fill material.

3. Compact low cohesive soils with pneumatic-tire rollers or large vibratory equipment where practicable. Use small vibratory equipment elsewhere for compaction of cohesionless fill material.

4. Do not use heavy compaction equipment over pipelines or other structures, unless the depth of fill is sufficient to adequately distribute the load.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. All stockpiled materials shall be adequately handled as required in Section 31 25 10 – Dust, Soil Erosion and Sediment Control.

B. No material shall be placed until satisfactory test reports for material type and compaction requirements have been approved by the Engineer.

C. Warning tape/ribbon shall be placed and/or restored as required when backfilling new and existing utility lines.

3.02 IMPLEMENTATION

A. Backfill all excavations to the original surface of the ground or to such other grades as may be shown or required. For areas to be covered by lawn mix, leave or stop backfill 12 inches below the finished grade or as otherwise required to provide

adequate depth of lawn mix to satisfy the requirements of Section 32 90 00 – Planting.

B. Remove from all backfill, and from the space being backfilled, any compressible, putrescible, or destructible rubbish and refuse before backfilling is started. Dispose of the rubbish and refuse in accordance with the requirements of Section 01 74 20 – Construction Waste Management.

C. Leave sheeting and bracing in place or remove as the Work progresses, as shown in the Contract Drawings, specified or directed by the Engineer.

D. Do not permit backfilling construction equipment to travel against or over cast-in-place concrete structures until the specified concrete strength has been obtained, as verified by concrete test cylinders. In special cases where conditions warrant, the above restriction may be modified provided the concrete has gained sufficient strength, as determined from test cylinders, to satisfy design requirements for the removal of forms and the application of load.

E. Electrical Duct and Structure Bedding

1. All electrical ducts and precast manhole bases shall be bedded in well graded, compacted, select fill material. Select fill shall be placed in uniform layers not greater than 9 inches in loose thickness and compacted in place with suitable mechanical or pneumatic tools to not less than 95 percent of the maximum dry density as determined by ASTM D1557. Bedding thickness shall be not less than 6 inches after compaction. Bedding below electrical ducts shall extend the full width of the trench.

2. Existing underground structures, tunnels, conduits and pipes crossing the excavation shall be bedded with compacted select fill material. Place bedding material under and around each existing underground structure, tunnel, conduit or pipe and extend underneath and on each side to a distance equal to the depth of the trench below the structure, tunnel, conduit or pipe.

3. Cast-in-place manhole bases and other foundations for structures shall be cast against a concrete work mat in clean and dry excavations, unless otherwise shown, specified or required.

F. Pipe Bedding and Initial Backfill

1. Place select fill by hand for initial pipe backfill from top of bedding to 1 foot over top of pipes in uniform layers not greater than 6 inches in loose thickness. Tamp under pipe haunches and thoroughly compact in place the select fill with suitable mechanical or pneumatic tools to not less than 95 percent of the maximum dry density as determined by ASTM D1557.

2. Do not place stone fragments larger than 2-inch size in the pipe bedding or in the backfill to 1 foot over the top of pipes, nor any stone fragments larger than 3-inch size nearer than 2 feet from any pipe, conduit or concrete wall.

3. Pipe bedding containing very fine sand, uniformly graded sands and gravels, or other materials that have a tendency to flow under pressure when wet is unacceptable.

4. Bed pipelines or electrical ducts placed in short tunnels in select fill, flowable fill, or 2500 psi concrete. Completely fill the remainder of the annular space between the outside of the pipe wall and the tunnel wall with select fill, flowable fill, suitable job-excavated material, or 2500 psi concrete, as approved. Pipes and ducts in short tunnels shall be supported to permit placing and compaction of backfill.

G. Placement of Flowable Fill

1. Flowable fill shall be batched and premixed by an approved producer, dispensed from ready-mix trucks, and placed by approved methods and equipment.

2. Flowable fill shall be placed so as to completely fill the space to receive it with no trapped air pockets or other voids. Positive means of allowing air to escape shall be provided where necessary. Where placed against and around existing structures, lift heights shall be limited so as not to overload the structure. Lift heights shall be as approved by the Engineer.

3. Where flowable fill is placed around piping and other elements subject to floating within the fill, positive means shall be taken to provide temporary balancing loads to prevent uplift, or fill lift heights shall be limited to prevent uplift.

4. Application of loads or placement of other fill materials or concrete on top of flowable fill shall not occur until the flowable fill surface is determined to be suitable for loading per ASTM D6024.

H. Trench Backfill

1. Backfill trenches from 1 foot over the top of the pipe, from the top of electrical duct bedding or as shown to the bottom of pavement base course, subgrade for lawns or lawn replacement, to the top of the existing ground surface or to such other grades as may be shown or required. Backfill trenches as soon as, in the opinion of the Engineer, it can be done without injury to the concrete or pipe lines.

2. Provide select fill, suitable job-excavated material or other material, as specified and as approved for trench backfill.

3. Depth of Placement - General: Except under pavements, walkways, railroad tracks, and street or highway appurtenances, or as otherwise specified, place trench backfill in uniform layers not greater than 9 inches in loose thickness and thoroughly compact in place using suitable mechanical or pneumatic equipment. Compact backfill to not less than 90 percent of the maximum dry density as determined by ASTM D1557.

4. Depth of Placement - Traffic Areas and Under Utilities: Where pavements, walkways, railroad tracks and street or highway appurtenances are to be placed over trenches and under utilities or utility services crossing the trench, provide trench backfill using select fill placed in uniform layers not greater than 9 inches in loose thickness and thoroughly compacted in place

with equipment as specified above. Compact backfill to not less than 95 percent of the maximum dry density as determined by ASTM D1557.

5. Depth of Placement - Undeveloped Areas: In undeveloped areas and where select fill material or hand-placed backfill are not specified or required, place suitable job-excavated material or other approved backfill in lifts not exceeding 12 inches in loose thickness. When the trench is full, consolidate the backfill by jetting, spading, tamping or puddling to ensure complete filling of the excavation. Mound the top of the trench approximately 12 inches to allow for consolidation of backfill.

6. Backfill trenches in such a way as to prevent dropping material directly on top of any conduit or pipe through any great vertical distance. Do not allow backfilling material from a bucket to fall directly on a structure or pipe and, in all cases, lower the bucket so that the shock of falling earth will not cause damage.

7. Break up lumps and distribute any stones, pieces of crushed rock or lumps which cannot readily be broken up, throughout the mass so that all interstices are solidly filled with fine material.

8. Retain backfill in trenches by temporary bulkheads only and remove them as the backfilling progresses. Do not make bulkheads of stone.

9. Do not cover sewers, drains, basin connections, ends of sewers and branches until the Engineer orders or gives permission to backfill.

10. After completion of backfilling in City streets, remove all surplus material, and regrade and leave free, clear, and in good order all roadways and sidewalks. Deposit and compact a temporary surface of asphalt, or other equivalent and suitable material to a depth of six inches on all backfilled areas where ordered by the Engineer in writing. Until areas are restored to their original condition, maintain the surface of the temporary pavement in good and safe condition and promptly fill all depressions caused by settlement of the backfill with the temporary surfacing materials and compact the same. Wet the temporary surface by spraying with water when necessary to prevent a dust nuisance.

I. Structure Backfill

1. Backfill excavations as soon as, in the opinion of the Engineer, it can be done without injury to the concrete or structures.

2. Use select fill underneath all structures, and adjacent to structures where pipes, connections, electrical ducts and structural foundations are to be located within this fill. Use select fill beneath all pavements, walkways, and railroad tracks, and extend to the bottom of pavement base course or ballast.

   a. Place select fill in uniform layers not greater than 8 inches in loose thickness and thoroughly compact in place with suitable approved mechanical or pneumatic equipment.

b. Compact select fill to not less than 95 percent of the maximum dry density as determined by ASTM D1557.

3. When shown on the Contract Drawings, or approved by the Engineer, lightweight fill shall be used to raise the grade in areas that are to support pavements, walkways, railroad tracks and other structures.

   a. Place lightweight fill in uniform horizontal layers not greater than 12 inches in loose thickness.

   b. Lightweight fill shall be compacted by four complete coverages with an approved smooth drum vibratory roller having a minimum static weight of 14,000 pounds, a minimum dynamic force of 23,000 pounds, and a total force not less than 5,500 pounds per foot of compactor drum width.

4. Use of common granular fill adjacent to structures in all areas not specified above, unless otherwise shown or specified. Select fill may be used in place of common granular fill at no additional cost.

   a. Extend such backfill from the bottom of the excavation or top of bedding to the underside of the lawn mix for seeded, sodded or hydroseeded areas, the top of previously existing ground surface or to such other grades as may be shown or required.

   b. Place backfill in uniform layers not greater than 8 inches in loose thickness and thoroughly compact in place with suitable equipment, as specified above.

   c. Compact backfill to not less than 90 percent of the maximum dry density as determined by ASTM D1557.

5. In unpaved areas adjacent to structures, for the top 1 foot of fill directly under the lawn mix, use cohesive backfill conforming to Article 2.02.G.3, placed in 6-inch lifts. The cohesive backfill shall extend to the limits of the excavated area. Compact to not less than 90 percent of the maximum dry density as determined by ASTM D1557.

6. When shown on the Contract Drawings, flowable fill shall be used for backfilling of structures. Backfilling with flowable fill shall be as specified in Article 3.02.G.

7. When sheeting is withdrawn, solidly fill all cavities in or adjoining the trench or other excavation. When sheeting is left in place, solidly fill all cavities behind such sheeting.

J. Drainage Blanket

1. Provide a drainage blanket consisting of drainage fill where shown, specified, or required. Place drainage fill in uniform layers not greater than 8 inches in loose thickness.

2. Where drainage fill is required underneath structures or adjacent to structures where pipes, connections, electrical ducts and structural

foundations will be located within the fill, compact the fill with suitable mechanical or pneumatic equipment to not less than 95 percent of the maximum dry density as determined by ASTM D1557.

3. Where drainage fill is required in areas not specified in Paragraph 3.02.J.2, compact with suitable mechanical or pneumatic equipment to not less than 90 percent of the maximum dry density as determined by ASTM D1557.

K. Earth Embankments

1. Make all earth embankments of approved cohesive common fill material.

2. Place fill in uniform layers not greater than 10 inches in loose thickness. Compact in place with suitable approved mechanical equipment.

3. Compact earth embankments to not less than 90 percent of the maximum dry density as determined by ASTM D1557.

4. Do not use cohesionless, granular material as earth embankment backfill, unless otherwise shown or required.

L. Finish Grading

1. Perform finish grading in accordance with the completed contour elevations and grades shown on the Contract Drawings and blend into conformation with remaining natural ground surfaces.

   a. Leave all finished grading surfaces smooth and firm to drain. Areas shall be finished to the degree obtainable by either blade or scraper operations and suitable for application of topsoil.

   b. Bring finish grades to elevations within plus or minus 0.10 foot of elevations or contours shown.

   c. Areas which are anticipated to be undisturbed for a period of more than 30 days shall receive temporary seeding of rye grass at a rate of three bushels per acre, weather and season permitting. This seeding shall be repeated as necessary to maintain a continuing ground cover.

2. Grade outside of building or structure lines in a manner to prevent accumulation of water within the area. Where necessary or where shown, extend finish grading to ensure that water will be carried to drainage ditches, and the site area left smooth and free from depressions holding water.

3.03 FIELD TESTING / QUALITY CONTROL

A. Sampling and Testing of Select, Common and Lightweight Backfill:

1. Provide sampling, testing, and laboratory methods in accordance with ASTM D1556 or other method as determined by the Engineer for select fill and common fill.

2. Lightweight fill shall be tested as specified herein.

3. Subject all backfill to these tests to the satisfaction of the Engineer. These tests shall be the basis for acceptance or rejection by the Engineer of the compaction. Failure to achieve the specified densities shall require the Contractor to recompact or remove the material as required.

B. Sampling and Testing of Flowable Fill:

1. The Contractor shall provide all facilities as may be necessary for the ready procurement of samples of flowable fill from the Work or truck mixers as required by the Engineer for test purposes.

2. The DEP/QA/QC Consultant will provide personnel and equipment for making periodic determinations in the field of slump, air content, ambient and concrete temperature, unit weight and yield and for the preparation of compressive strength test cylinders as required in compliance with applicable ASTM tests and procedures. In compliance with ASTM D4832, a minimum of two cylinders will be tested at 7 days, two at 28 days, and three at 56 days. Tests shall be made on material at point of discharge into the work. Tests shall be made for each 200 cubic yards of material placed but not less than one test for each day flowable fill is placed.

3. The Contractor shall supply all equipment necessary to perform the required tests including, but not limited to, cylinder molds, tags, capping compound, slump cones, platform scale, two buckets (each 2 cubic feet in size), thermometers, pressure air meter, and roller meter.

C. Correction of Work:

1. Correct any areas of unsatisfactory compaction by removal and replacement, or by scarifying, aerating or sprinkling as needed and recompaction in place prior to placement of a new lift. The Contractor shall, if necessary, increase the compactive effort by increasing the number of passes, using heavier or more suitable compaction equipment, or by reducing the lift thickness. The Contractor shall adjust the moisture content of the soil to bring it to the optimum range by drying or adding water, as required.

2. Correct any depression which may develop from settlement in backfilled areas within one year after the work is fully completed. Provide, as needed, backfill material, pavement base replacement, permanent pavement, sidewalk, curb and driveway repair or replacement, and lawn replacement, and perform the necessary reconditioning and restoration work to bring such depressed areas to proper grade as approved.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 31 23 64 – PROTECTIVE COATING FOR STEEL PILE
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies requirements for the shop application of protective coating.

B. Piles shall be coated to five (5) feet below the bottom of the fill and or organic clay layer i.e. about thirty feet (30) feet below the pile cut-off elevation for TI-010 foundation piles and no less than fifteen (15) feet below the pile cut-off elevation for TI-011 foundation piles.

C. Refer to Section 31 62 23.13 – Concrete filled Steel Piles for additional pile requirements.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. No Used.

1.04 REFERENCE STANDARDS

A. The following is a listing of the publications referenced in this Section:

American Society for Testing and Materials (ASTM)

ASTM A 972/972M	Standard Specification for Fusion Bonded Epoxy Coated Pipe Piles
ASTM D 3359	Standard Test Methods for Rating Adhesion by Tape Test
ASTM D 4417	Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
ASTM D 4541	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM D 4285	Standard Test Method for Indicating Oil or Water in Compressed Air

U.S. Army Corps of Engineers (ACOE)

SSPC-SP 1	Solvent Cleaning
SSPC-SP 5	White Metal Blast Cleaning
SSPC-SP 10	Near-White Blast Cleaning
SSPC-SP 11	Power Tool Cleaning to Bare Metal
SSPC-PA 1	Shop, Field and Maintenance Painting
SSPC-PA 2	Measurement of Dry Paint Thickness with Magnetic Gages
SSPC-VIS 1	Visual Standard for Abrasive Blast Cleaned Steel

American Welding Society (AWS)

AWS D 1.1	Structural (Steel) Welding Code

1.05 DESCRIPTION

A. Not Used.

1.06 QUALITY ASSURANCE

A. Not Used.

1.07 SUBMITTALS:

A. Product Data:

1. For specific products listed in 2.2 A., B. and C. of this Section, submit the following for each product:

   a. Manufacturer's printed Technical Data Sheets and Material Safety Data Sheets (MSDS).

   b. Manufacturer's printed product label and application instructions.

2. For products other than those expressly listed in 2.2 A., B. and C. of this Section, submit the following for each product:

   a. Information adequate for Engineer to compare the specified product and the proposed substitution; including, but not limited to, technical specifications, test data, references to product use in existing installations, or any other data required by the Engineer.

B. Surface Preparation/Coating Plan:

1. Written procedures for conducting the Work of this Section including but not limited to, the preparation of surfaces, abrasive "work mix" analysis; coating mixing, application, and repair; recoat times and cleaning between coats; and specific details for the preparation and coating of welds.

2. A comprehensive listing of the equipment that will be used for surface preparation and coating. A description of equipment repair and replacement capability, including the procedures that will be followed in the event of equipment failure so that lost production time is kept to a minimum.

C. Steel Test Panel:

1. Submit one 8" x 8" blasted steel test panel for approval by the Engineer. The panel shall be prepared using the same procedures, equipment, and abrasive "work mix" described in A.2. herein. The approved test panel shall be used by the Engineer as a standard of judgment for approval of production operations.

2. Identify the name and chemical composition of detergents or solutions that will be used if it is necessary to clean the surface of one coat prior to the application of the next. Only detergents which are environmentally safe and which will have no adverse effect are acceptable. Submit the MSD Sheets for the chemicals and detergents. Use chemicals and detergents that are acceptable to the coating manufacturer.

D. Quality Control Inspection Plan - Submit the quality control inspection plan that will be followed to confirm that all work under this Contract complies with the requirements of this Section. The plan shall include the following at a minimum:

1. Inspection organization chart including lines of authority and the experience, training, and qualifications of all quality control personnel.

2. Written inspection procedures for all phases of the Work, including the frequency of inspections that will be performed, and the handling of non-conforming Work.

3. Documentation procedures including samples of the actual inspection forms that will be used for Work of this Section.

4. Written description of equipment to be used for surface preparation and coating application inspection, calibration procedures, frequency of calibration, and the methods for handling equipment that is found to be out of calibration.

E. Inspection Log or Report:

1. Submit one (1) copy of the log or report form package to the Engineer each seven (7) calendar days.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Use nylon slings to handle coated steel piles during handling, shipment and delivery to the construction site.

B. Do not handle or move coated steel piles until the coating has cured.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. ABRASIVES:

1. Abrasives shall be dry and free of oil, grease, corrosion producing chemicals, or other deleterious contaminants. Do not use silica sand.

2. Abrasives shall be shaped and sized to produce a profile that comply with profile requirements specified by the approved coating manufacturer

B. COATINGS

1. Fusion Bonded Epoxies

1) Scotchkote 206N, manufactured by 3M, St. Paul MN

2) Pipe Clad 2000, manufactured by Lilly Industries, Inc. North Kansas City, MO

3) Nap-Gard 72500, manufactured by Dupont Powder Coatings, Houston, TX

2. Coal Tar Epoxies

1) Bitumastic 300 M, manufactured by Carboline, St.Louis, MO

2) Hempel 119US-19990, manufactured by Hempel Coatings (USA), Inc. Houston, TX

3) Coal Tar Epoxy Series 9000, manufactured by Mercury Paint Corp., Brooklyn, NY

4) Sigma 3307 Coal Tar, manufactured by Sigma Coatings, Harvey, LA

3. Touchup coatings for repair of coating defects and damage, as recommended by the approved coating manufacturer.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Surface Preparation

1. Weld Spatter, Sharp Edges, and Holes

a. Remove slag, flux deposits, weld spatter, and surface irregularities such as slivers, tears, fins, and hackles. Grind all resulting burrs smooth, including burrs around holes. Do not remove any weld material that will weaken weld strength.

b. Prior to preparation, break sharp edges such as those created by flame cutting and shearing. The rolled edges of angles, channels, and wide flange beams do not normally require further rounding unless specifically shown on the Contract Drawings.

2. Compressed Air Cleanliness

a. Compressed air shall be free from moisture and oil contamination.

b. Use the white blotter test in accordance with ASTM D-4285 to verify the cleanliness of the compressed air. Conduct the test at the start of each shift for each compressor system.

c. If testing indicates contamination, soiling or discoloration visible on the paper, change filters, clean traps, add moisture separators or filters, or make adjustments as necessary to achieve clean, dry air. Re-inspect surfaces prepared or coated since the last satisfactory test, and reblast such surfaces at no additional cost to the DEP.

3. Prior to dry abrasive blast cleaning, remove all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants from bare steel in accordance with SSPC-SP 1 Solvent Cleaning.

4. Abrasive Blasting

a. All steel surfaces to be coated shall have SSPC-SP 10 Near White Blast Cleaning. Blast cleaning shall be accomplished using abrasive as stipulated in 2.1 herein.

b. For all steel surfaces to be coated provide a sharp, angular, uniform anchor pattern with a profile height of 2-3 mils, unless the requirements of the coating manufacturer are more restrictive. Peak counts per square inch shall be eighty (80) or greater, when tested in accordance with ASTM D-4417, Method C.

c. SSPC-VIS 1 shall be used as an aid in determining the quality of cleaning.

3.02 IMPLEMENTATION

A. PAINT STORAGE, MIXING AND HANDLING

1. Store materials not in actual use in tightly covered containers at a minimum ambient temperature of 45 °F in a well-ventilated area. Maintain containers used in storage of coatings in a clean condition, free of foreign materials and residue. Protect from freezing where necessary.

2. Mixing and Thinning of Coal Tar Epoxies

a. Do not use coating materials that have exceeded their shelf life.

b. When required by the approved manufacturer, warm paints stored at less than 50 °F to above 50 °F prior to mixing.

c. Mix all coatings in accordance with the requirements of the approved coating manufacturer using mechanical equipment such as a jiffy mixer.

d. Mix only complete kits of multi-component materials. Mixing of partial kits is not allowed.

e. Do not use two component materials beyond the pot life established by the approved manufacturer's written instructions.

f. Do not thin any coatings unless approved in writing by the manufacturer and the Engineer. If thinning is required and authorized, use only those types, brands, and amounts of thinner stipulated by the coating manufacturer.

B. COATING APPLICATION

1. General:

a. Apply the coatings in accordance with the requirements of this Section, the coating manufacturer, and SSPC-PA 1.

b. In the event of a conflict between the manufacturer's technical data and the requirements of this Section, comply with this Section unless the requirements of the manufacturer are more restrictive. In these cases, advise the Engineer of the discrepancies in writing, and comply with the Engineer's written resolution.

2. Quality of Surface Preparation and Time Restrictions Prior to Painting:

   a. Verify that the surface exhibits the specified degree of cleaning immediately prior to coating. Reclean deficient areas. Do not apply coating unless the prepared surface is inspected and approved by the Engineer.

   b. Apply the first coat within twelve (12) hours of cleaning to bare metal. If the bare substrate is allowed to remain uncoated for more than twelve (12) hours, or rerusting is evident, reclean the surface prior to painting.

3. Surface Cleanliness Prior to Coating and Between Coats:

   a. Do not perform coating application in areas where dust is being generated.

   b. Thoroughly clean the surface of each coat prior to the application of the next to remove spent abrasive, dirt, dust, cement spatter, and other deleterious materials. Pay particular attention to the removal of detrimental residue from surfaces such as corners and pockets. Clean the surfaces by vacuuming or blowing down with compressed air.

   c. If grease or oil have become deposited on the bare steel or on the surface of any of the applied coats, remove by solvent cleaning in accordance with SSPC-SP 1 prior to the application of the next coat. Use a solvent that is acceptable to the coating manufacturer.

4. Ambient Conditions During Coating Application of Coal Tar Epoxies:

   a. Apply coatings under the following conditions unless the requirements of the coating manufacturer are more restrictive:

      1) Surface and Air Temperatures - Between 50°F and 100°F.

      2) Relative Humidity - Less than 90%.

      3) Dew Point - Surface temperature at least 5°F above the dew point temperature of the surrounding air.

      4) Frost/Rain - Do not apply coatings to surfaces containing frost or free-standing water, or during rain, fog, or similar detrimental weather conditions.

   b. Remove and replace any coating that is exposed to unacceptable conditions (e.g. rain or dew) prior to adequate curing.

5. Methods of Application:

   a. For fusion bonded epoxies, coat exposed surfaces of steel piles within limits shown on the Contract Drawings with electrostatically applied, fusion-bonded epoxy to a minimum dry coat thickness of 18 mils, as tested in accordance with SSPC-PA 2. Follow the coating manufacturer's printed instructions regarding handling, mixing, pre-heating, application, post-baking and curing.

   b. For coal tar epoxies, coat exposed surfaces of steel piles within limits shown on the Contract Drawings using spray application to a minimum dry film thickness of 18 mils, as measured in accordance with SSPC-PA 2. Apply one (1) or two (2) coats as recommended by the approved manufacturer to achieve the required dry film thickness.

6. Performance Requirements

   a. The cured coating shall be of uniform gloss and thickness and shall be free of blisters, pinholes, fisheyes, sags, runs and any other irregularities.

   b. Test for continuity of coating with a holiday tester of 100 volts or less and repair all holidays detected to meet such test.

   c. Conduct adhesion tests in accordance with ASTM D-3359 or ASTM D-4541 as directed by the Engineer and repair all test areas. The acceptance criteria for the testing shall be obtained by the Contractor from the coating manufacturer and submitted for approval by the Engineer. Remove all defective coating and reblast and recoat such areas in accordance with this Specification.

   d. Maintain all quality control records on the results of all inspections and submit all results to the Engineer as stipulated in Appendix "A".

7. Repair of Damaged & Unacceptable Coatings Before and After Driving:

   a. Based upon results of the tests stipulated in 3.03 F. herein, repair coating as follows:

      1) Surface preparation of defective area.

         a) Prepare the surface by cleaning in accordance with SSPC-SP 1 Solvent Cleaning followed by SSPC SP-3 Power Tool Cleaning. Use a solvent that is acceptable to the approved coating manufacturer.

         b) If the damage exposes the substrate, remove all loose material and prepare the steel in accordance with SSPC SP 11.

      2) Coating Application in Repair Areas

a) When the bare substrate is exposed in the repair area, reapply all coats of the system to the specified thickness.

b) When the damage does not extend to the bare substrate, reapply to only the affected coats.

c) Maintain the thickness of the system in overlap areas within the specified total thickness tolerances.

d) For field touch-up after driving, use touch-up coatings as recommended by the approved coating manufacturer.

3.03 FIELD TESTING / QUALITY CONTROL

A. Inspection will be performed in accordance with the Section of Division 1 entitled "Quality Control".

3.04 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, tools, equipment, and incidentals required to assure adequate environmental protection including implementation of all erosion and sediment control measures and maintenance of storage areas as directed by the Engineer.

B. The Contractor shall provide an Erosion and Sediment Control Plan (E&SCP) that establishes methods and procedures to prevent migration of contaminated stormwater and sediment and to prevent erosion of features of the Work.

C. The Contractor shall minimize erosion and prevent discharge of sediment to surface water features, watercourses, drainage systems, public streets or private property from construction activities. The Contractor shall provide methods to prevent construction activities from generating contaminated stormwater runoff. Methods of constructing berms and dikes to direct clean stormwater runoff around the work area to the local drainage system shall be included.

D. The Contractor shall comply with all Federal, State, or local laws, codes, ordinances, and regulations which govern the control of sediment, erosion, and stormwater during construction activities.

E. The Contractor shall provide Best Management Practices (BMPs), including, but not limited to silt fences, straw bales, diversion dikes, swales, sedimentation basins/traps, truck wash areas/decontamination stations, stabilized construction entrances and/or other means as a temporary structural practice to minimize erosion and sediment runoff.

F. The Contractor shall implement dust, erosion, and sediment control and stormwater pollution prevention in accordance with the requirements of the current NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity, and, if applicable, in accordance with the approved Stormwater Pollution Prevention Plan (SWPPP) for this contract prepared by the Engineer.

G. If applicable, the approved SWPPP for this contract will be made available to the Contractor upon request during the bidding process. Proposed modifications to the approved SWPPP shall be in accordance with the requirements of this Section.

H. The Contractor shall control dust caused by operation and movement of vehicles and equipment in accordance with the latest DEP and OSHA standards, and all other applicable Federal, State and local regulations.

I. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 02 24 20 - Soil Sampling and Analysis

B. Section 31 10 10 - Site Clearing

C. Section 31 23 19 - Dewatering

D. Section 31 23 16 - Excavation

1.04 REFERENCES

A. Comply with applicable provisions and recommendations of the following except as otherwise shown or specified.

1. NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-15-002, or latest version)

2. New York City Watershed Regulations (April 4, 2010, or latest version)

3. New York State Standards and Specifications for Erosion and Sediment Control (aka “Blue Book”) (NYSDEC, Aug 2005, or latest version)

4. New York State Stormwater Management Design Manual (latest version)

1.05 DESCRIPTION

A. Definitions

1. Best Management Practices: Physical, structural, and/or managerial practices that, when used singly or in combination, prevent or reduce pollution of water, and have been approved by DEP or NYSDEC.

2. Commencement of Construction: The initial disturbance of soils associated with clearing, grading or excavation activities; or other construction related activities that disturb or expose soils such as demolition, stockpiling of fill material, and the initial installation of erosion and sediment control practices.

3. Erosion: The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as geological creep, detachment, movement of soil or rock fragments by water, wind, ice, or gravity.

4. Erosion/Sediment Control: Any temporary or permanent measures taken to reduce erosion, control siltation and sediment, and ensure that sediment-laden water does not leave the site.

5. Final Stabilization: All soil-disturbing activities at the site have been completed and uniform, perennial vegetative cover with the density of eighty (80) percent has been established or equivalent stabilization measures (such as the use of mulches or geo-textiles) have been employed on all unpaved areas and areas not covered by permanent structures, concrete or pavement.

6. Receiving Waters: Bodies of water or surface water systems receiving water from upstream manmade (or natural) streams

7. Sediment: Fragmented material that originates from weathering and erosion of rocks and unsolicited deposits, and is transported by, suspended in, or deposited in water.

B. Environmental Requirements

1. Soil Stabilization: The stabilization practices to be implemented shall include one or a combination of the following: temporary seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, erosion control mats, protection of trees and shrubs, preservation of mature vegetation. Protection of trees shall be in accordance with Section 31 10 10 – Site Clearing. Stabilization practices shall be implemented as approved by the Engineer. The Contractor shall record the dates when the major grading activities occur (i.e. clearing and grubbing, excavation, embankment and grading); when construction activities temporarily or permanently cease on a portion of the site; and when stabilization practices are initiated. Except as provided in paragraphs 1.08A.1 and 1.08A.2 below, stabilization practices shall be initiated as soon as practicable, but no more than fourteen (14) days after construction activities have temporarily or permanently ceased.

   a. Unsuitable Conditions: Where the initiation of stabilization measures by the fourteenth day after construction activity

temporarily or permanently ceases is precluded by unsuitable conditions caused by the weather. Stabilization practices shall be initiated as soon as practicable after conditions become suitable.

b. Temporary Inactivity Less than 14 Days: Where construction activity will resume on a portion of the site within 14 days after it temporarily ceases, no stabilization practices will be required.

2. Erosion and Sediment Control: Erosion and Sediment control BMPs shall be operational at all times during the Work, specifically during excavation, backfilling and restoration, and decontamination operations. The sediment and erosion control system shall be capable of handling stormwater during construction. Damage to excavation slopes and the migration of contaminated soil to downstream areas resulting from storm events shall be repaired or remediated by the Contractor, at the Contractor's expense.

3. Stormwater: At no time shall the Contractor allow stormwater runoff from soil excavation/stockpiling operations, or effluent from decontamination operations to migrate off to contaminate soils in other areas or percolate into the groundwater. The Engineer will monitor any overflow or leakage that occurs, and may at his discretion require the Contractor to perform soil sampling within all areas affected by such overflow. Any soils that have been contaminated by such overflow shall be removed, treated and disposed of by the Contractor at no additional cost to the City. All sampling and analyses of soils required to determine the contamination or remediation of these soils shall be performed in accordance with Section 02 24 20 – Soil Sampling and Analysis.

4. Disposal of Water: Water collected from decontamination areas and dewatering operations shall be handled in accordance with Section 31 23 19 - Dewatering.

C. Project Conditions

1. Existing Work: All BMPS (e.g., silt fences, straw bales, swales, sumps, pumps, piping) and other sediment/stormwater controls shall be installed such that other aspects of the Work are not adversely impacted or endangered. All installations shall be subject to the approval of the Engineer.

2. Dust Control: The Contractor shall be responsible for controlling visible dust caused by Work operations and the moving of vehicles and equipment. Dust control shall be implemented when soils are exposed, before, during and after Work activity ceases. Dust control will also be required on the weekends. The Contractor shall utilize the application of water or other methods, subject to the Engineer's approval, when visible dust is present on-site, in accordance with the Health and Safety Plan. The use of chemicals for dust control, including calcium chloride, will not be permitted.

a. All excavation, loading and transport of materials shall minimize the formation of dust and shall conform to Section 31 23 16 - Excavation. To prevent dust generation, application of water to roadways and active work areas shall be utilized as required. The Contractor's operations shall include air monitoring and dust minimization measures, consistent with the Health and Safety Plan (HASP) Specifications.

3. Silt and Sediment Disposal: All silt and sediment which accumulates behind any BMPs used on the site (i.e., straw bale berms or silt fences) shall be removed and disposed of off-site in accordance with all applicable Federal, State and local regulations.

D. Materials

1. All components/controls must be designed in conformance with the most current version of the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, and the New York State Stormwater Management Design Manual. Where erosion and sediment control practices are not designed in conformance with these technical standards, the Contractor must demonstrate equivalence to the technical standard.

E. Installation and Maintenance

1. All installation of erosion and sediment control BMPs must be consistent with the most current version of the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, and the New York State Stormwater Management Design Manual. Where erosion and sediment control practices are not designed in conformance with these technical standards, the Contractor must demonstrate equivalence to the technical standard.

2. Maintenance: The Contractor shall maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition at all times consistent with the most current version of the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, and the New York State Stormwater Management Design Manual.

1.06 QUALITY ASSURANCE

A. Permits and Regulations:

1. The Contractor shall obtain all necessary permits and be responsible for implementing the terms and requirements of these permits as needed and for payment of all fees.

2. The Contractor shall handle all material in compliance with applicable requirements of OSHA and other governing authorities having jurisdiction.

3. Certifications. The Contractor must sign a copy of the certification statements below, as provided in GP-0-15-002 (or certifications in latest

version), before undertaking any construction activity at the site identified in the SWPPP. All certifications must be included in the SWPPP.

a. "I hereby certify that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the NYCDEP must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPDES") General Permit for Stormwater Discharges from Construction Activity (GP-0-15-002, or latest version) and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings."

b. The certification statements must include the name and title of the person providing the signature, address and telephone number of the contracting firm, the address of the site, and the date the certification is made. The certification must be signed by an authorized representative of the firm.

4. Inspections. The Contractor must have a qualified inspector conduct an assessment of the site prior to the commencement of construction and certify in an inspection report that the appropriate erosion and sediment controls described in the SWPPP have been adequately installed or implemented to ensure overall preparedness of the site for the commencement of construction. Following commencement of construction, site inspections shall be conducted at least once every seven (7) calendar days and twice a week for sites with soil disturbance greater than 5 acres. The two (2) inspections shall be separated by a minimum of two (2) full calendar days. The inspection reports must be kept on file at the construction site with the SWPPP, if applicable, for review by a NYSDEC inspector.

5. Stabilization. The contractor shall initiate stabilization measures as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased.

6. If a SWPPP is required, it shall be kept current on file at the construction site for review by a NYSDEC inspector. If there is a significant change in construction which may have a significant effect on the potential for the discharge of pollutants to surface waters of the State and which has not otherwise been addressed in the SWPPP, it would require that the SWPPP be updated to reflect those required changes. The SWPPP would also require an amendment if the SWPPP proves to be ineffective in eliminating or significantly minimizing pollutants from sources identified in the SWPPP or achieving the general objectives of controlling pollutants in

stormwater discharges from permitted construction activity. Additionally, the SWPPP shall be amended to identify any new subcontractor and their associated responsibilities.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and other documentation, required to show conformance to the requirements of the Contract Drawings, for the approval to the Engineer. Shop Drawings shall show details of the Sediment and Stormwater Control System. The Submittals shall include, but not limited to the following:

1. Plan locations of all components of the Sediment/Stormwater Control System.
2. Details of all applicable BMPs (e.g., silt fence, diversion dike, straw bale berm, decontamination stations, etc.).
3. All of the planned components of the Erosion and Sediment Control Plan, as detailed below in Paragraph B.
4. All components of the SWPPP to be constructed on site, as detailed in Paragraph C below.
5. The Contractor shall submit manufacturer's descriptive literature and installation instructions for stockpile liner and cover material as specified in Paragraph 2.01.B and Part 3.02.

B. Erosion and Sediment Control Plan (E&SCP): The Contractor shall develop and submit to the Engineer for approval, prior to commencement of construction activities, an E&SCP. The E&SCP shall address schedules and measures that will be taken to prevent migration of contaminated stormwater/sediment, and to prevent erosion of features of the Work. The E&SCP shall include the following at a minimum:

1. Measures to capture and mitigate stormwater runoff from active, disturbed areas.
2. Provisions for silt fences and other measures to limit migration of sediments.
3. Provisions for straw bale berms and silt fences or other measures to prevent contaminant and sediment migration.
4. Diversion of stormwater: The Contractor shall include provisions for controlling stormwater runoff in and around excavation areas.
5. Soil Storage Area: All details of temporary soil storage to be implemented as specified in this section.
6. Soil Stabilization Practices: All details of soil stabilization practices to be implemented, as specified in this section.
7. Provisions for all other applicable Best Management Practices.

C. The Contractor shall adopt the approved SWPPP prepared by the Engineer for this Contract, if applicable. If the Contractor proposes to modify the approved SWPPP,

the Contractor shall develop and submit to the Engineer for approval the modified SWPPP in accordance with the requirements of the current NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity. The modified SWPPP shall be developed and submitted to the Engineer for approval prior to the initiation of construction activities. The modified SWPPP must be in compliance with the requirements of this Section in all respects. The Contractor shall bear sole responsibility for all permitting requirements of, and coordination with, the governing authorities having jurisdiction, as well as for any costs and delays resulting from the modification(s).

D. The SWPPP shall include the following at a minimum:

1. Provide background information about the scope of the project, including the location, type and size of project;

2. Provide a site map for the project, including a general location map. The site map should show the total site area; all improvements; areas of disturbance; areas that will not be disturbed; existing vegetation; on-site and adjacent off-site surface water(s), wetlands and drainage patterns that could be affected by the construction activity; existing and final slopes; locations of off-site material, waste, borrow or equipment storage areas; and location(s) of the stormwater discharge(s);

3. Provide a map and a description of the soil(s) present at the site;

4. Provide a Construction Phasing Plan describing the intended sequence of construction activities, including clearing and grubbing, excavation and grading, utility and infrastructure installation and any other activity at the site that results in soil disturbance. Consistent with the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-15-002 or latest version), there shall not be more than five (5) acres of disturbed soil at any one time without prior written approval from the NYSDEC;

5. Provide a description of the pollution prevention measures that will be used to control litter, construction chemicals and construction debris from becoming a pollutant source in the stormwater discharges;

6. Provide a description of construction and waste materials expected to be stored on-site with updates as appropriate, and a description of controls to reduce pollutants from these materials including storage practices to minimize exposure of the materials to stormwater, and spill prevention response;

7. Describe the temporary and permanent structural and vegetative measures to be used for soil stabilization, runoff control and sediment control for each stage of the project from initial land clearing and grubbing to project closeout;

8. Identify and show on a site map the specific location(s), size(s), and length(s) of each erosion and sediment control practice;

9. Provide the dimensions, material specifications, and installation details for all erosion and sediment control practices, including the siting and sizing of any temporary sediment basins;
10. Identify temporary practices that will be converted to permanent control measures;
11. Provide an implementation schedule for staging temporary erosion and sediment control practices, including the timing of initial placement and the placement and the duration that each practice should remain in place;
12. Provide a maintenance schedule to ensure continuous and effective operation of the erosion and sediment control practices;
13. Provide the name(s) of the receiving water(s);
14. Provide a delineation of SWPPP implementation responsibilities for each part of the site;
15. Provide a description of structural practices to divert flows from exposed soils, store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site to the degree attainable; and
16. Provide any existing data that describes the stormwater runoff characteristics at the site.

E. Inspection Reports: The Contractor shall conduct inspections and submit inspection reports consistent with requirements of the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-15-002 or latest version) including:

1. Site inspections shall be conducted by the Qualified Inspector.
2. Site inspections are conducted a minimum of once every seven (7) calendar days and twice every seven (7) calendar days for sites with greater than 5 acres of soil disturbance. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.
3. Inspection reports shall be maintained in a logbook at the site with SWPPP and other required documentation.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall store, handle, and remove material and equipment consistent with requirements of the SWPPP and NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (Permit No. GP-0-15-002) or latest version.

B. Removal of all waste shall be in accordance with the requirements of Section 01 74 20 – Construction Waste Management.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Materials

1. Stockpile cover and liner fabric shall be a composite structure of fiber-reinforced polyethylene (RPE) fabric (minimum 20-mils). The fabric shall be inert to biological degradation and naturally encountered chemicals, alkalis and acids. Its permeability coefficient shall be less than 10^{-3} cm/sec.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Stockpiling

1. Cover and Liner Requirements

a. Soil Stockpiles: Stockpiles of excavated soil to be used for backfilling on-site under the NYSDEC Pre-Determined or Case-Specific BUD, or stockpiles of other soil mixes being brought onsite for landscaping purposes, shall be stored as follows:

1) Contaminated Soil: Stockpiles of excavated soil that are known to be or potentially could be contaminated (pending analysis), shall be lined on the bottom and covered with an impermeable, RPE fabric, as specified in 2.02.A above.

2) Uncontaminated Soil: Stockpiles of excavated uncontaminated soil shall have a cover only; a bottom liner is not required. The cover fabric shall be as specified in 2.01.B above.

b. Demolition Waste Stockpiles: Stockpiles of demolition waste that are to be recycled (on-site or off-site) or disposed of at a sanitary landfill shall be stored as follows:

1) Contaminated Demolition Waste: Stockpiles of demolition waste that are known to be or potentially could be contaminated (pending analysis), shall be lined on the bottom and covered with an impermeable, RFP fabric, as specified in 2.01.B above.

2) Uncontaminated Demolition Waste: Stockpiles of uncontaminated demolition waste shall have a cover only; a bottom liner is not required. The cover fabric shall be as specified in 2.01.B above.

c. Stockpiles of materials classified as contaminated, hazardous waste shall be stored with a cover and liner as specified above for contaminated soil or contaminated demolition waste, and transported off-site promptly in DOT-approved hazardous waste shipping containers. Temporary hazardous waste storage areas shall comply with and the requirements of the Contract and applicable Federal, State and local regulations.

d. All stockpiles shall be covered during non-working hours and during periods of no construction activity. The terminal edges of the fabric cover panels shall be secured to prevent uplift by wind.

2. Stockpile Areas and Placement

a. Stockpiling of excavated materials will be permitted on-site within areas as designated on the Contract Drawings for construction staging, or as directed by the Engineer. All stockpiling areas on-site must be approved by the Engineer in advance.

b. The Contractor shall make his or her own arrangements to provide additional stockpiling area on-site or off-site, if required, for excavated material at no additional cost to the City. Additional stockpiling areas whether on-site or off-site shall be approved by the Engineer.

c. Stockpiles of excavated material to be used for backfilling on-site under the NYSDEC Pre-Determined or Case-Specific BUD shall be so piled and placed as not to encumber sidewalks or roadways, or wash away or obstruct the free flow of surface or drainage water. Stockpiles shall be suitably bermed for run-off containment of any water that drains from the soils.

d. Stockpiles shall not be placed closer to the edge of an excavation than a distance equal to 1-1/2 times the depth of the excavation, unless the excavation is in rock or the sides of the excavation have been sloped or sheeted and shored to withstand the lateral forces imposed by such superimposed loads.

3.03 FIELD TESTING / QUALITY CONTROL

A. Inspections: Site Inspections shall be conducted consistent with the requirements of the SWPPP and the current NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-15-002 or latest version). The Qualified Inspector shall inspect disturbed areas of the construction site, areas used for storage of materials that are exposed to precipitation that have not been finally stabilized, stabilization practices, structural practices, other controls, areas where vehicles exit the site daily and all other requirements listed in the most current NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-15-002 or latest version).

B. Inspection of soil and material stockpiles shall be done daily to ensure the integrity of the cover and liner is maintained.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. The Contractor shall clean the site and equipment consistent with requirements of the SWPPP and the current New York State Standards and Specifications for Erosion and Sediment Control. Where appropriate, truck washes/decontamination stations should be installed to minimize the migration of sediment off-site as specified herein**.**

END OF SECTION

SECTION 31 62 16.13 – STEEL SHEET PILES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish all labor, equipment and material required to handle, store and install all steel sheet piling and bracing systems as specified herein and shown on the Contract Drawings.

B. Steel sheet piling and all necessary structural shapes, bracing, bolts, washers, nuts, connections and miscellaneous appurtenances shall be of the form, weights, shapes and lengths as specified herein and shown on the Contract Drawings.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

B. No payment will be made for steel sheet piling which the Contractor uses for its own purposes or for steel sheet piling required to complete the Work under another

item of the Contract, except where such piling is left in place on written order of the Engineer.

1.03 RELATED SECTIONS

A. Section 31 23 16 - Excavation

B. Section 05 05 13.01 - Galvanizing

C. Section 05 12 00 - Structural Steel Framing

D. Section 05 50 00 - Metal Fabrications

E. Section 09 91 00 - Painting

1.04 REFERENCES

A. Definitions

1. Environmental Product Declaration - A third-party-verified International Organization for Standardization (ISO) Series 14025 Type III declaration that quantifies environmental information on the life cycle of a product to enable comparisons between products fulfilling the same function.

B. Reference Standards

1. ASTM A6 - General Requirements for Rolled Structural Steel Bars, Plates, Shapes and Sheet Piling.

2. ASTM A36 - Carbon Structural Steel.

3. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

4. ASTM A325 - Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

5. ASTM A328 - Steel Sheet Piling.

6. ASTM A370 - Test Methods and Definitions for Mechanical Testing of Steel Products.

7. ASTM A572 - High Strength Low-Alloy Columbium-Vanadium Structural Steel.

8. ASTM A673 - Sampling Procedure for Impact Testing of Structural Steel.

9. ANSI/AWS D1.1 - Structural Welding Code.

10. ANSI/AWS QC1 - Qualification and Certification of Welding Inspectors.

11. New York City Building Code (NYCBC).

12. New York City Board of Standards and Appeals (BS&A).

13. American Institute of Steel Construction (AISC).

14. Specifications for Structural Joints Using ASTM A325 or A490 Bolts (AISC).

15. Code of Standard Practice for Steel Buildings and Bridges (AISC).

16. ISO 14025 - Environmental labels and declarations - Type III environmental declarations

1.05 DESCRIPTION

A. Schedule of Procedures and Operations

1. Before commencing any steel sheet pile installation, the Contractor shall submit to the Engineer for approval, a schedule of the procedures he intends to use.

2. The schedule shall show in detail his proposed method, sequence and timing of all steel sheet piling driving operations, catalog data and manufacturer's specification for all hammers and anvils to be used, method of lifting, handling, driving and cutting off of steel sheet piles.

B. Seismic Monitoring

1. When driving steel sheet piling, the Contractor shall provide the monitoring stations at locations as specified herein or shown on the Contract Drawings.

2. All pile driving, removal of piling, demolition and related sheet piling activities shall be performed in a manner so that the following criteria shall not be exceeded; peak resultant particle velocity of one-inch per second at location of sensitive instruments and two-inches per second at concrete structures.

3. The Engineer reserves the right to change the locations of the monitoring stations, as required during construction. The Contractor shall engage the services of an approved geotechnical consultant (who shall be a registered Professional Engineer in the State of New York) experienced in the monitoring of vibrations, to install, maintain and monitor an approved seismic monitoring system.

4. Particle velocity shall be measured by using seismographs capable of measuring peak component particle velocities in the range of 0.2 to 0.4 in/sec. All pile driving vibrations shall be monitored for the duration of pile driving unless otherwise ordered to be discontinued by the Engineer. In the event that the monitoring is ordered to be discontinued a suitable credit shall be due the City.

5. All vibration monitoring of specified locations shall be implemented in such a manner that peak component particle velocity can be determined shortly after instances where the vibrations exceed the above criteria. Both the Contractor and the Engineer shall be notified within 30 minutes after any such occurrence and the actual peak particle velocity identified.

6. Permanent vibrations monitoring records of each day's work shall be maintained until the completion of the work or until such time when monitoring is ordered to be discontinued. Such records shall be turned over to the Engineer upon completion of all seismic monitoring work. Monthly reports shall include a tabulation of all instances of vibration levels in excess of the seismic criteria noted above.

7. The cost of the work specified under this section shall be included in the lump sum price bid for the Contract unless otherwise specified in the Contract.

C. Job Conditions

1. The excavation support system must retain the adjacent soil, water, structures, utilities, streets and other features and must protect them from damage due to settlement, lateral movements, loss-of-ground or any other causes related to this construction. The Contractor shall be responsible for taking all precaution necessary to prevent such damage. An important function of the sheeting is to act as a ground water cutoff so as to prevent disturbance of subgrade at bearing level due to groundwater inflow into the excavation.

2. The Contractor shall be fully responsible for installing and maintaining the rakers, and corner bracing as necessary to minimize movements of the wall during all stages of construction.

3. Expose active utilities by hand, where they lie within work areas. All existing utilities affected by construction shall be temporarily supported and protected from harm.

4. If existing utilities interfere with the method of excavation support shown on the Contract Drawings, relocate the utilities as approved by the Engineer.

5. Use continuous members for the excavation support system unless otherwise approved by the Engineer.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Details of pile driving equipment

2. Certification that materials meet ASTM requirements

3. Detail drawings of steel sheet piling, shoring and bracing

4. Details of all connections and brackets, including corner details

5. Schedule of procedures and operations

6. Sample of driving record forms

7. Sheet piling installation sequence

8. Sheet piling location survey (project record documents).

B. After locations of utilities and other underground obstructions have been confirmed, provide drawings showing the actual locations of existing utilities, structures or other interferences in relation to the proposed locations of steel sheet piling and bracing.

C. Any variations proposed by the Contractor between the Contract Drawings and requirements in this Section shall be submitted for review and approval to the Engineer and shall also require approval by the City. For all proposed variations or alternatives, the Contractor shall submit engineering calculations and design assumptions for determinations of loads and stresses acting in the wall and lateral supports during installation, as well as final conditions. The redesign shall take into account the excavation procedures, dewatering operations, surcharge loading, soil properties, material stresses, temperatures, permanent construction, stages of work and all other conditions which could affect the excavation support system. These calculations must be prepared and stamped by a Professional Engineer licensed in the State of New York.

D. After installation, prepare dimensioned as-built CAD drawings of the complete support system and of the portion of the system left in place.

E. Sustainability Submittals:

1. Environmental Product Declarations

a. The Contractor shall provide product-specific type III Environmental Product Declaration (EPD) conforming to ISO 14025, 14044.

2. Envision Submittals

a. The Contractor shall report information pertaining to the sustainable procurement, regional sourcing, and/or recycled content of new materials to be procured during the Work, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall coordinate with its vendor on sustainable product requirements as stipulated by the Contractor's approved New Materials Sustainable Implementation Plan, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall submit vendor shop drawings for review by the Engineer that clearly illustrate the vendor is meeting the requirements as approved in the Contractor's New Materials Sustainable Implementation Plan.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Storage of sheet piling and other excavation support materials shall be such that sagging which would produce permanent deformation shall be prevented.

Concentrated loads which occur during stacking or lifting shall be kept below the level which would produce permanent deformation of the material.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Steel sheet piling shall conform to the requirements of ASTM A328 or ASTM A572. Sheet piles shall be new and shall consist of rolled sections of the continuous interlocking type of the section, length, weight and ASTM as specified herein or shown on the Contract Drawings.

1. Sheet piling utilized for temporary construction shall conform to ASTM A328.

2. Sheet piling installed as permanent construction shall conform to ASTM A572.

a. Each heat shall meet the Charpy V-notch impact test requirements of ASTM A370. Samples shall be machined in a set of three and tested at the following minimum requirements for temperature and test value:

Temperature	Test Value
30°F	25 ft-lb
0°F	15 ft-lb

b. When using subsize samples, that is thickness of less than one-half inch as specified in ASTM A673, the following minimum requirements shall be met:

Temperature	Test Value
30°F	19 ft-lb
0°F	11 ft-lb

c. In the event that the average ft-lbs of the three samples does not meet the above requirements when tested at both temperatures, all the material manufactured from that sheet shall be rejected.

B. All structural shapes, plates and similar members shall conform to the requirements of ASTM A6 and A36, and Sections 05 12 00 – Structural Steel Framing and 05 50 00 – Metal Fabrications.

C. C. Bolts, nuts and washers shall conform to the requirements of ASTM A325 or A307. All hardware for permanent construction shall be galvanized in accordance with Section 05 05 13.01 - Galvanizing.

D. D. Minimum web and flange thickness of the steel sheet piling shall be 3/8 inch unless otherwise shown on the Contract Drawings or specified herein.

E. E. Opening of socket at interlock shall be checked with manufacturer supplied tolerance gages.

F. Pile Hammer

1. Pile hammers shall have a sufficient reserve capacity for driving the sheet piles to the design requirements, including any contingencies occurring during driving. The minimum hammer energy and maximum hammer energy in foot-pounds per blow shall be as specified herein or shown on the Contract Drawings, and in accordance with NYBC.

2. The lower end of the hammer shall be fitted with an anvil base that is built to fit the top of the steel sheet piling and to hold the sheet piling under the center of the hammer during driving.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Welding

1. Welding shall be performed in accordance with the requirements of:

2. ANSI/AWS D1.1 Structural Welding Code.

a. Relevant sections of the NYBC.

b. Latest rules of the BS&A.

3. All shop and field welding shall be performed by certificated welders under the immediate supervision of a representative of a standard testing agency or an inspection agency reporting directly to and under the control of the Department of Environmental Protection. The Contractor shall submit the name of such agency to the Commissioner for approval before starting work. The costs of all welding inspections shall be borne by the Contractor.

B. Fabrication

1. Steel sheet piling shall be new and so fabricated that when driven in place, it will form a continuously interlocked wall to the extent shown on the Contract Drawings. Steel sheet piles with bends or springs, or with damaged interlocks shall not be used.

2. Steel sheet piling shall be full length; no splices will be permitted.

3. Walers and braces may be prefabricated or fabricated in place. All welding shall conform to the requirements of Article 2.02, Welding.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examination of the Site

1. Prior to starting steel sheet piling driving operations, the Contractor, the City and the Engineer shall make a joint inspection of the accessible existing structures, pavement and improvements adjacent to the pile driving site to examine and document their present condition.

2. Photographs and measurements shall be taken by the Contractor to record any conditions that may become the subject of possible damage claims.

3. The Contractor shall prepare a report of such conditions, verified by the photographs, and signed by the personnel of the Contractor, the City and the Engineer participating in the investigation.

3.02 IMPLEMENTATION

A. Driving

1. Steel sheet piling shall be carefully positioned at the locations shown on the Contract Drawings and driven in a plumb position, to the minimum tip elevations as specified herein or shown on the Contract Drawings.

2. Sheet piling shall penetrate to approved depth in firm subsurface material and each sheet pile shall interlock with the adjacent sheet pile so as to form a single continuous wall. Piling shall be driven in vertical increments limited in such a manner so that driving proceeds without erratic advance of individual sheets.

3. Sheet piles shall be driven in such a manner as to insure continuous interlocking throughout the length of the sheet piles. Sheet piles shall be driven in pairs with ball end leading.

4. Steel sheet piling shall be framed with and connected to other structural members and shapes as specified herein or shown on the Contract Drawings.

5. In the event the sheet piling cannot be driven to the minimum tip elevation, the Contractor shall immediately notify the Engineer for corrective measures.

B. Excavation

1. Excavation shall conform to Section 31 23 16 – (Soil) Excavation (and Disposal) and shall not be carried in advance of or below the bottom of the steel sheet piling.

2. Excavation within the sheet piling shall not be performed until the bracing system, if required by the Contract Drawings or this Section, has been installed at the stage and in the sequence as approved by the Engineer.

C. Jetting

1. Steel sheet piling shall be jetted only when written permission is given by the Engineer. Sufficient jets and adequate water pressure shall be used to erode the material adjacent to the pile without impairing the penetration of steel sheet piling already in place.

2. Before the desired penetration is reached, the jets shall be withdrawn and the steel sheet piling shall be driven with the hammer alone to obtain the required penetration in the subsurface material.

D. Obstructions

1. Any obstructions encountered in driving the steel sheet piling shall be removed or otherwise disposed of by the Contractor so as to permit the proper installation of the sheet piling.

2. After the removal of the obstructions, the steel sheet piling shall be redriven to the required penetration. It is essential that the Contractor familiarize himself with the site conditions and the subsurface conditions at the site so as to be prepared for removal of obstructions.

3. The Contractor shall have on hand suitable equipment for removing obstructions, and shall employ this equipment, in a manner satisfactory to the Engineer.

E. Tolerance

1. Steel sheet piling shall be driven plumb to the lines, grades and depths shown on the Contract Drawings or specified herein with secure interlocking for the entire length of the sheet piling.

2. Driving shall be done with fixed leads to hold the sheet piling firmly in position and alignment and in axial alignment with the hammer.

3. Sheet Piling Cutoff

4. The Contractor shall cutoff sheet piling left in place to the grades established on the Contract Drawings or specified herein.

5. Cutoffs are the property of the Contractor and shall be disposed of off-site.

F. Survey Work

1. The Contractor shall engage the services of a licensed surveyor, approved by the Commissioner, for the performance of the survey work.

2. Before starting work, the Contractor shall survey adjacent structures and improvements, establishing exact elevations at fixed points to act as benchmarks. He shall clearly identify benchmarks and record existing elevations. Datum level used to establish benchmark elevations shall be

located at a sufficient distance so as not to be affected by movement resulting from excavation or construction operations.

3. During excavation, the Contractor shall resurvey benchmarks as required by the Contract. The Contractor shall maintain an accurate log of surveyed elevations for comparison with original elevations, and shall promptly notify the Engineer if changes occur or if cracks, sags or other damage is evident.

4. The installed location of the sheet piling shall be established by survey and shown on drawings prepared for this purpose as project record documents. Upon completion of the sheet piling installation, the Contractor shall submit to the City, drawings showing installed location of the sheet piling as related to column lines, center of footings or other reference points and lines, the cutoff elevation, and length below cutoff for each pile.

G. Painting

1. Structural steel braces and supports attached to the steel sheet piling and exposed in the finished work and indicated to remain shall be thoroughly cleaned, prepared for painting and painted in accordance with the requirements of Section 09 91 00 - Painting.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Damaged Sheet Piling

1. Any sheet piling, which at any time becomes damaged, displaced, separated from adjacent sheets or otherwise injured, shall be withdrawn and replaced with new sheet piling at the expense of the Contractor.

2. All damaged sheet piling shall be removed from the site by the Contractor.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish, install, drive and cutoff concrete filled steel pipe piling as specified herein and shown on the Contract Drawings.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

B. No Separate Payment:

1. No separate payment will be made for pile tips, splices, concrete, test piles, removing damaged or misdriven piles, piles driven for the temporary use or for the convenience of the Contractor, jetting if permitted, pile surveys and related drawings, pile cut-offs and their disposal off-site. The costs thereof shall be included in the unit prices bid for piling.

2. No separate payment will be made for excavating for pile driving, replacing unsuitable materials or for furnishing, placing and compacting fill and

backfill material; the costs thereof shall be included in the unit prices bid for piling.

1.03 RELATED SECTIONS

A. Requirements from the following sections also apply to this Section:

1.	Section 03 21 00	-	Reinforcing Steel
2.	Section 03 30 10	-	Low Carbon Cast in Place Concrete
3.	Section 31 09 16.10	-	Dynamic Pile Testing
4.	Section 31 09 16.20	-	Pile Load Tests, Compressive, Lateral and Uplift Loads

1.04 REFERENCES

A. Definition:

1. Environmental Product Declaration - A third-party-verified International Organization for Standardization (ISO) Series 14025 Type III declaration that quantifies environmental information on the life cycle of a product to enable comparisons between products fulfilling the same function.

B. Reference Standards:

1.	ASTM A252	-	Welded and Seamless Steel Pipe Piles.
2.	ASTM C33	-	Concrete Aggregates.
3.	ASTM C94	-	Ready-Mixed Concrete.
4.	ASTM C150	-	Portland Cement.
5.	AWS D1.1	-	Structural Welding Code.
6.	ACI 211.1	-	Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
7.	ACI 301	-	Standard Specification for Structural Concrete.

8. ISO 14025 - Environmental labels and declarations - Type III environmental declarations

9. New York City Building Code (NYCBC).

1.05 DESCRIPTION

A. Performance Requirements

1. Furnishing and installation of the pipe piles shall conform to the New York City Building Code and as specified herein. Where the requirements as specified herein are more rigorous, they shall be adhered to.

2. Pile design loadings, concrete strengths, diameters and wall thicknesses of steel pipe shall be as specified herein or shown on the Contract Drawings. The ends of each pipe shall be perpendicular to its axis. Metal to metal bearing joints shall be machine cut. Other joints may be flame cut.

3. Pipe piles with open ends driven to rock in accordance with NYBC will not require load tests. The Contractor shall drive test piles as specified in Article titled "Test Piles" in this Section.

4. Dynamic pile testing, when required by the Contract, shall be performed in accordance with Section 31 09 16.10 – Dynamic Pile Testing.

5. Pipe piles to be driven to material other than rock shall be driven with closed ends or shoes and load tests, when required by the Contract, shall be performed in accordance with Section 31 09 16.20 – Pile Load Tests, Compressive, Lateral and Uplift Load.

B. Test Piles

1. The Contractor shall be responsible for the proper length of piles required to develop the specified loads.

2. All available samples and information relating to boring records and subsurface conditions are expressly excluded from and are not a part of the Contract and are available for information purposes only. It shall be the Contractor's responsibility:

   a. To make application for inspection and review of these data in order to select the proper length of piles.

   b. To obtain any additional subsurface data he may desire.

3. The Contractor shall determine the lengths of the piles required to develop the specified loads by driving test piles. The allowable load of the test piles shall be determined using the following driving formula:

$$P = \frac{2E}{S + 0.1}$$

   P - Allowable pile load, in pounds
   E - Rated energy delivered by the hammer per blow in foot pounds
   S - Penetration of pile per blow, in inches, after the pile has been driven to a depth where successive blows produce approximately equal net penetration.

4. The location and number of test piles shall be as specified herein or shown on the Contract Drawings The test piles shall be of the same material and construction as the permanent piles.

5. The Engineer shall be notified at least forty-eight (48) hours in advance so that he may be present at the commencement of driving the test pile(s).

6. Load tested piles are considered to be sacrificial piles and cannot be considered part of permanent foundation piles. Sacrificial piles including reaction piles are to be abandoned upon the completion of load test program..

C. Seismic Monitoring

1. When driving piles, the Contractor shall provide the monitoring stations at locations as specified herein or shown on the Contract Drawings.

2. All pile driving, removal of piling, spudding and related pile driving activities shall be performed in a manner so that the following criteria shall not be exceeded; peak resultant particle velocity of one-inch per second at location of sensitive instruments and two-inches per second at concrete structures.

3. The Engineer reserves the right to change the locations of the monitoring stations, as required during construction. The Contractor shall engage the services of an approved geotechnical consultant (who shall be a registered Professional Engineer in the State of New York) experienced in the monitoring of vibrations, to install, maintain and monitor an approved seismic monitoring system.

4. Particle velocity shall be measured by using seismographs capable of measuring peak particle velocities in the range of 0.2 to 0.4 in/sec. All pile driving vibrations shall be monitored for the duration of pile driving unless otherwise ordered to be discontinued by the Engineer. In the event that the monitoring is ordered to be discontinued a suitable credit shall be due the City.

5. All vibration monitoring of specified locations shall be implemented in such a manner that peak component particle velocity can be determined shortly after instances where the vibrations exceed the above criteria. Both the Contractor and the Engineer shall be notified within 30 minutes after any such occurrence and the actual peak particle velocity identified.

6. Permanent vibrations monitoring records of each day's work shall be maintained until the completion of the work or until such time when monitoring is ordered to be discontinued. Such records shall be turned over to the Engineer upon completion of all seismic monitoring work. Monthly reports shall include a tabulation of all instances of vibration levels in excess of the seismic criteria noted above.

7. The cost of the work specified under this Section is deemed to be included in the unit prices bid for piling.

1.06 QUALITY ASSURANCE

A. Qualifications

1. The work shall be performed by a General Contractor or a specialty Subcontractor specializing in the specified foundation system and having experience installing the specified foundation system under similar subsurface conditions.

B. Quality Assurance Inspections

1. Quality Assurance inspections may be made by NYC DEP Bureau of Engineering Design and Construction, Quality Assurance Section or its representative at the manufacturer's facility.

2. Quality Assurance inspections shall be in accordance with the requirements of the Contract Documents.

3. The Contract shall give ample notice to the Engineer prior to the beginning of any fabrication, so that Quality Assurance inspection may be made.

4. Quality Assurance inspections shall include (but are not limited to) the following activities:

   a. Obtain copies of Certified Materials Test Reports (both chemical and physical) and Manufacturer Certificates of Conformance.

   b. Perform visual inspection of welding, as per applicable welding code.

   c. Perform visual and dimensional inspection of completed work.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Pile location plan, size and numbering system
2. Pile location survey during installation
3. Additional pile locations
4. Final pile location survey
5. Sample of pile record form
6. Pile installation sequence.

B. The Contractor shall also submit the following:

1. Details of proposed pile driving equipment
2. Material certification for piling (mill test reports)
3. Detailed welding drawings and material specifications
4. Test pile report
5. Concrete mix report.

C. Project Record Documents

1. Upon completion of installation of all piles, the Contractor shall submit to the City, drawings showing types and installed location of all piles, including obstructed, damaged and additional piles, as related to their column lines, center of footings or other reference points and lines, percentage out of plumb, the cutoff elevation, and length below cutoff for each pile.

D. Sustainability Submittals:

1. Environmental Product Declarations

a. The Contractor shall provide product-specific type III Environmental Product Declaration (EPD) conforming to ISO 14025, 14044.

2. Envision Submittals

a. The Contractor shall report information pertaining to the sustainable procurement, regional sourcing, and/or recycled content of new materials to be procured during the Work, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall coordinate with its vendor on sustainable product requirements as stipulated by the Contractor's approved New Materials Sustainable Implementation Plan, in accordance with Section 01 35 63 – Sustainability Certification Project Requirements. The Contractor shall submit vendor shop drawings for review by the Engineer that clearly illustrate the vendor is meeting the requirements as approved in the Contractor's New Materials Sustainable Implementation Plan.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Steel pipe piles

1. Steel pipe piles shall be new, electric-fusion buttwelded and shall conform to the requirements of ASTM A252, Grade 3, having a minimum yield point of 45,000 psi.

B. Concrete for Steel Pipe Piles

1. Concrete shall be as shown on the Contract Drawings and as specified in Section 03 30 10 - Low Carbon Cast in Place Concrete.

C. Cushion Block and Hammer

1. The cushion block used for pile driving shall be a solid block of hardwood with the grain parallel to the pile and encased in a tight fitting housing or of laminated micarta and steel or aluminum plates. The details of the proposed cushion block shall be submitted for the Engineer's approval.

2. Pile hammers shall have a sufficient reserve capacity for driving the piles to the design requirements, including any contingencies occurring during driving. The piles shall be driven with a single-acting steam or compressed-air hammer and the minimum hammer energy and maximum hammer energy in foot-pounds per blow shall be as specified herein or shown on the Contract Drawings and in accordance with the NYBC.

D. Reinforcing Bars

1. Reinforcing bars shall be as specified in Section 03 21 00 - Reinforcing Steel.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Steel pipe piles

1. All pipe welds shall be performed in accordance with the requirements of this Article.

2. The Contractor shall submit detailed welding drawings and material specifications to the Engineer for approval.

B. Splices

1. For piles less than 50 feet in length, splices below the upper splice shall be at least 20 feet apart. For piles exceeding 50 feet in length, splices below the upper splice shall be at least 30 feet apart.

2. Splices shall be made using heavy, close fitting, cast-steel, internal sleeves (tapered at top and bottom).

a. Splice sleeves shall have a minimum thickness of 3/8 inch (or not less than pipe pile thickness), the minimum length of shoulder shall be 5/8 inch and the minimum overall length of sleeve shall be equal to the diameter of the pipe pile.

b. Splices shall develop full strength of the member.

c. Length of pile to be spliced shall be secured in proper alignment so that no eccentricity results.

d. Details of the splices shall be submitted by the Contractor for the Engineer's approval.

3. Welding of joints shall be performed in accordance with the requirements of:

a. AWS D1.1 Structural Welding Code.

b. Relevant sections of the NYBC.

4. All shop and field welding shall be performed by certificated welders under the immediate supervision of a representative of a standard testing agency or an inspection agency reporting directly to and under the control of the Department of Environmental Protection. The Contractor shall submit the

name of such agency to the Commissioner for approval before starting work. The costs of all welding inspections shall be borne by the Contractor.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examination of the Site

1. Prior to starting pile driving operations, the Contractor, the City and the Engineer shall make a joint inspection of the accessible existing structures, pavement and improvements adjacent to the pile driving site to examine and document their present condition.

2. Photographs and measurements shall be taken by the Contractor to record any conditions that may become the subject of possible damage claims.

3. The Contractor shall prepare a report of such conditions, verified by the photographs, and signed by the personnel of the Contractor, the City and the Engineer participating in the investigation.

3.02 IMPLEMENTATION

A. Driving

1. Piles shall be located and driven as shown on the Contract Drawings, unless otherwise directed by the Engineer. The final driving resistance will be determined based on the specific equipment proposed and the results of driving test piles or the pile load tests, as specified in the Contract.

2. The Contractor shall cooperate with the Engineer in determining the resistance to penetration and length of pile and shall mark each pile at one-foot intervals before driving or as required by the Engineer.

3. Spudding, jetting, predrilling, or other methods utilized to maintain alignment or allow easier penetration are subject to the approval of the Engineer.

4. Permanent pile casings shall be driven without interruption to the calculated tip elevation to reach a driving resistance in accordance with the test pile or pile load test driving data. The pile hammer used for driving shall be the same type and operated at the same rate and in the same manner as that used for driving the test piles or in the pile load test.

5. When driving is interrupted before final penetration is reached, the record of penetration shall not be taken until at least a 12-inch penetration has been obtained on resumption of driving.

6. When driving piles in groups or clusters, or under any conditions of relatively close spacing with other new piles, survey reference marks shall be placed on each pile immediately after installation and reference levels

recorded. The Contractor shall resurvey the levels of all piles in a group after the group has been driven and while the piles are accessible. Piles heaving or subsiding by more than 1/4 of an inch shall be reported to the Engineer and redriven if so directed.

B. Jetting

1. Piles shall be jetted only when written permission is given by the Engineer. Sufficient jets and adequate water pressure shall be used to freely erode the material adjacent to the pile without impairing the bearing capacity of piles already in place.

2. Before the desired penetration is reached, the jets shall be withdrawn and the piles shall be driven with the hammer alone for the last 4 feet, or more if necessary, to obtain the required bearing value.

C. Predrilling

1. The Contractor shall predrill holes to the depth and diameter as specified herein or shown on the Contract Drawings, Predrilling shall be done with continuous flight auger drilling equipment. Piles shall be installed in predrilled holes within 30 minutes of drilling the hole, unless otherwise approved by the Engineer.

2. After installation of the pile, the length of the hole remaining open shall be backfilled with clean granular material.

D. Obstructions

1. When the pile meets obstructions of any kind including concrete, piling, boulders, riprap, rockfill, or timbers within the upper ten (10) feet of driving, the obstructions shall be removed by whatever means necessary including spudding, drilling, augering, jetting and churning. After the removal of the obstructions, the pile shall be redriven to the required penetration. It is essential that the Contractor familiarize himself with the site conditions and the subsurface conditions at the site so as to be prepared for removal of obstructions. If obstructions are encountered below ten (10) feet such as to damage or prevent driving piles, piles shall be abandoned as directed by the Engineer.

2. The actual driven or installed footage of piles abandoned by order of the Engineer because of obstructions encountered, shall be added to the aggregate pay length of piling. Holes left by withdrawn piles shall be filled with clean granular fill.

3. The Contractor shall have on hand suitable equipment for spudding through buried timbers, cribbing and similar obstructions, and shall employ this equipment, when directed, in a manner satisfactory to the Engineer.

4. When spudding or predrilling is ordered by the Engineer, measurement for payment will be made in accordance with Article 1.02 included in this Section.

E. Tolerance

1. Hammer and piles shall be supported in rigid leads designed to hold the pile firmly in position and in alignment with the hammer.

2. Piles shall not be out of alignment by more than 2 percent of their length. The center of each pile at the level of cutoff shall not vary from its designated center by more than such distance that the stress in any pile group is more than 10 percent greater than its designated stress as determined by the Engineer.

3. A tolerance of 3 inches from the design location will be permitted in the installation of the piles, without reduction in load capacity, provided that such variation does not produce a load on any pile more than 10 percent greater than its design load bearing capacity as determined by the Engineer.

4. In general, driving shall be a continuous operation, when driving is interrupted before final penetration is reached, the record of penetration shall not be taken until at least a 12-inch penetration has been obtained on resumption of driving. Piles, which in the opinion of the Engineer are so damaged as to destroy their usefulness, shall be removed or abandoned and replaced with new piles.

F. Placement of Concrete in Steel Pipe

1. No concrete shall be placed in a pile until all piles within a radius of thirty (30) feet have been driven and the pile has been inspected and approved for concrete placement by the Engineer. The inspection will verify the integrity of the steel pipe throughout its length and the absence of distortion and reduction in area, and that all mud, water and other extraneous material has been removed from the interior. The Engineer shall be present when the piles are filled with concrete.

2. Pipe piles driven with open ends shall be cleaned out by means of air or water under pressure or both. The bottom of the piles shall be inspected with an electric lamp and if found satisfactory, the piles shall be driven further to ascertain their bearing capacities before concreting. Where water prevents inspection, the ends shall be sealed with tremie concrete, the piles driven to satisfactory bearing, the water pumped out, and the piles concreted in the dry.

3. Concrete shall be deposited in the pile through a funnel or vertical chute having spacers at the neck to permit air escape during the filling operation and with baffles to prevent segregation of the concrete. Placing of concrete in each pile shall be continuous, and the filling of any pile shall not be commenced unless there is sufficient concrete on hand to fill it. Piles shall be filled with concrete to the elevations as specified herein or shown on the Contract Drawings

4. Concrete shall not be placed through water unless tremie placement methods specifically approved by the Engineer are used. No more than 1

inch of standing water shall be permitted in any pile at the time of placing concrete.

5. Top 5 feet of concrete shall be rodded during placement.

6. The Contractor shall calculate the theoretical volume of each pile and compare to actual volume of concrete placed in each pile.

G. Pile Cutoff

1. All piles shall be cutoff to true planes at the elevation as specified herein or shown on the Contract Drawings

2. Pipe piles requiring a final cutoff elevation below the existing or excavated ground surface shall be filled with concrete to the cutoff elevations.

3. Cutoffs are the property of the Contractor and shall be disposed of off-site.

H. Pile Survey

1. The Contractor shall engage the services of a licensed surveyor, approved by the Commissioner, for the performance of the survey work. The Contractor shall, at such times so as not to interfere with the progress of the installation, make surveys of the installed piles. The installed location of each pile shall be established by survey and shown on drawings prepared for this purpose.

2. Copies of the drawings shall be submitted by the Contractor in accordance with the provisions as hereinafter specified in this Article and in Article titled "Analysis and Corrective Measures" in this Section. Survey information may be submitted on several drawings, each covering a partial area only, as the job progresses, in order to expedite the approval of the work.

3. Upon completion of all pile installation, the Contractor shall submit to the City, mylars of drawings showing installed location of all piles as related to their column lines, center of footings or other reference points and lines, percentage out of plumb, the cutoff elevation, and length below cutoff for each pile. Mylars shall be the same size as the Contract Drawings.

I. Analysis and Corrective Measures

1. The analysis and redesign work called for herein shall be performed by the Engineer.

2. The Engineer will analyze the conditions at each pile to determine whether corrective measures are required. If corrective measures are not required, approval will be given for proceeding with the work.

3. The Engineer will determine the corrective measures required to keep pile loads within the allowable limits. Corrective measures, for any piles installed more than 3 inches from the plan location, will be determined by the Engineer. If the corrective measures are not deemed feasible, the pile

shall be removed in its entirety and replaced by another pile installed in the design location.

4. If corrective measures involve the installation of additional piles, the Engineer will prepare supplemental drawings showing the details of the required corrective work.

   a. The Engineer will then obtain the approval of the supplemental drawing(s) by the Commissioner. The Department of Environmental Protection will obtain the signature of the Engineer of Record required on the Amendment from which the drawing showing corrective measures is to be submitted for approval.

   b. After the approval of the Commissioner has been obtained for the supplemental drawing(s), a copy of the approved Amendment and/or print of the drawing(s) stamped "Inspector's Copy," together with the original tracing of the drawing, will be filed by the Department of Environmental Protection as part of the permanent records of the Contract.

   c. After approval, copies of the drawing(s) will be issued to the Contractor and the work shall be installed in accordance with the drawings.

5. Cost of Additional Work:

   a. The cost of installing additional piles (as called for on the supplemental drawings for the corrective measures), shall be borne by the Contractor in the case of rejected, defective, damaged or misdriven piles.

   b. The cost will be borne by the City in the case of obstructed piles ordered by the Engineer abandoned or in the case of modifications required because of the presence of obstructions.

   c. Payment for corrective work necessitated by obstructed piles will be made in accordance with the applicable unit prices.

J. Rejected Piles

1. A sudden decrease in driving resistance which cannot be correlated with subsurface data or pile driving event may be a cause for rejection, unless pile is removed for inspection and found to be undamaged.

2. When any pile exceeds the installation tolerances specified in Article 3.02E, it may be rejected.

3. When any driven pile has been so injured in driving (due to causes other than obstructions encountered) as to be, in the opinion of the Engineer, unsuitable, or otherwise does not conform to the requirements of the Contract, such piles shall be rejected.

4. Rejected piles shall be cutoff at an elevation as directed by the Engineer or removed from the site by the Contractor.

K. Additional Piles

1. Additional piles shall be installed in locations designated by the Engineer to replace rejected piles, at no additional cost to the City

L. Withdrawn Piles

1. Piles driven in locations, other than in the permanent work, shall be removed, with the approval of the Engineer, after completion of driving. Such piles, if undamaged, may be reused.

2. The Contractor shall also remove piles driven in the permanent work for inspection of tips, if so ordered by the Engineer.

3. If the Contractor removes any piles driven in the permanent work for his convenience, for the prosecution of the work, or for any other reason, except at the direction of the Engineer, he shall replace such piles at no additional cost to the City.

4. Where piles are withdrawn, the pile hole shall be backfilled with clean granular fill.

M. Foundation Piles

1. All piles, within the area of uniform subsurface conditions pertaining to a given load-tested pile of satisfactory performance, shall be installed to the same or greater penetration resistance (or static load) as the successful load -tested pile, and shall bear in or on the same bearing stratum as the load tested pile.

2. The same equipment (or heavier equipment of the same type) that was used to install the load tested pile shall be used to install all other building piles, and the equipment shall be operated identically.

3. All piles shall be of the same type, shape, external dimension, and equal or greater cross-section as the load tested pile.

3.03 FIELD TESTING / QUALITY CONTROL

A. Inspection

1. All inspections will be performed by the Engineer designated for controlled inspection.

2. The driving of each pile is a mandatory hold point for which prior notification of the Engineer is required, and driving of each pile shall be performed in the presence of the Engineer. Driving records will be kept by the Engineer.

3. The Contractor shall cooperate with the Engineer in determining the resistance to penetration and shall mark each pile before driving as required by the Engineer.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Damaged or Misplaced Piles

B. All damaged or misplaced piles shall be removed or abandoned, and new piles shall be driven as directed by the Engineer at no cost to the City. Voids remaining from pulled piles shall be filled with clean granular fill at the Contractor's expense.

C. Abandoned piles shall be cut off one foot below cutoff elevation as specified herein or as shown on the Contract Drawings

D. All damaged piles and cutoff sections shall be removed from the site by the Contractor.

END OF SECTION

SECTION 32 12 16 - ASPHALT PAVING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide asphaltic concrete pavement roads and walks constructed on properly prepared subgrades and in conformance to the required lines, grades and cross sections shown on the Contract Drawings.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 02 41 10 - Demolition and Removals

B. Section 31 23 16 - Excavation

C. Section 31 23 23 - Fill

1.04 REFERENCES

A. Definitions

1. California Bearing Ratio (CBR): The ratio of (1) the force per unit area required to penetrate a soil mass with a 19 sq. cm (3 sq.in.) circular piston (approximately 51 mm (2 in.) diameter) at the rate of 1.3mm/min (.05 in/min) to (2) that required for corresponding penetration of a standard material.

2. Minimum Average Roll Value (MARV): Property value calculated as typical minus two standard deviations. Statistically, it yields a 97.7 percent degree of confidence that any sample taken during quality assurance testing will exceed value reported.

3. Typical Roll Value: Property value calculated from average or mean obtained from test data.

B. Reference Standards

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m3))

3. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate

4. ASTM D3666 - Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

5. ASTM D3786 - Standard Test Method for Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method

6. ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table

7. ASTM D4354 - Practice for Sampling of Geosynthetics and Rolled Erosion Control Products (RECPs) for Testing

8. ASTM D4355 - Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus

9. ASTM D4491 - Test Methods for Water Permeability of Geotextiles by Permittivity

10. ASTM D4533 - Test Method for Trapezoid Tearing Strength of Geotextiles

11. ASTM D4595 - Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method

12. ASTM D4632 - Test method for Grab Breaking Load and Elongation of Geotextiles
13. ASTM D4759 - Practice for Determining the Specification Conformance of Geosynthetics
14. ASTM D4751 - Test Method for Determining Apparent Opening Size of a Geotextile
15. ASTM D4833 - Test Method for Index Puncture Resistance of Geomembranes and Related Products
16. ASTM D4873 - Guide for Identification, Storage and Handling of Geosynthetic Rolls and Samples
17. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
18. AASHTO T 27 - Sieve Analysis of Fine and Coarse Aggregates
19. AASHTO T 88 - Standard Method of Test for Particle Size Analysis of Soils
20. AASHTO T 311 - Standard Method of Test for Grain-Size Analysis of Granular Soil Materials
21. AASHTO T 89 - Standard Method of Test for Determining the Liquid Limit of Soils
22. AASHTO T 90 - Standard Method of Test for Determining the Plastic Limit and Plasticity Index of Soils
23. AASHTO T 176 - Standard Method of Test for Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
24. Geosynthetic Accreditation Institute (GAI) - Laboratory Accreditation Program (LAP)
25. International Standards Organization (ISO) 9001 - Quality Management Systems — Requirements
26. New York State Department of Transportation (NYSDOT) Standard Specifications
27. Federal Highway Administration- Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)
28. New York City Local Law 71 of 2011

1.05 DESCRIPTION

A. Not used

1.06 QUALITY ASSURANCE

A. The paving mix manufacturer shall be registered with and approved by NYSDOT.

B. Sub-base materials shall comply with the testing and certification requirements of Section 31 23 23 – Fill.

C. Recycled Portland Cement Concrete Aggregate shall comply with the procedures contained in the Geotechnical Control Procedure (GCP-17) "Procedure for the Control and Quality Assurance of Granular Materials: as per NYSDOT Standards and Specifications section 733-07.

D. Geotextile fabric manufacturer shall be approved by NYSDOT.

E. Manufacturers shall comply with ASTM D3666.

1.07 SUBMITTALS

A. The Contractor shall submit shop drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Geotextile

a. Manufacturer's literature including physical, mechanical and chemical properties of the geotextile.

b. Certification of geotextile's minimum MARVs and tests used to determine those properties.

c. Certificate of Compliance stating that the geotextile conforms to the Specifications and the manufacturer is aware of and agrees with its intended use.

d. Geotextile manufacturer's qualifications: ISO 9001 certified or equivalent.

e. Manufacturing quality control test results on geotextiles.

2. Asphalt Concrete

a. The bituminous mix design for both the binder course and the top course, which shall include the sources of all ingredient materials, Recycled Asphalt Pavement (RAP) content by weight, the penetration of the asphaltic cement and the percentages by weight and the number of pounds of each of the materials making up one batch.

1) The laboratory analysis of the bituminous mix and the laboratory compacted density.

3. Recycled Portland Cement Concrete Aggregate (RCA) Material

a. Name of location of all suppliers.

b. Certificate of compliance with standard specified for each source of material.

c. Prior to stockpiling or placing of materials at the job site, submit for approval samples representative of the material at the proposed

borrow source. In addition, submit documentation of the availability of the required material quantities at any proposed borrow source.

d. Certification by the material borrow source of the gradation as per ASTM D 422 for the gravel, RCA and any other materials being used. The minimum number of tests shall be determined by quantity of material placed, and reports of the test results shall be submitted promptly.

e. RCA shall also comply with the testing and certification requirements of Section 31 23 23 – Fill.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Materials delivered to the site shall be stored in a manner to prevent contamination and segregation.

B. Geotextile

1. Geotextile delivery, storage, and handling shall comply with the requirements of NYSDOT Standard Specifications Section 207-3.01.

2. Wrap geotextile in black protective wrap.

3. The geotextile rolls shall be labeled as per ASTM D4873.

4. Deliver, store and handle rolls in manner to prevent damage.

5. After unloading, inspect rolls for defects and damage.

6. Protective wrapping should not be removed until ready for installation. Do not leave covered rolls exposed to elements for more than 30 days unless additional heavy-duty waterproof cover is provided. At no time shall the geotextile be exposed to ultraviolet light for a period exceeding 14 days.

7. Store rolls off ground, protected from precipitation, ultraviolet radiation, strong chemicals, sparks and flames, temperatures in excess of 160 °F and other environmental conditions that could cause damage to geotextile.

8. Prevent damage to wrappings and geotextile.

9. Rolls should be deployed as closely as possible to the designated location to avoid dragging. Excessive stress and movement should be kept to a minimum.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Geotextiles shall be as manufactured by:

1. Propex Fabrics, Chattanooga, TN;
2. TenCate Geosynthetics, Pendergrass, GA;
3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Geotextile: Provide geotextile fabric conforming to the requirements specified in this Section:

1. Woven high-performance/high-strength slit film polypropylene geotextile; individual slit films woven together in manner to provide dimensional stability relative to each other.
2. Resistant to ultraviolet degradation and biological and chemical environments normally found in soils.
3. Minimum Average Roll Values:

Property	Test Method	Units	Results
Wide Width Tensile Strength	ASTM D4595	kN/m (lbs/in)	31x30.6 (175 x 175)
Grab Tensile Strength	ASTM D4632	N (lbs)	1335 x 1335
Grab Elongation	ASTM D4632	Percent	15 x 15
Puncture Strength	ASTM D4833	N (lbs)	555 (125)
Mullen Burst	ASTM D3786	KPa (psi)	4475 (650)
Trapezoidal Tear	ASTM D4533	N (lbs)	530 x 530
Apparent Opening Size	ASTM D4751	mm	0.212
Permittivity	ASTM D4491	sec-1	0.06
Water Flow Rate	ASTM D4491	1/min/m^2 (gpm/ft^2)	200 (5)
UV Resistance (percent retained at 500 hours)	ASTM D4355	Percent	90

B. Provide asphaltic concrete pavement for roadways conforming to the requirements specified in this Section and to the following standards:

1. Sub-base Course of Recycled Concrete Aggregate as follows:

a. Sub-base material shall have a maximum particle size of 3-in. in any directions and a nominal size of 2-in.

b. Use materials with not more than 30 percent by weight of glass. May use a blend of at least 95 percent, by weight, of RCA, and free from organic and other deleterious material. This material shall not contain asphalt or brick.

c. If RCA is used, provide documentation showing that the material was obtained from a NYSDEC registered or permitted construction and demolition (C&D) debris processing facility as specified in Section 360-16.1 of 6NYCRR Part 360 "Solid Waste Management Facilities" and complying with the regulatory requirements and regulations of Section 31 23 23 – Fill. This material shall be procured from a NYSDOT approved source.

d. Sub-base material shall meet the specification material requirement and must be able to be placed and fine graded to the required tolerances. Should the sub-base course become unstable at any time prior to the placement of the overlying course, correct the unstable condition to the satisfaction of the Engineer at no additional cost to the City. Perform any required modification prior to placing the material on the grade.

e. A Geotextile shall be used to separate the sub-grade layer from the sub-base course.

2. Tack Coat: Asphalt emulsion per NYSDOT Standard Specifications, Sections 407 and 702.

3. Binder Course: Binder mixture as specified in the Contract Drawings per NYSDOT Standard Specifications, Sections 401, 402 and 702.

4. Top Course: Asphaltic concrete mixture as specified in the contract drawings per NYSDOT Standard Specifications, Sections 401, 402 and 702.

C. Walks: Provide asphaltic pavement for walks conforming to the requirements specified in this section and to the following standards:

1. Bottom Course: Asphaltic concrete mixture, NYSDOT Standard Specifications, Subsections 401-2.01 through 401-2.05, Table 401-1, Type 3

2. Wearing Course: NYSDOT Standard Specifications, Subsections 401-2.01 through 401-2.05, Table 401-1, Type 6F

3. Tack Coat: Asphalt emulsion, NYSDOT Standard Specifications, material designation 702-90

D. Asphaltic concrete shall contain not less than 30 percent reclaimed asphaltic pavement, as measured by weight, in accordance with New York City Local Law 71 of 2011.

E. Traffic and Parking Markings:

1. Colors: As shown on the Contract Drawings and in accordance with the MUTCD.

2. Conform to NYSDOT Standard Specifications Section 727 – Pavement Marking Materials.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Quality Control of Geotextile

1. Manufacturing Quality Control: Testing shall be performed at a laboratory accredited by GAI-LAP for tests required for the geotextile, at frequency exceeding ASTM D4354, with following minimum acceptable testing frequency:

Property	Test Method	Test Frequency sq m (sq ft)
Grab Tensile Strength	ASTM D4632	1/10,000 (100,000)
Grab Elongation	ASTM D4632	1/10,000 (100,000)
Trapezoidal Tear	ASTM D4533	1/10,000 (100,000)
Mullen Burst	ASTM D3786	1/10,000 (100,000)

2. Conformance Testing:

a. Upon delivery to site, Engineer will remove samples of geotextile and send to laboratory for testing.

b. Testing will be performed at a laboratory accredited by GAI-LAP in accordance with ASTM D4759, Practice A.

B. RCA Material

1. General: Provide materials for sub-base course that consist of sand, gravel, approved blast furnace slag, RCA, or stone that meet the requirements of this specification. Provide materials well graded from coarse to fine, and free from organic or other deleterious material. Any gravel material will be rejected if it is determined to contain any unsound or deleterious materials.

2. Testing: The Contractor shall retain the services of an independent materials testing laboratory to perform the following laboratory and field tests:

a. Gradation: Perform sieve analysis in accordance with ASTM/AASHTO procedures C136/T 27, T 88, T 311, T 89 or D 4318/ T 90. Report the following sieves for all tests: #200, #40, ¼ in., ½ in., ¾ in., 1 in., 1 ½ in., 2 in., 3 in.

b. Soundness: Provide material that complies with the soundness limits specified in the NYSDOT Standard Specifications. Material will be accepted on the basis of Magnesium Sulfate Soundness Loss after four (4) cycles performed according to NYSDOT Standard Specifications.

c. Plasticity: Determine plasticity using either of the following methods:

1. Plasticity Index: The Plasticity Index of the material passing the #40 mesh sieve shall meet the values of the Table 1. Determine the plasticity using AASHTO T 89 and ASTM D4318/AASHTO T 90.
2. Sand Equivalent: The sand equivalence of the granular material shall meet the values in Table 1. Determine sand equivalence using ASTM D2419 or AASHTO T 176.

d. Elongated Particles: Not more than 30 percent, by weight, of the particles retained on a ½-in. sieve shall consist of flat or elongated particles. A flat or elongated particle is defined as one which hast it greatest dimension more than 3 times its least dimension. Acceptance for this requirement will normally be based on a visual inspection. When the Engineer elects to test for this requirement, material with a percentage greater than 30 will be rejected.

e. Fractured Faces: When the Engineer elects to test for this requirement, Surface material shall have at least two fractured faces on 50 percent of the stone particles larger than ½ in. Base material shall have at least one fractured face on 50 percent of the stone particles larger than ½-in.

3. All materials used in construction, whether brought to the site or developed from on-site sources, shall be tested for gradation, optimum moisture-maximum density curve, and reports of the test results for each source shall be submitted promptly. The tests will be performed in conformance with the procedures contained in the appropriate NYSDOT publications and ASTMs listed in Section 1.04 - References.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. The Resident Engineer shall conduct a pre-pave meeting in accordance with NYSDOT Standards and Specifications Section 402-3.

B. Full Depth Asphaltic Concrete Pavement

1. General: Asphaltic concrete pavement roads shall consist of

a. A layer of woven geotextile fabric,

b. A sub-base course,

c. A base course

d. A tack coat of asphalt emulsion,

e. An intermediate binder course of asphaltic concrete (close binder type),

f. A tack coat of asphalt emulsion, and

g. A top course of fine surface mix asphaltic concrete (top course).

2. Preparation of Subgrade:

a. Per Section 31 23 16 – Excavation, remove to a depth of 24 inches, top soil, boulders, muck, soft clay, spongy material and any other objectionable material and replace them with broken stone, sand and gravel or other approved fill to promote positive drainage.

b. On sites where it appears that there may be some areas containing objectionable materials, proof roll to locate the unsuitable materials.

c. Exercise care during stripping operations to prevent excessive disturbance to subgrade. Use lightweight dozers or grade-alls for low strength, saturated, noncohesive and low cohesive soils.

d. For extremely soft ground such as peat bog areas, do not over excavate surface materials to take advantage of root mat strength.

e. If vegetation is present, cut at ground surface and place sawdust or sand over stumps and roots extending above ground surface.

f. Scrape and fill subgrades, as necessary, and thoroughly consolidate them to the required lines and grades. Consolidate subgrades for pavements by means of a smooth steel-wheel roller having a nominal gross weight of not less than 10 tons, and exerting a minimum force of not less than 300 lbs/in of width on the compression roll faces, or approved equivalent.

g. Compact subgrade to not less than 75 percent relative density as determined by ASTM D4253, or not less than 95 percent of the maximum dry density as determined by ASTM D1557, as applicable.

h. In places where the use of a roller is impractical, compact subgrades with hand tampers weighing not less than 40 lbs. and having a face not exceeding 80 sq.in. in area.

i. Subgrade shall be prepared not less than 100 ft. in advance of the pavement to be immediately constructed.

3. Installation of Geotextile:

a. After subgrade has been prepared, place geotextile in same direction as the new roadway aggregate is being laid down.

b. Do not drag geotextile across subgrade. Place entire roll on subgrade surface and roll out smoothly. Remove wrinkles and folds by stretching and holding down with sandbags as required.

c. Join parallel rolls of geotextile as follows:

California Bearing Ratio (CBR)	Method of Joining
Over 2	300-450 mm (12-18 in) overlap
1-2	600-900 mm (24-36 in) overlap
0.5-1	900 mm (36 in) overlap or sewn
Less than 0.5	Sewn
All roll ends	900 mm (36 in) overlap or sewn

d. If the CBR of the subgrade is not known, join parallel rolls by sewing them together.

e. For subgrades with CBR less than or equal to 1, where the geotextile is to provide reinforcement, the geotextile shall be pretensioned in the following manner:

1) Proofroll with heavily loaded, rubber-tired vehicle. Wheel load of truck shall be equivalent to maximum expected for site. Vehicle to make at least four passes over first lift in each area of site.

2) Once design aggregate has been placed, use roadway prior to paving to prestress geotextile-aggregate system.

f. If required, the geotextile may be held in place prior to subbase placement with sandbags. The use of pins to anchor the geotextile will not be permitted, except at edges of existing pavement as specified below.

g. Do not place overlaps along anticipated primary wheel path locations. Place overlaps at end of rolls in direction of aggregate placement with previous roll on top.

h. When sewn seams are required, strength of seams shall be greater than or equal to 80 percent of tensile strength of unseamed geotextile as determined by same testing methods.

i. When placing woven geotextile on curves, fold or cut geotextile and overlap in direction of turn with previous fabric on top. Staple or pin folds in geotextile approximately 2 ft on center.

j. When geotextile intersects an existing pavement area, extend geotextile to edge of old system and anchor it by trenching and covering the edge of the fabric with stone, or staple or pin the fabric to the ground. For widening or intersecting existing roads where geotextiles have been used, excavate edge of roadway down to existing geotextile and sew the new geotextile to the existing geotextile, or overlap and staple or pin the new fabric to the old and into the ground.

k. Prior to covering, inspect geotextile for excessive damage, including holes, rips and tears.

1) If excessive defects are observed, repair affected area by placing new layer of geotextile over damaged area.

2) Extend new layer beyond damaged area the same distance as required for overlap of adjacent rolls.

l. End-dump base aggregate on previously placed aggregate. End dumping or tail-gate dumping of the aggregate directly on the geotextile will not be permitted.

1) For subgrades with CBR less than or equal to 1, limit pile heights to prevent possible subgrade failure.

2) Maximum placement thickness for subgrades with CBR less than or equal to 1 shall not exceed design thickness of road.

m. Spread and grade first lift of aggregate to 12 in. or to design thickness if less than 12 in. prior to compaction. Do not allow traffic on soft roadway with less than 8 in. of aggregate over geotextile, except 6 in. for CBR greater than or equal to 3.

n. Compact the sub-base course as specified in Paragraph D.2. Vibratory compaction shall not be used on the initial lift over the geotextile.

o. Perform construction parallel to road alignment.

p. Fill ruts formed during construction to maintain adequate cover over geotextile. Do not blade ruts down.

q. Place remaining base aggregate in lifts not exceeding 250 mm (10 in) in loose thickness and compact to specified density.

r. Equipment may operate on roadway without aggregate for geotextile installation under permeable bases if subgrade is of sufficient strength.

1) For soils with CBR less than or equal to 0.5, use lightweight construction vehicles for access on first lift.

2) Limit construction vehicles in size and weight to limit rutting in initial lift to 3 in.

3) If rut depths exceed 3 in, decrease construction vehicle size or weight or increase lift thickness.

s. Turning will not be permitted on first lift of base aggregate. Construct turn-outs at roadway edge to facilitate construction.

4. Sub-Base Course:

a. Spreading

1) Spread the No. 1 and No. 2 stone or RCA uniformly on the geotextile with shovels from piles along the side of the roadway or from dumping boards or by means of vehicles of approved design constructed especially for this purpose, but in no case dump the material directly on the geotextile.

2) The loose lift thickness shall be a minimum of 1.5 times the maximum particle size. The Contractor shall control the lift thickness, provided that the thickness shall not exceed the thickness limitations specified herein, for installation of aggregate over geotextile, and shall not exceed the maximum allowed according to the equipment classifications in Subparagraph 2, *Compaction Equipment* of Subsection 203-3.03.C, Compaction, of New York State Department of Transportation Standard Specifications, and the equipment meets all specified class criteria of that Standard.

3) Spread broken stone or RCA in sufficient quantity to provide the required thickness after rolling. The depth of stone shall be gauged by the use of cubical concrete blocks of the required thickness, or other approved means.

4) Remove all segregated fine or coarse stone and replace it with well graded stone.

5) Do not spread the broken stone or RCA over wet geotextile.

6) Do not place broken stone or RCA adjacent to manhole heads or other structures until such structures have been set to the required lines and grades.

b. Rolling and Filling

1) After the No. 1 and No. 2 stone or RCA mixture has been laid loose, thoroughly roll it with an approved smooth steel-wheel roller having a nominal gross weight of not less than 10 tons and exerting a minimum force of 300 lbs/in of width on the compression roll faces.

2) Start rolling longitudinally at the sides and proceed toward the center, overlapping on successive trips by at least one-half the width of a rear wheel. A minimum of 8 passes shall

be applied over each lift with the roller operating at a speed not exceeding 6 feet per second. Rolling shall be continued until there is no movement of the stone ahead of the roller.

3) After the sub-base is thoroughly compacted, as measured by the method described in Paragraph f, below, uniformly spread No. 4 stone over the compacted area from piles along the side of the roadway or from dumping boards. Broom the filler in and roll it dry until no more filler can be forced into the voids. Remove excess filler.

4) Do not lay over 500 lineal feet of the sub-base without it being rolled and thoroughly filled.

5) The maximum layer thickness prior to compaction shall be 12 in., and the final compacted thickness shall be as shown on the Contract Drawings. In confined areas as defined by the Engineer the maximum compacted layer thickness shall be 6 in.

6) Do not allow the surface of the completed sub-base to deviate more than ¼ inch in 5ft from the nearest point of contact nor more than 3/8-in in 18ft when tested by means of an 18ft straight-edge placed parallel to the centerline of the roadway.

7) If any irregularities develop in the surface during or after rolling of the sub-base, remedy them by loosening the surface and removing or adding broken stone or RCA as may be required, and follow by rolling the entire area, including the surrounding surface, applying filler and continuing rolling until the course is compacted satisfactorily to a uniform surface.

5. Base and Binder Courses:

a. Preparation: Clean the binder course of all dirt and loose material, thoroughly dry it and obtain the Resident Engineer's approval before laying the binder course.

b. Weather Limitations: Bituminous material or mixture shall not be applied on any soft surfaces, when the surface is wet, when the temperature of the surface on which the mixture is to be placed is below 45°F, or when other weather conditions would prevent proper construction of the pavement.

c. Forms: When side forms are required, accurately set them to line and grade and securely stake and brace them in place sufficiently to withstand all construction operations. Thoroughly clean and oil forms before use.

d. Spreading:

1) Dump the binder course into the hopper of the spreader. Spread and screed it immediately to the full width required for the pavement and to such a depth that, when rolled, the required thickness is obtained. The maximum allowable compacted thickness for binder shall be 4 in. The maximum allowable compacted thickness for base shall be 6in.

2) When the mixture is to be spread by hand, dump it on approved steel dump sheets outside of the area on which it is to be spread and immediately distribute it into place and spread it in a uniformly loose layer.

3) Remove material from areas which show an excess or lack of bituminous material or an inconsistent mix and fill with new material. Re-spread or otherwise rectify areas which show segregation to obtain a uniform mixture in the course.

4) Do not use mixture which has been over 45 minutes out of the mixer, or if longer, the mixture must be over 250^{o}F when spread.

5) Do not lay over 500 lineal feet of binder material without it being rolled and properly compacted.

e. Compacting:

1) 50 Series Compaction Method: Contractor shall compact HMA according to NYSDOT Standard Specifications Section 402-3.07A.

2) 60 Series Compaction Method: Contractor shall compact HMA according to NYSDOT Standard Specifications Section 402-3.07B.

3) 70 Series Compaction Method: Contractor shall compact HMA according to NYSDOT Standard Specifications Section 402-3.07C.

4) 80 Series Compaction Method: Contractor shall compact HMA according to NYSDOT Standard Specifications Section 402-3.07D.

6. Tack Coat:

a. Before spreading the binder course, spray the sub-base with an asphalt emulsion tack coat in the amount of 0.25 gallon per square yard. Allow the tack coat to cure until sticky or tacky. Renew and repair or replace damaged coating.

b. Tack coat shall be applied evenly by means of a truck having appropriate spray nozzles. All nozzles shall be kept free of clogs.

c. Paint contact surfaces of all curbing, gutters, manholes and adjacent pavement edges with the tack coat material.

d. Tack coat shall not be applied on a wet pavement surface or when the temperature is below 45° F.

7. Top Course:

a. Preparation:

1) Thoroughly clean the binder course of all loose and foreign material before the top mixture is delivered.

2) Apply a tack coat at a rate of 0.03 to 0.07 gallon per square yard as approved by the Engineer.

3) Do not lay mixture until the Engineer approves the binder course and determines in all cases whether the weather conditions are suitable to permit laying.

b. Weather Limitations: Bituminous material or mixture shall not be applied on any soft surfaces, when the surface is wet, when the temperature of the surface on which the mixture is to be placed is below 45° F, or when other weather conditions would prevent proper construction of the pavement

c. Forms: If at the time of laying the mixture, permanent side supports such as curbs, edgings or gutters have not been constructed, firmly fasten in place suitable side forms of wood or steel, true to line and grade. In all cases adequately support the sides of roadways until final compaction has been obtained and the mixture has hardened by cooling.

d. Spreading and Compacting:

1) Spread and compact the top course until it meets the compaction and surface requirements specified above for the binder course.

2) The Contractor shall have the same options for achieving the required compaction as given for the compaction of the binder course.

3) Do not lay over 500 lineal feet of top course material without it being rolled and properly compacted.

4) Do not use mixture which has been over 45 minutes out of the mixer, or if longer, the mixture must be over 250° F when spread.

e. Joints: Perform construction as near continuously as possible. Carefully make joints between old and new pavements, or between successive days' work, in a manner which will insure a thorough and continuous bond, as follows:

1) Cut back the edge of the old surface before recommencing the operation of laying, in order to present a fresh, clean surface for contact with the newly placed material.

2) Carefully employ hot smoothing irons to heat the old pavement sufficiently (without burning) to insure a proper bond.

f. Shoulders: If temporary forms are used, protect the edges of the finished roadway by placing and thoroughly compacting approved material to form shoulders along the roadway as shown on the Contract Drawings. Construct finished shoulders 1/4 inch above the elevation of the finished roadway edges.

g. If weather conditions necessitate delaying the installation of the top course for more than two days, the tack coat shall be reapplied to the binder course at the rate of 0.03 to 0.07 gallon per square yard as approved by the Engineer.

C. Mill and Overlay

1. Conform to NYSDOT Standard Highway Specifications, Section 490 for cold milling of existing pavement.

2. Milling shall conform to Section 02 41 10 – Demolition and Removals.

3. Conform to NYSDOT Standard Highway Specifications, Section 401, 402 and 702 for new top course.

4. Mill to the thickness shown in the Contract Drawings or as directed by the Engineer.

5. Follow requirements for Top Course as specified herein.

D. Walks

1. General: Asphaltic concrete pavement walks shall consist of

a. A binder course of asphaltic concrete (close binder type),

b. A tack coat of asphalt emulsion, and

c. A top course of fine surface mix asphaltic concrete.

2. Binder Course:

a. Before the binder course is laid:

1) Compact the subgrade thoroughly, so that the binder course, after compaction, will be found satisfactory when field tested.

2) Clean subgrade of all loose and foreign material, dry it, and obtain the Resident Engineer’s approval.

b. Paint contact surfaces of all curbing, gutters, manholes and adjacent pavement edges with an asphalt emulsion tack coat at the rate of

0.03 to 0.07 gallon per square yard as approved by the Resident Engineer.

c. Set forms, spread and compact the binder course as specified above for the binder course for roads.

d. Provide a binder course surface free from depressions exceeding 3/8-inch when tested with a 10-foot straight edge placed parallel with the center line of the walk.

3. Top Course:

a. Clean the binder course of all loose and foreign material before the top course mixture is delivered. Do not lay mixture until the Resident Engineer approves the binder course and determines in all cases whether the weather conditions are suitable to permit laying.

b. If at the time of laying the mixture, permanent side supports such as curbs, edging or gutters have not been constructed, fasten in place suitable side forms of wood or steel, true to line and grade. In all cases, adequately support the sides of walks until final compaction is obtained and until the mixture hardens.

c. Spread and compact the top course as specified for the binder course.

d. Provide a walk surface free from depressions exceeding 1/8-inch when measured with a 10-foot straight edge placed parallel with the centerline of the walk.

e. Perform construction as near continuously as possible. Carefully make joints between old and new pavements, or between successive days' work, in a manner which will insure a thorough and continuous bond, as follows:

1) Cut back the edge of the old surface before recommencing the operation of laying, in order to present a fresh, clean surface for contact with the newly placed material.

2) Carefully employ hot smoothing irons to heat the old pavement sufficiently (without burning) to insure a proper bond.

f. Paving procedure, including compaction requirements, shall be the same as specified above for the top course for roads.

E. Patching

1. As directed by Resident Engineer, remove and replace defective areas. Cut such areas and replace with fresh asphaltic concrete and compact to required density.

F. Pavement Marking

1. Clean with power and hand brooms.

2. Mark edges straight and uniform. Use two coats and comply with manufacturer's recommendations.

3.03 FIELD TESTING / QUALITY CONTROL

A. Pavement Density Testing/Monitoring

1. Contractor shall conduct the following pavement density monitoring operations depending on the pavement design compaction series indicated in the Contract Drawings:

a. 50 Series Compaction: Contractor shall extract pavement cores, in accordance with NYSDOT Section 402-3.08A, and deliver to the Regional Materials Laboratory in accordance with NYSDOT standard specifications Section 402-3.08E, for density testing.

b. 60 Series Compaction: Contractor shall monitor pavement density using density gauges in accordance with NYSDOT Standard Specifications Section 402-3.07B. The density gauges used to monitor pavement density shall follow the requirements specified in NYSDOT Standard Specification Section 402-3.07E. In addition to density gauge measurements, contractor shall extract pavement cores, in accordance with NYSDOT Standard Specifications Section 402-3.08A, and deliver to the Regional Materials Laboratory in accordance with NYSDOT Standard Specifications Section 402-3.08E, for density testing.

c. 70 Series Compaction: Contractor shall monitor pavement density using density gauges in accordance with NYSDOT Standard Specifications Section 402-3.07C. The density gauges used to monitor pavement density shall follow the requirements specified in NYSDOT standard specification section 402-3.07E.

d. 80 Series Compaction: Density testing is not required. Contractor shall place and compact HMA as per NYSDOT Standard Specifications Section 402-3.07D.

2. When required by the Engineer, furnish 4-inch diameter test samples cored from the binder course and from the completed pavement. The Engineer will choose the number of cores and the locations at which the cores shall be taken. Sample cores, when required, shall be taken for every 10,000 square feet of pavement and patch. Density test shall show that the sample is within 90 percent of the laboratory specimen. Replace with new mixture and refinish the areas of pavement so removed without additional compensation.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Cleaning and Protection

1. After paving, clear surfaces of excess asphaltic concrete and all foreign matter.
2. Protect new pavement until fully hardened.
3. Cover openings of drainage structures until permanent covers are placed.

END OF SECTION

SECTION 32 12 16.01 - ASPHALT PAVING FOR NYCDOT ROW
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide asphaltic concrete pavement roads and walks constructed on properly prepared subgrades and in conformance to the required lines, grades and cross sections shown on the Contract Drawings.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 02 41 10 - Demolition and Removals

B. Section 31 23 16 - Excavation

C. Section 31 23 23 - Fill

1.04 REFERENCES

A. Definitions

1. Typical Roll Value: Property value calculated from average or mean obtained from test data.

B. Reference Standards

1. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))
2. ASTM D3666 - Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials.
3. ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
4. New York State Department of Transportation (NYSDOT) Standard Specifications
5. New York City Department of Transportation (NYCDOT), Bureau of Highway Operations Standard Specifications
6. New York City Department of Transportation (NYCDOT) Highway Rules, Title 34 Chapter 2, Rules of the City of New York
7. New York City Local Law 71 of 2011
8. NYCDDC – Quality Assurance (QA) Mix Design, Laboratory, and Plant Acceptance Protocol
9. Federal Highway Administration - Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)

1.05 DESCRIPTION

A. Not used.

1.06 QUALITY ASSURANCE

A. Paving mix manufacturer

1. Shall be registered with and approved by NYSDOT.
2. Shall meet the NYCDDC QA Mix Design, Laboratory, and Plant Acceptance Protocol, and shall maintain the required accreditations for NYCDDC Plant Acceptance.

B. Sub-base materials shall comply with the testing and certification requirements of Section 31 23 23 – Fill.

C. Manufacturers shall comply with ASTM D3666 - Standard Specification for Minimum Requirements for Agencies testing and inspecting road and paving materials.

1.07 SUBMITTALS

A. The Contractor shall submit shop drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Asphalt Concrete

a. The bituminous mix design for both the binder course and the wearing course, which shall include the sources of all ingredient materials, Recycled Asphalt Pavement (RAP) content by weight, the penetration of the asphaltic cement and the percentages by weight and the number of pounds of each of the materials making up one batch.

b. The laboratory analysis of the bituminous mix and the laboratory compacted density.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Materials delivered to the Site shall be stored in a manner to prevent contamination and segregation.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not used

2.02 MATERIALS / EQUIPMENT

A. Provide asphaltic concrete pavement for roadways conforming to the requirements specified in this Section and to the following standards:

1. Concrete Base for Pavement per NYCDOT Standard Highway Specifications, Section 4.04.

2. Tack Coat: Asphalt emulsion, NYCDOT Standard Highway Specifications, Section 6.58.

3. Binder Course: Binder mixture Type 3, NYCDOT Standard Highway Specifications, Section 4.02.

4. Wearing Course: NYCDOT Standard Highway Specifications, Section 4.02.

B. Walks: Provide asphaltic pavement for walks conforming to the requirements specified in this Section and to the following standards:

1. Tack Coat: Asphalt emulsion, NYCDOT Standard Highway Specifications, Section 6.58.
2. Binder Course: Binder mixture Type 3, NYCDOT Standard Highway Specifications, Section 4.02.

C. Wearing Course: NYCDOT Standard Highway Specifications, Section 4.02. Asphaltic concrete shall contain not less than 30 percent reclaimed asphaltic pavement, as measured by weight, in accordance with New York City Local Law 71 of 2011.

D. Traffic and Parking Markings:

1. Colors: As shown on the Contract Drawings and in accordance with the MUTCD.
2. Conform to NYCDOT Standard Highway Specifications, Section 6.44 and NYCDOT Standard Typical Markings Specifications.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. The Resident Engineer shall conduct a pre-pave meeting in accordance with NYSDOT Standards and Specifications Section 402-3.

B. Full Depth Asphaltic Concrete Pavement

1. General: Asphaltic concrete pavement roads shall consist of
   a. A concrete base for pavement,
   b. A tack coat of asphalt emulsion,
   c. An intermediate binder course of asphaltic concrete (close binder type),
   d. A tack coat of asphalt emulsion, and
   e. A wearing course of fine surface mix asphaltic concrete (top course).
2. Preparation of Subgrade:
   a. Per Section 31 23 16 – Excavation remove to a depth of 24 inches, top soil, boulders, muck, soft clay, spongy material and any other

objectionable material and replace them with broken stone, sand and gravel or other approved fill to promote positive drainage.

b. On sites where it appears that there may be some areas containing objectionable materials, proof roll to locate the unsuitable materials.

c. Exercise care during stripping operations to prevent excessive disturbance to subgrade. Use lightweight dozers or grade-alls for low strength, saturated, noncohesive and low cohesive soils.

d. For extremely soft ground such as peat bog areas, do not over excavate surface materials to take advantage of root mat strength.

e. If vegetation is present, cut at ground surface and place sawdust or sand over stumps and roots extending above ground surface.

f. Scrape and fill subgrades, as necessary, and thoroughly consolidate them to the required lines and grades. Consolidate subgrades for pavements by means of a smooth steel-wheel roller having a nominal gross weight of not less than 10 tons, and exerting a minimum force of not less than 300 lbs/in of width on the compression roll faces, or approved equivalent.

g. Compact subgrade to not less than 75 percent relative density as determined by ASTM D4253, or not less than 95 percent of the maximum dry density as determined by ASTM D1557, as applicable.

h. In places where the use of a roller is impractical, compact subgrades with hand tampers weighing not less than 40 lbs and having a face not exceeding 80 sq.in. in area.

i. Subgrade shall be prepared not less than 100 ft in advance of the pavement to be immediately constructed.

3. Installation of Concrete Base for Pavement

a. Concrete base for pavement shall meet the requirements of spec section 03 30 00 – Cast-In-Place Concrete and NYCDOT Standard Highway Specifications Section 4.04.

b. Concrete shall be placed, spread, internally vibrated, consolidated and struck off using methods and equipment approved by the Resident Engineer. Spreading by shovels will be permitted.

c. Concrete shall be deposited before the initial set has taken place, crosswise of the street, in as nearly a continuous operation as practicable, and with approved tools which will prevent segregation. It shall not be deposited in standing water and shall be thoroughly compacted to the required depth and against rails and structures.

d. Concrete shall have its top surface parallel to and at the required depth below the finished pavement surface.

e. The Contractor shall be required to furnish a minimum of three (3) hand operated immersion type vibrators to the job site, one of which shall be used as a backup for the other two. Immediately after concrete has been placed, the Contractor shall use the hand operated immersion type vibrators to thoroughly consolidate the concrete in areas against and along the face of forms, when used, and along curbs, street hardware, and other structures. Vibrators shall not come in contact with forms, shall not be used for moving concrete in the work, and in no case shall any vibrator be operated longer than 4 seconds in any one location.

f. Where a block pavement is to be laid on the concrete base it shall be finished to a surface that is not rough and where an asphalt pavement is to be laid the surface of the concrete shall be left roughened by transverse brooming, except within one (1') foot of joints which shall be finished smooth for the application of a reflective cracking membrane.

g. Concrete base in roadways shall be finished three (3) inches below the surface of the new asphaltic concrete wearing course and shall conform to the profile and cross section of finished asphaltic concrete wearing course within a tolerance of +1/4 inch throughout. Hand screeding and finishing of the concrete base will be permitted. The finished surface shall be struck uniformly and be free of ruts, depressions, bumps and unevenness, suitable for temporary use as a vehicular riding surface.

h. For the application of reflective cracking membrane under Item NYCDOT Standard Highway Specifications Section 6.91, the surface of the concrete base within one (1) foot of joints shall be finished smooth. No other hand finishing of the pavement will be required except to correct surface irregularities.

i. Transverse and construction joints shall be constructed as per the New York City Department of Transportation's Standard Details of Construction Standard Drawing Nos. H-1040 and H-1034. Construction joints will be required at paving stops and at other locations as directed by the Resident Engineer.

j. No traffic of any kind will be allowed on the concrete base until permitted by the Resident Engineer. Normally that shall be at least seven (7) days or at least seventy-two (72) hours for High Early Strength Concrete.

4. Tack Coat:

a. Before spreading the binder course, spray the bottom course with an asphalt emulsion tack coat in the amount of 0.25 gallon per square yard. Allow the tack coat to cure until sticky or tacky. Renew and repair or replace damaged coating.

b. Tack coat shall be applied evenly by means of a truck having appropriate spray nozzles. All nozzles shall be kept free of clogs.

c. Paint contact surfaces of all curbing, gutters, manholes and adjacent pavement edges with the tack coat material.

d. Tack coat shall not be applied on a wet pavement surface or when the temperature is below 45° F.

5. Binder Course:

a. Preparation: Clean the bottom course of all dirt and loose material, thoroughly dry it and obtain the Resident Engineer's approval before laying the binder course.

b. Weather Limitations: Bituminous material or mixture shall not be applied on any soft surfaces, when the surface is wet, when the temperature of the surface on which the mixture is to be placed is below 45°F, or when other weather conditions would prevent proper construction of the pavement.

c. Forms: When side forms are required, accurately set them to line and grade and securely stake and brace them in place sufficiently to withstand all construction operations. Thoroughly clean and oil forms before use.

d. Spreading:

1) Dump the binder course into the hopper of the spreader. Spread and screed it immediately to the full width required for the pavement and to such a depth that, when rolled, the required thickness is obtained. The maximum allowable compacted thickness for binder shall be 4 in.

2) When the mixture is to be spread by hand, dump it on approved steel dump sheets outside of the area on which it is to be spread and immediately distribute it into place and spread it in a uniformly loose layer.

3) Remove material from areas which show an excess or lack of bituminous material or an inconsistent mix and fill with new material. Re-spread or otherwise rectify areas which show segregation to obtain a uniform mixture in the course.

4) Do not use mixture which has been over 45 minutes out of the mixer, or if longer, the mixture must be over 250° F when spread.

5) Do not lay over 500 lineal feet of binder material without it being rolled and properly compacted.

e. Compacting:

1) Rake the mixture after spreading and immediately compress it thoroughly and uniformly by either of the following methods:

   a) Option A - Three-roller Compaction Train: Under this option, the binder course shall be initially rolled with an approved steel-wheel roller. The roller shall overlap the previous roller pass by one-half the width of the roller.

      (1) Immediately following the initial rolling, the course shall be rolled with an approved pneumatic rubber-tired roller. A minimum of three passes of the rubber-tired roller shall be made. One pass is defined as one movement of the roller over any point of the pavement in either direction.

      (2) Immediately following the intermediate rolling, the course shall be finish rolled with a steel-wheel tandem roller. This final rolling shall be both longitudinal and diagonal as directed by the Engineer and shall remove all shallow ruts and ridges and other irregularities from the surface. Rolling shall be continued until all roller marks are eliminated.

      (3) Under this option, the binder course shall not be compacted to a thickness in excess of 4 in. No rollers shall move at speeds in excess of 3 miles per hour unless otherwise approved.

   b) Option B - Vibratory Compaction: Under this option, the Contractor shall use vibratory compaction equipment appearing on the current Approved List - Bituminous Concrete Vibratory Compaction Equipment in the NYSDOT Standard Specifications. The Contractor may substitute one vibratory roller in lieu of the initial roller and the pneumatic roller in the conventional three-roller compaction train stipulated under Option A. Under this option, the course shall be finish rolled with a steel-wheel tandem roller having a minimum weight of 8 tons. This finish roller shall add a minimum of two passes closely following the vibratory roller or as directed by the Engineer.

(1) One vibratory roller and one steel-wheel tandem roller shall be provided for each nominal 12-foot width of paving. Dual vibrating drum rollers meeting the requirements of a steel- wheel tandem roller and operating in the static mode may be used as the finish roller. However, this single vibratory roller shall not be used as both the initial roller and the finish roller.

2) To prevent adhesion of the mixture to the roller, keep the drum properly moistened with water. Drums must have working water spray nozzles to keep drums moistened.

3) Compact material thoroughly with hot irons or damp vibratory tampers along curbs, headers, manholes and similar structures and at all places not accessible to the roller.

4) Remedy depressions which develop before the completion of the rolling by loosening the laid mixture and adding new mixture to bring such depressions to a true surface. Should any depressions remain after the final compaction has been obtained, remove the full depth of the mixture, replace it with new mixture, and reroll it to form a true and even surface. Correct all high spots, waves, bunches and honeycombing, to the satisfaction of the Engineer.

5) Remove and replace with new material areas that are unbonded after rolling, areas containing drippings, areas that are fat or lean, and areas evidencing defective construction of any description.

6) Do not allow the surface of the completed binder course to deviate more than 1/16 in/ft from the nearest point of contact nor more than 1/4 in. maximum when tested longitudinally with an 18-foot straight edge placed parallel to the centerline of the roadway.

7) After final compression, the finished course shall at no point have a density less than 95 percent, as measured by a nuclear density meter, of the laboratory compacted density.

6. Wearing Course:

a. Preparation:

1) Thoroughly clean the binder course of all loose and foreign material before the top mixture is delivered.

2) Apply a tack coat at a rate of 0.03 to 0.07 gallon per square yard as approved by the Engineer.

3) Do not lay mixture until the Engineer approves the binder course and determines in all cases whether the weather conditions are suitable to permit laying.

b. Weather Limitations: Bituminous material or mixture shall not be applied on any soft surfaces, when the surface is wet, when the temperature of the surface on which the mixture is to be placed is below 45°F, or when other weather conditions would prevent proper construction of the pavement

c. Forms: If at the time of laying the mixture, permanent side supports such as curbs, edgings or gutters have not been constructed, firmly fasten in place suitable side forms of wood or steel, true to line and grade. In all cases adequately support the sides of roadways until final compaction has been obtained and the mixture has hardened by cooling.

d. Spreading and Compacting:

1) Spread and compact the wearing course until it meets the compaction and surface requirements specified above for the binder course.

2) The Contractor shall have the same options for achieving the required compaction as given for the compaction of the binder course.

3) Do not lay over 500 lineal feet of wearing course material without it being rolled and properly compacted.

4) Do not use mixture which has been over 45 minutes out of the mixer, or if longer, the mixture must be over 250°F when spread.

e. Joints: Perform construction as near continuously as possible. Carefully make joints between old and new pavements, or between successive days' work, in a manner which will insure a thorough and continuous bond, as follows:

1) Cut back the edge of the old surface before recommencing the operation of laying, in order to present a fresh, clean surface for contact with the newly placed material.

2) Carefully employ hot smoothing irons to heat the old pavement sufficiently (without burning) to insure a proper bond.

f. Shoulders: If temporary forms are used, protect the edges of the finished roadway by placing and thoroughly compacting approved material to form shoulders along the roadway as shown on the Contract Drawings. Construct finished shoulders 1/4 inch above the elevation of the finished roadway edges.

g. If weather conditions necessitate delaying the installation of the wearing course for more than two days, the tack coat shall be reapplied to the binder course at the rate of 0.03 to 0.07 gallon per square yard as approved by the Engineer.

C. Mill and Overlay

1. Conform to NYCDOT Standard Highway Specifications, Section 6.75.
2. Mill to the thickness shown in the Contract Drawings or as directed by the Engineer.
3. Follow requirements for Wearing Course as specified herein.
4. Milling shall conform to Section 02 41 10 – Demolition and Removals.

D. Walks

1. General: Asphaltic concrete pavement walks shall consist of
   a. A bottom course of asphaltic concrete (close binder type),
   b. A tack coat of asphalt emulsion, and
   c. A wearing course of fine surface mix asphaltic concrete.
2. Bottom Course:
   a. Before the bottom course is laid:
      1) Compact the subgrade thoroughly, so that the bottom course, after compaction, will be found satisfactory when field tested.
      2) Clean subgrade of all loose and foreign material, dry it, and obtain the Resident Engineer's approval.
   b. Paint contact surfaces of all curbing, gutters, manholes and adjacent pavement edges with an asphalt emulsion tack coat at the rate of 0.03 to 0.07 gallon per square yard as approved by the Resident Engineer.
   c. Set forms, spread and compact the bottom course as specified above for the binder course for roads.
   d. Provide a bottom course surface free from depressions exceeding 3/8-inch when tested with a 10-foot straight edge placed parallel with the center line of the walk.
3. Wearing Course:
   a. Clean the bottom course of all loose and foreign material before the wearing course mixture is delivered. Do not lay mixture until the Engineer approves the bottom course and determines in all cases whether the weather conditions are suitable to permit laying.

b. If at the time of laying the mixture, permanent side supports such as curbs, edging or gutters have not been constructed, fasten in place suitable side forms of wood or steel, true to line and grade. In all cases, adequately support the sides of walks until final compaction is obtained and until the mixture hardens.

c. Spread and compact the wearing course as specified for the bottom course.

d. Provide a walk surface free from depressions exceeding 1/8-inch when measured with a 10-foot straight edge placed parallel with the centerline of the walk.

e. Perform construction as near continuously as possible. Carefully make joints between old and new pavements, or between successive days' work, in a manner which will insure a thorough and continuous bond, as follows:

1) Cut back the edge of the old surface before recommencing the operation of laying, in order to present a fresh, clean surface for contact with the newly placed material.

2) Carefully employ hot smoothing irons to heat the old pavement sufficiently (without burning) to insure a proper bond.

f. Paving procedure, including compaction requirements, shall be the same as specified above for the wearing course for roads.

E. Patching

1. As directed by Engineer, remove and replace defective areas. Cut such areas and replace with fresh asphaltic concrete and compact to required density.

F. Pavement Marking

1. Clean with power and hand brooms.

2. Mark edges straight and uniform. Use two coats and comply with manufacturer's recommendations.

3.03 FIELD TESTING / QUALITY CONTROL

A. Pavement Samples

1. When required by the Engineer, furnish 4-inch diameter test samples cored from the binder course and from the completed pavement. The Engineer will choose the number of cores and the locations at which the cores shall be taken. Sample cores, when required, shall be taken for every 10,000 square feet of pavement and patch. Density test shall show that the sample is within 90 percent of the laboratory specimen. Replace with new mixture and refinish the areas of pavement so removed without additional compensation.

B. The Contractor shall meet the sample coring requirements of the New York City Department of Transportation (NYCDOT) Highway Rules, Title 34 Chapter 2, Rules of the City of New York.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Cleaning and Protection

1. After paving, clear surfaces of excess asphaltic concrete and all foreign matter.
2. Protect new pavement until fully hardened.
3. Cover openings of drainage structures until permanent covers are placed.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 32 14 13 – PRECAST POROUS CONCRETE PANEL
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified, and required to furnish, install, and test all Precast Porous Concrete Panels (PPCPs) complete.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Reference Standards

1. ASTM C33 - Standard Specification for Concrete Aggregates
2. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
3. ASTM C78 - Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
4. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
5. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete
6. ASTM C1688 - Standard Test Method for Density and Void Content of Freshly Mixed Pervious Concrete
7. ASTM C1701 - Standard Test Method for Infiltration Rate of In-Place Pervious Concrete
8. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3)
9. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

B. New York City Department of Environmental Protection (NYC DEP) Standard Green Infrastructure Specifications (attached hereto as Exhibit A):

1. Section GI-2.07 CLEAN OPEN GRADED STONE
2. Section GI-4.06 GI CONCRETE ELEMENTS
3. Section GI-PPCP-CH CAST-IN-PLACE CONCRETE HEADER
4. Section GI-PPCP-MG MICROGRID
5. Section GI-PPCP-DC STACKED DRAINAGE CELLS
6. Section GI-PPCP-BXG BIAXIAL GEOGRID

C. New York City Department of Transportation (NYCDOT), Bureau of Highway Operations Standard Specifications, latest edition at time of Bid, available at: https://www.nyc.gov/site/ddc/resources/publications.page:

1. Section 1.06.48 ADDITIONAL PROVISIONS PERTAINING TO STREET PAVING AND INSTALLATION OF SIDEWALKS, SECT. D
2. Section 2.15 FILLER, EXPANSION JOINT, PREFORMED
3. Section 4.08 CURB, CONCRETE
4. Section 4.11AS EARTH EXCAVATION FOR STRUCTURES

1.05 DESCRIPTION

A. Not Used.

1.06 QUALITY ASSURANCE

A. The precast porous concrete panels must be supplied by a manufacturer having at least five (5) years of experience in the production and sale of porous concrete panels.

B. Quality Control Plan must be furnished by the Contractor and must receive approval from the Engineer at least five (5) working days prior to commencing any work.

1. The plan must include, but is not limited to, horizontal and vertical layout of the work, methods for the installation of the edge restraints, the methods for placing of the broken stone leveling course (base) and the placing of the panels.

2. A review of the Contractor's Quality Control installation plan will be done at a pre-construction meeting with the Contractor, the Contractor's panel installer mechanic/subcontractor, the panel manufacturer's representative (if present on the site) and the Engineer.

C. The Contractor shall review and comply with the manufacturer's handling and installation requirements including any required training, if applicable.

1.07 SUBMITTALS

A. The Contractor shall submit shop drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Action Submittals (submitted prior to the Pre-Construction Meeting):

a. Installation plan showing layout of each precast porous concrete panel with identification mark intended for installation.

b. Individual slab drawings detailing lifting points in surface, reinforcing, finishes, and all dimensions.

c. Narrative of shipping, handling, and protection procedures.

B. Test results performed by an independent AASHTO Materials Reference Laboratory (AMRL) accredited testing laboratory of the following:

1. Density and void content results in accordance with ASTM C1688 Standard Test Method for Density and Void Content of Freshly Mixed Pervious Concrete, and

2. Flexural strength test results in accordance with ASTM C78 Flexural Strength of Concrete. Three (3) saw-cut concrete beams prepared specifically for testing purposes as per ASTM C78, with the same concrete mix and reinforcing characteristics would be representative of a full-size panel. Changes in reinforcement configuration for testing purposes will

not be permitted. The Contractor must submit a drawing for approval of the concrete beams intended for testing with all the reinforcing and lifting hook placements indicated. No end caps on the beams intended for testing will be permitted. One percent (1%) of the total number of panels intended for the entire project will be tested for compliance with the specifications.

3. Infiltration rate of Precast Porous Concrete Paving Panels in accordance with ASTM C1701 Standard Test Method for Infiltration Rate of In-Place Pervious Concrete. One percent (1%) of the total number of panels intended for the entire project will be tested for compliance with the specifications.

C. Particle size analysis in accordance with ASTM C136 for the open-graded stone leveling course with approved source(s) of supply noted.

D. Test method procedures to conduct percolation rate testing after installation in accordance with ASTM C1701 Test Method for Infiltration Rate of In-Place Pervious Concrete. The submittal must include information related to the testing apparatus being used (infiltration rings) for approval by the City.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of the precast porous concrete panels must be coordinated so as not to interfere with other construction in the project to avoid delays.

B. Precast porous concrete panels must be handled per manufacturer recommendations which were included in the approved submittal.

C. Offloading of panels must be performed by trained and experienced equipment operators. Extra care must be taken while offloading the panels due to their unique structural characteristics. A forklift or similar machine with forks must be used to offload. Chains, cables, or slings must not be wrapped around slabs and only the lifting points must be utilized.

D. Precast porous concrete panels must be visually inspected for completeness, texture, and consistency with the approved shop drawings and the installation drawings. Minor spalls and cracks will be the basis for rejection. Defective panels will be inspected by the Engineer and the decision will be made at his sole discretion.

E. Panels must be stored such that they are kept free from mud, dirt, grass cuttings, accumulation of foliage and debris at all times.

F. Panels must not be exposed unsecured to vehicular and pedestrian traffic. Skid steer and forklift equipment must be kept off unsecured paving panels.

G. Geogrid, geofabrics, crushed stone, and liner materials must be kept clean and prepared for installation.

H. Stored panels must be placed on a level or nearly level paved surface. In dusty environment, panels must be covered to prevent dust and debris from settling on panel surfaces.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Precast Porous Concrete Panel

1. Concrete average unit weight shall be 120 lb./ft.3 (+/- 4%). The average core compressive strength of the precast porous concrete panels must be a minimum of 2,000 psi at 28 days per ASTM C42. The manufacturer must cure the precast porous concrete panels. The precast porous concrete panels shall have a minimum infiltration rate of 250 inch/hr when tested in accordance with ASTM D1701.

2. Refer to the Contract Drawings for precast porous concrete panel dimensions, thickness, and reinforcing requirements. The precast porous concrete panels supplied shall be of the type(s) shown in the Contract Drawings.

3. Fiber reinforcement shall be utilized to achieve the panel design load requirements. Reinforcing shall be a product on the New York State Department of Transportation Approved Materials, Equipment, Methods and Procedures List, Material Code 711-01.

4. Minor adjustments of the limits of work will be considered by the Engineer to reduce the number of panels less than full length to eliminate cutting. Smaller lengths shall only be used where necessary and appropriate to accommodate utilities and overall alignment or as shown on the Contract Drawings.

5. Installation of precast porous concrete panels shall be in strict accordance with the manufacturer's recommendations, all information contained in this specification, and related contract drawings.

6. Permanent lifting points shall be embedded in the panel surface for unloading, handling, installation, maintenance, removal, and reinstallation purposes. Refer to Contract Drawings for lifting point locations. Shop drawings are required. All panels shall be provided with lifting point protection caps and approved lifting swivels for use in covering the embedded lifting points. Any altered unit shall include a minimum of two

(2) permanent lifting points.

7. Precast porous concrete panels shall have a minimum average Flexural Strength of 400 psi when tested in accordance with ASTM C78. Panels shall not be shipped until they have achieved 85% of the minimum flexural strength or higher as determined by the lab test results submitted. The void content shall be from 15% to 25%, conforming to ASTM C1688.

8. Each individual precast porous concrete panel shall be weighed, and the unit shall be labelled with the weight, size, and date of manufacture.

9. All panels shall be provided with spacers preventing slab to slab contact, as required by the manufacturer.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Use

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. General:

1. Before panels are installed, the Contractor shall ensure that all materials and preparation for subbase and edge restraints are installed in accordance with Contract Drawings and specifications and accepted by the Engineer.

2. Do not damage drainpipes, underdrains, observation wells, roadway boxes, manholes, or any other utilities during installation. Report any damage immediately to the Engineer. All damage shall be replaced or repaired as part of the bid price of this item by the Contractor at no additional cost to the city.

B. Subgrade Preparation:

1. The subgrade under the clean open graded stone course (subbase) shall not be compacted.

2. Prepared subgrades under all infiltration areas shall not be compacted and shall not be subjected to construction equipment traffic. Where erosion has caused accumulation of sediment or ponding on the subgrade, remove sediment with light equipment and/or manually. Scarify the underlying soils to a minimum depth of six-inches (6”) with a York-type rake or equivalent equipment to the satisfaction of the Engineer.

3. Restore any subgrade areas damaged by erosion, ponding, or traffic compaction to design line and grades prior to installation of geogrid and clean open graded stone.

4. Any excess thickness of material placed over the soil subgrade to trap

sediment transported by runoff from adjacent construction areas shall be removed before placement of geogrid and storage reservoir layer. Keep area where precast porous concrete panels are to be installed free of sediment during the entire construction period. Any materials that are contaminated with sediment shall be removed and replaced with clean materials.

C. Low Carbon Cast-in-Place Concrete Header

1. Low Carbon Cast-in-place concrete header shall comply with Section GI-PPCP-CH and shall be placed prior to the placement of the geogrid or open graded stone base.

D. Microgrid:

1. Microgrid shall comply with Section GI-PPCP-MG.

E. Stacked Drainage Cells:

1. Stacked drainage cells shall comply with Section GI-PPCP-DC.

F. Biaxial Geogrid:

1. Biaxial Geogrid shall comply with Section GI-PPCP-BXG.

G. Clean Open-Graded Stone Base:

1. Clean open-graded stone base shall comply with Section GI-2.07.

2. Clean open-graded stone base shall be compacted to at least 95% Modified Proctor relative compaction per ASTM D1557. A minimum 200-pound walk- behind plate compactor shall be used on each lift of six-inches (6”). Compaction using the plate compactor shall include four (4) passes in each direction longitudinally along length of the trench.

3. The surface tolerance of the compacted clean open-graded stone base shall be a maximum of +/- three-quarter inch (¾") under a ten (10) foot straightedge in all directions.

4. Verify that the open-graded stone base, as shown on the Contract Drawings, has been properly placed within the trench and compacted as approved and accepted by the Engineer before the leveling course is placed.

5. Place and spread leveling course stone evenly over screed rails to achieve a thickness of two inches (2”) minimum. Level the surface of leveling course stone with a screed, it shall not be compacted.

6. The surface tolerance of the screed leveling course shall be a maximum of a +/- one-quarter inch (¼") under a ten (10) foot straightedge in all directions. The cost of any additional stone beyond the limits shall be borne by the Contractor at no additional cost to the city.

7. Once installed, Contractor shall not disturb screeded leveling course.

3.02 INSTALLATION

A. PPCP Placement

1. Precast porous concrete panels shall not be placed in heavy rain or snow or on a saturated or frozen base.

2. Precast porous concrete panels shall only be lifted and placed using swivels and spreader chains. Chains, cables, or slings should never be wrapped around the panel for lifting under any circumstances. Swivels shall be securely bolted snug but not over-tightened to avoid damage to the surface of the panel.

3. Contractor shall keep skid steer, forklift, and all other heavy equipment off all unrestrained panels.

4. Lay panels in pattern(s) shown on approved shop drawings layout plan. Cut panels to complete installed length and pattern on approved shop drawings.

5. Contractor is responsible for installing precast porous concrete panels according to the manufacturer's requirements for proper handling and installation.

6. To prevent any damage to panel edges, Contractor shall place panels with the joint size specified without using metal hammers, pry bars or drift pins. Horizontal adjustments to the placement of laid slabs shall be made with wood wedges and levers, and rubber mallets as needed. Joint widths and lines shall be continually evaluated and straightened as necessary as paving proceeds to the satisfaction of the Engineer.

7. Panels shall be placed parallel to the adjacent low carbon cast-in-place header as per approved shop drawings. Any adjustments shall be made at the curb for irregular alignment.

8. Unless otherwise directed, adjacent slabs shall be separated from each other by one-eighth inch (1/8") to provide open joints between panel slabs of one- eighth inch (1/8") wide using spacers provided by the manufacturer of the panels to ensure proper joint spacing. No joints shall exceed one-eighth inch (1/8") in width unless otherwise directed by the Engineer in writing.

9. Panel to panel joints shall be left open. No stone or sand is to be placed in joints.

10. Horizontal joint lines along header shall not deviate more than ± one-half inch (½") over 50 feet from reference string lines.

11. The precast porous concrete panels shall be installed so that there is no lippage or surface unevenness greater than one-eighth inch (1/8") difference in height between panels and adjacent surfaces.

12. Contractor shall complete any gaps at the edges of the paved area with

panels cut according to manufacturer's requirements for minimum panel dimensions. Cut panels to meet installation dimensions as indicated on the approved panel layout shop drawings. End panels to be placed along the edge or corners shall be cut with a masonry saw. Cut units shall be no shorter than one-quarter (1/4) of a whole panel length and shall still retain the minimum number of lifting points required.

13. Contractor shall protect adjacent panels' surfaces from dust infiltration when cutting panels.

14. Contractor shall finish outside edge joints as indicated on the approved installation plan with approved joint filler material.

15. After an area is completely paved, Contractor shall complete a final setting of the precast porous concrete panels into the screed leveling course layer by trafficking with light-weight rubber-tired equipment approved by the Engineer.

16. Contractor shall remove and replace any panels cracked or damaged during installation with equivalent replacement panels. Contractor shall all reset panels not in conformance with specified installation tolerances to the satisfaction of the Engineer.

    a. Hairline cracks (1/8" or smaller) with no vertical or horizontal displacement of panels shall be considered as to not interfere with the proper functioning or performance of the system and are acceptable when immediately repaired upon observation per manufacturers recommendation. Where approved by the Engineer, larger cracks (1/8" or larger) with no vertical displacement may be repaired under the direction of the manufacturer. Any cracked panels with horizontal displacement of greater than 1/4" or a vertical displacement of any size shall be replaced.

    b. The repairs shall be properly finished and cured. The color of the repair area shall match as closely as possible with the rest of the panel color. Repairs shall be made with a mixture of self-leveling polyurethane sealant for horizontal applications and cement, as directed by the manufacturer.

17. Contractor shall warranty as noted in Schedule A of the Contract from the date of the initial acceptance of the installation that all installed panels are free of rocking or pumping as evidenced by visible vertical movement. Any panels observed to be moving or displacing shall be removed, the screeding leveling course re-screeded, and the panels reset and/or replaced if cracked.

18. Contractor shall verify and report to the Engineer in writing that the final surface elevations of the set panels are in conformance with the Contract Drawings. The final surface tolerance from grade elevations shall not deviate more than ± one-eighth inch (1/8") under a ten-foot (10')

straightedge.

19. The surface elevation of set panels shall be flush with all manholes and the top of utility structures.

B. Edge Restraint

1. Edge restraints installed at exterior sides of precast porous concrete panels pavement shall be as follows:

2. Edge restraints shall be furnished and installed under the following concrete items: Concrete Header, Section GI-PPCP-CH, Concrete Curb, Section GI- PPCP-CC, or GI Concrete Elements, Section GI-4.06, and as shown on the Contract Drawings.

3. Expansion joint material shall be placed per Contract Drawing details between edge restraints and panels. Cost to be included in the cost of the panels.

4. Manufacturer: Expansion Joint Material shall be from a manufacturer listed in the current New York State Department of Transportation's approved list of Pre-Molded Resilient Joint Fillers.

5. Material Standards for Expansion Joint Material shall comply with the requirements of Section 2.15, Type IV, in the New York City, Department of Transportation, Standard Highway Specification, current edition, and shall be either one-quarter inch (¼") or one-half inch (½") thick, as directed by the Engineer.

6. Backer rods and polyurethane joint filler shall be provided on the curb side. Joint filler consisting of closed cell foam backer rod and polyurethane non- sag elastomeric sealant such as Sikaflex –2c NS TG, Akonaflex Expansion joint filler, or approved equal shall be used.

3.03 FIELD TESTING / QUALITY CONTROL

A. Acceptance

1. Prior to acceptance by the City for Substantial Completion, the Contractor shall conduct percolation rate testing every hundred (100) linear feet of gutter but no less than three (3) per section of gutter in accordance with ASTM C1701. All testing shall be done in coordination with and in the presence of the Engineer.

2. Testing locations will be chosen at the Engineer's discretion and in accordance with the ASTM requirements.

3. Contractor shall submit testing results within seven (7) days after the completion of testing. The Contractor shall review testing results with the City of New York. Precast porous concrete panels with infiltration rates below the minimum infiltration rate of 150 inches per hour prior to Substantial Completion shall undergo corrective action (such as cleaning the failed panel, or cleaning the entire gutter run, or replacement of the

failed panel) prior to the City issuing Substantial Completion.

4. After corrective action has taken place, then one other panel in the same contiguous length of porous gutter will be randomly selected by the Engineer and tested to ensure that the gutter meets the specified infiltration rate. If the selected panel fails to meet that rate, then the whole length of the gutter shall be cleaned again, and the testing process repeated until passing results are obtained.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. PROTECTION

1. Immediately after precast porous concrete panels have been placed, insert plastic caps in lifter holes as provided.

2. After work in this section is complete, the Contractor will be responsible for protecting the precast porous concrete panel system from damage and/or contamination during the remainder of work on site. The surface of the precast porous concrete panels shall be completely covered during the placement of adjacent soils or paving materials in a manner approved by the Engineer.

B. Maintenance:

1. The Contractor shall conduct periodic maintenance and cleaning for the duration of the guarantee period after Substantial Completion.

2. Frequency of cleaning: At a minimum, during the guarantee period the Contractor shall conduct cleaning as described below:

a. Towards the end of the Spring pollen season (typically June-July)

b. Towards the end of the Fall leaf falling season (typically December-mid January)

c. Just prior to end of the guarantee period, unless the porous concrete panels were last cleaned within 120 calendar days.

C. Infiltration rate testing, in lieu of cleaning and maintenance, during the guarantee period will not be acceptable.

1. Procedures for Maintenance and Cleaning:

a. The Contractor shall remove all visible sediment deposits. Where sediment has accumulated in areas surrounding and/or upstream of the precast porous concrete panel system and may enter the porous concrete, the Contractor shall also remove such visible sediment deposits.

b. The Contractor shall use vacuum cleaning, regenerative air machines

equipped with a specialized vacuum head that includes high pressure water nozzles. Walk behind and handheld equipment are not acceptable for use. This maintenance shall remove sediment and debris that has clogged or blocked voids in the precast porous concrete panel.

c. Sediment and debris shall be sufficiently removed after cleaning to allow the porous pavement to infiltrate stormwater runoff. This may require multiple passes of cleaning to meet the desired post-cleaning infiltration rate, as discussed below.

d. After cleaning of the precast porous concrete panel system and no later than three calendar (3) days after cleaning, the Contractor shall conduct percolation rate testing every hundred (100) linear feet of gutter but no less than three (3) per section of gutter in accordance with ASTM C1701. All testing shall be done in coordination with and in the presence of the Engineer.

e. Testing locations will be chosen at the Engineer's discretion and in accordance with the ASTM requirements.

f. The Contractor shall provide testing results to the City of New York within seven (7) days after the completion of testing. The Contractor shall review testing results with the City. Precast porous concrete panels with infiltration rates below the minimum infiltration rate of 150 inches per hour specified shall undergo corrective action (such as further cleaning or replacement).

g. After corrective action has taken place, then one other panel in the same contiguous length of porous gutter will be randomly selected by the Engineer and tested to ensure that the gutter meets the specified infiltration rate. If the selected panel fails to meet that rate, then the whole length of the gutter shall be cleaned again, and the testing process repeated until passing results are obtained.

h. Cleaning will be deemed sufficient only if the minimum of 150 inch/hr infiltration rate required by the city has been met. The City will conduct field inspections to ensure the proper condition and performance of the precast porous concrete paving panel system. Visual inspections and infiltration tests will be used to determine the performance of porous concrete. If based on visual inspections and/or the test results reviewed by the Engineer, the City determines that the Contractor's performance of maintenance work is insufficient, the Contractor will submit a revised method or schedule for the maintenance of precast porous concrete paving panels. The Contractor shall perform subsequent corrective maintenance work at no additional cost to the City.

i. The Contractor shall responsibly decant dirty water in accordance

with DEP regulations.

j. The equipment information, operating procedures including disposal, and schedule for maintenance work shall be submitted to the City at least 45 calendar days prior to start of maintenance and cleaning. Maintenance and cleaning cannot begin until approved by the Engineer.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 32 14 13 PRECAST POROUS CONCRETE PANEL
EXHIBIT A
REF. SECTION GI-2.07 — CLEAN OPEN GRADED STONE

GI-2.07.1 INTENT

This section describes the types of clean open graded stone also described as stone cover or open-graded stone base in the NYC DEP Standard Design and Guidelines for Green Infrastructure Practices drawings.

All materials for this work must comply with the latest New York State Department of Transportation, Standard Specifications, Coarse Aggregate, Section 703-02. The stone must be washed and 3/4", 3/8", 1 1/2" and 2" to 5" in sizes.

The thicknesses and locations of the clean open-graded stone must be as shown on the Contract Drawing Details, the NYC DEP Standard Designs and Guidelines for GI or as determined by field conditions and ordered by the Engineer.

GI-2.07.2 MATERIALS

Use of screened rounded gravel is prohibited.

All clean open graded stone material acceptable under this section must be sound, hard, durable, unweathered stone freshly broken. All open graded stone must be double-washed and clean and free of all fines and debris, not contaminated with clay, and free from any organic or other deleterious material.

Table GI-2.07-1 – Sizes of Open Graded Stone

Size	Nominal Size	US Standard Sieve Sizes (Percent Passing)													
		5 in	4 in	3½ in	3 in	2½ in	2 in	1½ in	1 in	¾ in	½ in	3/8 in	No. 4	No. 8	No. 16
A	3/8 in. to No. 8	-	-	-	-	-	-	-	-	-	100	85 to 100	10 to 30	0 to 10	0 to 5
B1	¾ in.	-	-	-	-	-	-	-	100	0 to15	-	-	-	-	-
B2	¾ in. to 3/8 in.	-	-	-	-	-	-	-	100	90 to 100	20 To 55	0 to15	0 to 5	-	-
C	1½ in.	-	-	-	-	-	100	0 to 15	-	-	-	-	-	-	-
D1*	2 in. to 5 in.	100	85 to 100	80 to100	0 to 90	0 to 35	0 to 25	0 to 10	0 to 5		-	-	-	-	-

*Type D Stone requires 50% minimum porosity

Clean open graded stone of all types must be aggregate size per **Table GI-2.07-1**. Thickness, widths and all dimensions must be as shown on the standard details and Contract Drawings or as otherwise directed by the Engineer. All open graded stone must be properly compacted. The types of aggregate used for each Green Infrastructure Asset will be as per the following **Table GI-2.07-2**:

Table GI-2.07-2 - Types of default clean open graded stone choices unless otherwise specified on drawings or as directed by the Engineer:

GI Use	Course	Stone Type
Porous Concrete Panels	Screed / Leveling	A
	Base	B1
Permeable Pavers	Screed / Leveling	B2
	Base	C
Porous Asphalt	Screed / Leveling	C
	Reservoir/Asphalt Sub–Base	B1
Bio Swales, & Infiltration Basins	Base	D1
	Leveling	B1
Rain Gardens & Green Strips	Base	D1
	Leveling	B1
	Stone Strip Bed	B2
Bio Filter Inlet	Broken Stone Berm	C
Stone Column	Infill	Match GI asset-type base material

GI-2.07.3 SUBMITTALS

(A) The Contractor, prior to the start of work, must submit to the Engineer for approval samples of the clean open graded stone that have been sampled in accordance with the requirements of ASTM D 75. The minimum size of sample must be in accordance with the requirements of ASTM D 75 – TABLE 1 Minimum size of Field Samples.

Certified material test reports showing that the clean open graded stones meet the specified requirements must be submitted for each shipment and identified with specific lots prior to installing materials. Clean open graded stones used in the work must conform to the approved samples.

(B) The manufacturer must submit certified test date to cover each shipment of the material.

(C) Results of the coarse aggregate gradation analyses, with full reporting of all information in AASHTO sieve sizes, in accordance with the ASTM C 136.

(D) Results of the porosity analyses, with full reporting of all information, in accordance with the ASTM C 29.

(1) The "% voids" calculation result of ASTM C29 denotes the volume of voids over the total volume of aggregate, which is porosity, and must be reported and illustrated as such in the respective submittals

(2) A minimum 50% porosity is required.

GI-2.07.4 CONSTRUCTION METHODS

(A) Weather Consideration

(1) Do not place and/or compact clean open graded stone subbase in rain or snow, or on saturated or frozen subgrade.

(2) Do not place and/or screed clean open graded stone base in rain or snow, or on saturated or frozen subbase.

(B) Stockpiling and Sampling of clean open graded stone Reservoir and Leveling Course Aggregate

(1) All material must be stockpiled, unless otherwise directed. Stockpile construction requirements, sampling, testing and acceptance/rejection procedures must be as stipulated in the New York State Department of Transportation Section 703-02 – Coarse Aggregate.

(2) No material must be added to a stockpile after the stockpile has been sampled for approval. Only material from approved stockpiles must be placed on the subgrade for this section. The presence of any oversize particles in the stockpile will be cause for rejection of the entire stockpile. No material must be removed for use from any stockpile until the stockpile has been sampled, tested, and approved in writing, by the Engineer, for placement on the subgrade. Contractor must furnish suitable and approved excavating equipment for such sampling. Approval of a stockpile for placement on the subgrade must not relieve, in any degree, the full responsibility of the Contractor to furnish, in its compacted position, a subbase course of select granular materials, the final condition of which conforms to all the requirements of the specifications for this section. In the event the Contractor must have a plant or procedure resulting in subbase course material of uniform quality, at a rate satisfactory to the Engineer, and such that satisfactory samples for tests can be obtained, the requirement for stockpiling may be waived. Prior approval of the Engineer must be obtained and the work must be done in accordance with such conditions as may be imposed in the approval. Such waiver must remain in force only so long as a satisfactory material is produced.

(C) Subgrade Preparation

(1) The Subgrade under the clean open graded reservoir course (subbase) must not be compacted or permanently covered with geotextile, unless otherwise shown on the Contract Drawings or directed by the Engineer.

(2) Prepared subgrades must not be subject to construction equipment traffic.

(3) Where erosion has caused accumulation of sediment or ponding on the subgrade, remove sediment with light equipment and/or manually. Scarify the underlying soils to a minimum depth of 6 inches with a York type rake, or equivalent equipment.

(4) Restore any subgrade areas damaged by erosion, ponding, or traffic compaction to design line and grades prior to installation of storage reservoir course (layer).

(D) Installation of Reservoir Course (Subbase)

(1) The Reservoir Course Subbase will be installed per specification to the thicknesses and width shown on the contract drawings and as directed by Engineer.

(2) Place 1-1/2" (nominal) size open graded stone, over the prepared subgrade and spread and level evenly by raking to the dimensions shown on the Contract Drawing details. Do not disturb prepared subgrade or shift, wrinkle or fold the geotextile fabric and/or impermeable liner, and place as shown on the Contract Drawings.

(3) The open graded stone reservoir course material must be spread in equal thickness layers. The spreading of any layer of this material must be done with spreader equipment approved by the Engineer, and to such thickness that the maximum depth of the layer, after compaction, will be 6 inches. Spreading from piles dumped on the roadway will not be permitted. No segregation of large or fine particles will be allowed, but the material, as spread, must be well graded, with no pockets of fine material. Water must be added in such amounts as the Engineer may consider necessary to obtain satisfactory compaction.

(4) Compact layers with an approved vibrating plate compactors or impact rammers until there is no visible movement, weaving or deflection in the surface of the clean open graded stone reservoir course. All the equipment must be approved by Engineer with regards to adjacent structures.

(5) The surface tolerance of the compacted clean open graded stone reservoir course must be + 3/4 in. under a 10-ft straightedge.

(6) The Contractor must assume full responsibility for any contamination and/or degradation of any part of this base during construction and must, at the Contractor's own expense, remove any and all portions of this base which do not conform to the requirements of these specifications and replace these portions with specified material.

(E) Installation of Open Graded Stone Base

(1) The Open Graded Stone Base will be installed per specification to the thicknesses and width shown on the Contract Drawings and as directed by Engineer.

(2) The Open Graded Stone Base must be placed in equal thickness layers. Prior to backfilling with Open Graded Stone Base the subgrade of the Green Infrastructure Asset must be scarified to ensure no compaction. The placing of any layer of this material must be done so by gravity with no additional compaction to ensure the required porosity, or void content, is maintained. No segregation of large or fine particles will be allowed, but the material, as placed, must be well graded, with no pockets of fine material.

(3) The Contractor must assume full responsibility for any contamination and/or degradation of any part of this base during construction and must, at the Contractor's own expense, remove any and all portions of this base which do

not conform to the requirements of these specifications and replace these portions with specified material.

(F) Installation of Leveling Course (Screed Base Course)

Installation of all screed leveling courses with material specified above will be installed to the thicknesses and widths shown on contract drawings and Standard DEP GI Details.

Before installation of leveling course verify that the open graded stone base, as shown on the Contract Drawings, has been properly placed within the trench and compacted as approved and accepted by the Engineer.

In no case must a leveling course be less than two (2”) inches thick for Precast Porous Panels and six (6”) inches thick for pavers used in the roadway.

The cost of all leveling courses must be paid per the unit price herein.

SECTION 32 14 13 PRECAST POROUS CONCRETE PANEL
EXHIBIT A
REF. SECTION GI-4.06 – GI CONCRETE ELEMENTS

GI-4.06.1 INTENT

This section describes the concrete elements associated with Green Infrastructure Practice. The Contractor must install concrete as shown on the NYC DEP Standard Design and Guidelines for Green Infrastructure Practices drawings. The GI Concrete Elements may be either Precast or Poured In Place.

GI-4.06.2 PHYSICAL REQUIREMENTS

(A) Concrete elements must comply with the requirements of NYC Department of Transportation Standard Highway Specifications, Subsections 4.05.3, 4.05.4. and 4.05.5, and Section 4.14.

(B) Unless otherwise specified grout must be Cement Grout composed of neat cement and water and must comply with the requirements of Section 3.06 of the NYC Department of Transportation Standard Highway Specifications.

(C) The minimum acceptable average compressive strength of three samples is 4000 psi, with no individual less than 4000 psi. The maximum acceptable average freeze/thaw loss of five- block samples, subjected to 42 freeze/thaw cycles in a 3% NaCl solution, must not exceed 1.0%, with no individual sample exceeding 1.5%.

(D) Batching, mixing and placing of concrete must conform to ASTM C94 “Specification for Ready-Mix Concrete” and ACI 304 “Guide for Measuring, Mixing, Transporting and Placing Concrete”. All materials must be pre-weighed prior to mixing. Concrete must obtain a minimum compressive strength of 4,000 psi at 28 days of age. Concrete must contain 6% entrained air by volume (plus or minus 1%).

(E) Fabrication and placement must conform to ACI-318 “Building Code Requirements for Structural Concrete and Commentary”.

GI-4.06.3 METHODS

(A) All concrete elements must be furnished and installed as per the NYC DEP Standard Design and Guidelines for Green Infrastructure Practices drawings. It must be designed and constructed to fit as shown in the plans and to conform to site conditions, so that no gaps or hazards exist once the concrete is installed.

(B) All equipment and methods of construction must comply with the requirements of the NYC Department of Standard Highway Specifications, Subsections 4.05.4. and 4.05.5, and Section 4.14 with the following modifications and additions:

(1) For installations in existing pavement, the Contractor must be required to first full- depth saw cut and remove the pavement to the dimensions of the concrete elements shown on the Contract Drawings and directed by the Engineer. The Contractor must then backfill the excavated area to ensure that the concrete element will be placed to its proper elevation with foundation material which must comply with the requirements of Subsection 4.05.2(A) of the NYC Department of Transportation Standard Highway Specifications.

The earth subgrade, immediately before foundation material is placed on it, must be compacted to a minimum of 95 percent of Standard Proctor Maximum Density, smooth, parallel to and at the required depth below the finished concrete element surface and be dampened with water sufficient only to be absorbed by the subgrade. The subgrade must not be in a muddy or frozen condition and unsuitable material must be removed and replaced with acceptable material thoroughly compacted.
The foundation material must be placed on the prepared subgrade, in a manner to minimize segregation, using equipment and procedures approved by the Engineer. Uncontrolled spreading from piles dumped on the grade resulting in segregation will not be permitted. Foundation material must then be wetted to the optimum moisture content, based on a laboratory Proctor density test, and thoroughly compacted using an approved plate compactor. Compaction of foundation material must range between 90% and 95% of the Standard Proctor Maximum Density, as directed by the Engineer, depending upon material used.
Unsatisfactory subgrade material must be removed and replaced with acceptable material thoroughly compacted to a minimum of 95% of Standard Proctor Maximum Density. The top surface of the foundation material must be parallel to the finished grade and at a distance below the grade equal to the specified thickness of concrete.

(2) Following the placing and spreading of concrete, it must be struck-off and finished to conform to the cross-sections shown on the Contract Drawings. The final finish must be made by brooming after the water sheen has disappeared as per the requirements for Bus Stop Pavements, Section 4.05.5(K)(2) of the NYC Department of Transportation's Standard Highway Specifications.

(3) Contractor must furnish and install a welded wire fabric as per the NYC Department of Environmental Protection's Standard Design and Guidelines for Green Infrastructure Practices. The welded steel wire fabric must be laid in sheets which are straight and true to form and must be securely held in position by approved methods so that they will be in their prescribed position after the concrete has been placed.

(C) Dimensions must be as required in the contract documents. Dimensions must not vary by more than 1/4 inch from those specified. Concrete elements must be sound and free from cracks or other defects that would interfere with their proper placement or performance.

(D) Prior to installation, the subgrade must be compacted and carefully graded such that the concrete element will be seated flush on the subgrade, at the proper elevation and slope as shown on the Contract Drawings.

(E) Joint filler must comply with Section 2.15 of the NYC Department of Transportation Standard Highway Specifications.

GI-4.06.4 PRECAST CONCRETE ELEMENTS

Where shown in the NYC DEP Standard Design and Guidelines for Green Infrastructure, the precast concrete must be constructed in accordance with the

following requirements:

(A) Fabrication

(1) Precast concrete elements must be fabricated to conform to the shapes and sizes shown on the Contract Drawings.

(2) The Contractor must provide the Engineer with shop drawings and detailed construction procedures for the concrete element. Shop drawings must show the form dimensions and location and type of reinforcement in the precast concrete elements. The drawings must be delivered to the Engineer for approval ten (10) working days before fabrication is to begin. No work must begin until the drawings are approved.

(3) The tolerance on placement of welded steel wire fabric in the concrete element must be ± 1 inch. The chairs, spacers or other devices used to maintain the welded steel wire fabric in position must have rust resistant tips. The cost of any welded steel wire fabric required to transport the precast concrete elements must be deemed included in the cost of these items.

(4) Concrete must be consolidated in the forms by internal vibrators. Exposed surfaces must be free from objectionable imperfections, such as honeycomb and air voids as determined by the Engineer. If air voids collect at the interface of the concrete and forms, the forms must be tapped on the outside with rubber mallets or similar devices to displace the entrapped air.

(B) Curing

(1) The precast concrete elements may be cured as per the requirements for cast in place concrete.

(2) If the concrete elements are steam cured, the elements must be cured in an enclosure free from outside drafts, and cured in a moist atmosphere. The temperature must be maintained at a temperature between 125 degrees and 160 degrees F. by the injection of steam for a period of not less than 12 hours. Steam curing must not begin less than 2 hours from the time that the last concrete was placed. Care must be taken by the Contractor to prevent localized “hot spots” caused by the steam lines. A continuous temperature time recorder is required for each enclosure. The temperature of the curing atmosphere for any method must not be increased or decreased at a greater rate than 40 degrees F. per hour.

(C) Repair

(1) Where approved by the Engineer, occasional imperfections in manufacture or those caused by mishandling may be repaired. The repairs must be properly finished and cured. The color of the repaired area must match as closely as possible with the rest of the element color. Repairs may be made with a mixture of sand and cement, and must be made to the satisfaction of the Engineer.

(D) Basis of Acceptance

The precast concrete element must be accepted at the job site based on all of the following:

(1) The manufacturer's name must appear on the NYS Department of Transportation's Approved List of "Precast Concrete Manufacturers Approved for QC/QA Production" for either Product Group 1, 2, or 4.

(2) A manufacturer's certification.

(3) An acceptable product evaluation made by the Engineer.

GI-4.06.5 SUBMITTALS

(A) Manufacturer must have experience in design and fabrication of similar products and with facilities for fabricating the concrete elements with the quality specified herein and without delay to the specified schedule.

For Precast Concrete Elements, the Contractor must furnish: Shop drawings, in accordance with the requirements of Subsection 1.06.13. of the NYC Department of Transportation Standard Highway Specifications. Engineering layout drawings will be provided for approval and to assist field installation. The drawings will include dimensions, identification and location of each trench part in the trench layout along with a bill of material.

SECTION 32 14 13 PRECAST POROUS CONCRETE PANEL
EXHIBIT A
REF. SECTION GI-PPCP-BXG — BIAXIAL GEOGRID

GI-PPCP-BXG.1 INTENT

This section describes the installation of the BIAXIAL GEOGRID. The purpose of the biaxial geogrid is to improve the structural integrity of the precast porous concrete panels. This is accomplished by confining and distributing load forces by providing soil base reinforcement.

GI-PPCP-BXG.2 DESCRIPTION

Under this section, the Contractor must furnish and install the biaxial geogrid in accordance with the Contract Drawings, the specifications, the NYC DEP Standard Design and Guidelines for Green Infrastructure Practices, current edition, and as directed by the Engineer.

GI-PPCP-BXG.3 SUBMITTALS

(A) The contractor, prior to the start of work, must submit to the Engineer for approval two
(2) labeled samples of the biaxial geogrid in accordance with the requirements of Sections 1.06.13 and 1.06.31 of the NYC DOT Standard Highway Specifications, current edition. The label must include the manufacturer's product name, the type of fabric, and the weight of grade of the material. Biaxial geogrid used in the work must conform to the approved samples.

(B) Certified material test reports showing that the biaxial geogrid meet the specified requirements must be submitted for each shipment and identified with specific lots prior to installing materials. Material test reports must meet the requirements of the criteria outlined herein.

(C) The manufacturer must submit certified test date to cover each shipment of material.

GI-PPCP-BXG.4 MATERIALS

(A) References

(1) American Society for Testing and Materials (ASTM) and other testing standards, in any case the Current Edition will be the reference:

a. ASTM D4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc-Type Apparatus

b. ASTM D4759-11 Standard Practice for Determining the Specification Conformance of Geosynthetics

c. ASTM D5818-11 Standard Practice for Exposure and Retrieval of

Samples to Evaluate Installation Damage of Geosynthetics

d. ASTM D6637 Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method
e. ASTM D7748 Test Method for Flexural Rigidity of Geogrids, Geotextiles and Related Products
f. ASTM D7864 Standard Test Method for Determining the Aperture Stability Modulus of Geogrids

(B) Chemical and Physical Requirements

(1) The biaxial geogrid must be defined as a system that allows for long-term, adequate liquid flow normal through the biaxial geogrid with limited flow loss across the plane of the grid. The biaxial geogrid must exhibit high tensile strength in both longitudinal and transverse directions.

(2) The biaxial geogrid must have a Mid-Rib Width of 0.14 inches and a minimum Radial Stiffness @ 0.5% Strain of 321 kN/m (22,000 lb./ft.) when tested in accordance with ASTM D6637 and a Flexural Rigidity of 2,100,000 mg-cm when tested in accordance with ASTM D7748.

(3) The biaxial geogrid must have an Ultraviolet Degradation of 100% when tested in accordance with ASTM D4355. Biaxial Geogrid must be manufactured using an extrusion process resulting in a polypropylene sheet that is specifically shaped to create a triplanar reinforcing structure that produces a large, concave-shape rib. High profile ribs and junctions must be so configured to interlock and distribute stress of the loads above the grid onto the base below.

(4) Minimum Average Roll Value (MARV): Property value calculated as typical minus two (2) standard deviations. Statistically, it yields a 97.7 percent degree of confidence that any sample taken during quality assurance testing will exceed value reported. Typical Roll Value is represented by (TRV).

(5) The biaxial geogrid must have no tears or defects which adversely alter its physical properties. The biaxial geogrid must be inert to biological degradation and must be resistant to naturally encountered chemicals, alkalis, and acids.

Table GI-PPCP-BXG – Biaxial Geogrid Technical Characteristic Requirements

Technical Characteristics	**Units**	**MD Values[1]**	**XMD Values[1]**
Rib Pitch[2]	mm (in)	32 (1.26)	32 (1.26)
Minimum Rib Thickness	mm (in)	2.5 (0.1)	2.1 (0.08)
Rib Shape		Inverted T Beam	Rectangular

Table GI-PPCP-BXG – Structural Integrity Requirements of Biaxial Geogrid

Description	Units	MD Values
Aperture Stability[3]	N-m/deg	0.45
Overall Flexural Rigidity[4]	mg-cm	2,100,000
Radial Stiffness at low stain @ 0.5% Strain[5]	kN/m (lb./ft.)	321 (22,000)

Table GI-PPCP-BXG – Durability Requirements of Biaxial Geogrid

Description	Units	MD Values
Resistance to Installation Damage[6]	%SC / %SW / %GP	95 / 96 / 90
Resistance to Long Term Degradation[7]	%	100
Resistance to UV Degradation[8]	%	100

Table Notes:

1. Unless indicated otherwise, values shown are minimum average roll values determined in accordance with ASTM D4759-11. Machine direction is presented as (MD). Cross machine direction is presented as (XMD).

2. Nominal dimensions.

3. Resistance to in-plane rotational movement measured by applying a 20 kg- cm (2 m-N) movement to the central junction of a 9-IN x 9-IN specimen restrained at its perimeter in accordance with ASTM S7864-15.

4. Resistance to bending force determined in accordance with ASTM D7748, using specimens of width two (2) ribs wide, with transverse ribs cut flush with exterior edges of longitudinal ribs, and of length sufficiently long to enable measurement of the overhang dimension.

5. Radial stiffness is determined from tensile stiffness measured in any in-plane axis from testing in accordance with ASTM D6637/D6637M-15, tolerance +/- 2%.

6. Resistance to loss of load capacity or structural integrity when subjected to mechanical installation stress in clayey sand (SC), well graded sand

(SM), and crushed stone classified as poorly graded gravel (GP). The geogrid shall be sampled in accordance with ASTM D5818-11 and load capacity shall be determined in accordance with ASTM D6637.

7. Resistance to loss of load capacity or structural integrity when subjected to chemically aggressive environments.

8. Resistance to loss of load capacity or structural integrity when subjected to ultraviolet light and aggressive weathering.

GI-PPCP-BXG.5 CONSTRUCTION METHODS

(A) Each biaxial geogrid roll must be wrapped with an overlaying material that will protect the material, including the ends of the roll, from damage due to shipment, water, sunlight, and contaminants. The protective wrapping must be maintained during periods of shipment and storage. During storage, rolls must be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, and any environmental condition that may damage the physical property values of the geogrid.

(B) Excavation must be made to dimensions enough to accommodate placement of the biaxial geogrid, clean open graded stone, drainage cells, microgrid geotextile and leveling course with precast porous concrete panels. Any overcut underlying soil must be removed from the excavation and the bottom must be compacted **only** as specified and required elsewhere. The extra depth will be filled with clean open graded stone materials as required after installation of geogrid. No additional payment will be made for extra clean open graded stone used to compensate for overcut subbase. Where applicable, temporary support must be provided for trench walls to prevent it collapse when directed by the Engineer. The contractor must protect the pavement section at the saw cut line along the roadside.

(C) Prior to installation of biaxial geogrid, the drainage cells must be set in their final configuration as approved by the Engineer. If the biaxial geogrid is damaged during installation, the damaged section(s) must be removed, and the damaged area must be covered with a patch of new fabric which will overlap the undamaged fabric with twelve
(12) inches in all directions. The Contractor must make such repair work as directed by the Engineer at no extra cost to the city. Overlaying material must be placed within the same work shift whether the fabric is subject to damage from sunlight or not.

SECTION 32 14 13 PRECAST POROUS CONCRETE PANEL
EXHIBIT A
REF. SECTION GI-PPCP-CH — CAST-IN-PLACE CONCRETE HEADER

GI-PPCP-CH.1 INTENT

This section describes construction of a flared CAST-IN-PLACE CONCRETE HEADER. The purpose of the concrete header is to contain the precast porous concrete panel system.

GI-PPCP-CH.2 DESCRIPTION

Under this section, the Contractor must install the flared cast-in-place concrete header in accordance with the Contract Drawings, the specifications, the New York City Department of Environmental Protection Standard Designs and Guidelines for Green Infrastructure Practices, current edition, and as directed by the Engineer.

(A) Cast-in-place concrete header must be:

(1) Dimensioned in accordance with specifications, Contract Drawings, and directions of the Engineer.

(2) Constructed to the lines and grades as shown on the NYC Department of Environmental Protection Standard Design and Guidelines for Green Infrastructure.

(3) Installed over a well-compacted subgrade unless otherwise noted.

(4) Installed vertically and horizontally level with 0” reveal from the final finished adjacent asphalt grade. The top of the cast-in-place concrete header must be a medium broom finish as directed.

(B) Cast-in-place concrete header expansion joints must be spaced at fifteen (15) feet maximum spacing.

GI-PPCP-CH.3 MATERIALS AND METHODS

All materials and methods must comply with the requirements of Sections 6.09.3 and 6.09.4, as appropriate, in the NYC Department of Transportation Standard Highway Specifications, current edition, except as follows:

(A) Header dimensions as per Contract Drawings

(B) Depth as shown on the Contract Drawings

SECTION 32 14 13 PRECAST POROUS CONCRETE PANEL
EXHIBIT A
REF. SECTION GI-PPCP-DC — STACKED DRAINAGE CELLS

GI-PPCP-DC.1 INTENT

This section describes the installation of the polyethylene STACKED DRAINAGE CELLS. The purpose of the STACKED DRAINAGE CELLS is to provide subsurface storage for stormwater management.

GI-PPCP-DC.2 DESCRIPTION

Under this section, the Contactor must furnish and install all STACKED DRAINAGE CELLS in accordance with the Contract Drawings, the specifications, the New York City Department of Environmental Protection Standard Designs and Guidelines for Green Infrastructure Practices, current edition, and as directed by the Engineer.

GI-PPCP-DC.3 REFERENCES

(A) STACKED DRAINAGE CELLS must conform to the latest standards of the American National Standards Institute (ANSI), the American Society for Testing and Materials (ASTM), and the American Water Works Association (AWWA) as applicable.

(B) STACKED DRAINAGE CELLS must conform to the following ASTM standards:

(1) ASTM D1248 Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable

(2) ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

(3) ASTM D2412 Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading

(4) ASTM D6088 Standard Practice for Installation of Geocomposite Pavement Drains.

(5) ASTM D7001 Standard Specification for Geocomposites for Pavement Edge Drains and other High-Flow Applications

(6) ASTM F2418 Standard Specification for Polypropylene (PP) Corrugated Wall Stormwater Collection Chambers

GI-PPCP-DC.4 QUALITY CONTROL

(A) Contractor must have manufacturer's representative available for site review if requested by the Engineer.

GI-PPCP-DC.5 DELIVERY, STORAGE, AND HANDLING

(A) Protect STACKED DRAINAGE CELLS and other materials from damage during delivery, and store UV sensitive materials under tarp to protect from sunlight when time from delivery to installation exceeds two weeks. Storage of materials should be on smooth surfaces, free from dirt, mud, and debris.

(B) Handling is to be performed with equipment appropriate to the materials and site conditions, and may include hand, handcart, forklifts, and extension lifts.

(C) Cold weather:

(1) Care must be taken when handling plastics when air temperature is 40 degrees or below, as plastic becomes brittle.

(2) Contractor must not use frozen materials or materials mixed or coated with ice or frost.

(3) Contractor must not build on frozen ground or wet, saturated, or muddy subgrade.

GI-PPCP-DC.6 PRE-INSTALLATION CONFERENCE

(A) Prior to the start of the installation, a pre-installation conference must occur with the representatives of the Engineer, the Contractor, the excavation contractor, the STACKED DRAINAGE CELLS installation contractor, and the manufacturer's representative.

GI-PPCP-DC.7 PROJECT CONDITIONS

(A) Contractor must coordinate installation of the STACKED DRAINAGE CELLS with other on-site activities to eliminate all non-installation related construction traffic over the completed stacked drainage cell system. In no case at any time must loads heavier than the design loads of the panel type being installed be allowed over the system.

(B) Contractor must protect adjacent work from damage during the installation of the STACKED DRAINAGE CELLS.

(C) Contractor is responsible for any damage to the system during construction.

GI-PPCP-DC.8 SUBMITTALS

(A) All submittals must be submitted prior to purchase and must be made in accordance with the requirements of the NYC Department of Transportation Standard Highway Specifications, General Conditions, Subsections 1.06.13 and 1.06.31, current edition.

(B) Contractor must submit catalog data for STACKED DRAINAGE CELLS and other appurtenances.

(C) Drawings must include typical section details as well as the minimum cover requirements and STACKED DRAINAGE CELLS configuration.

(D) Contractor must submit manufacturer's product data, including compressive strength and unit weight.

(E) Contractor must submit the manufacturer's protection recommendations and installation instructions.

(F) Contractor must submit product sample for review. Reviewed and accepted samples will be kept on site for comparison purposes and will not be returned to the Contractor.

GI-PPCP-DC.9 CHEMICAL AND PHYSICAL REQUIREMENTS

(A) Drainage cell units must be injection molded plastic cells stacked to form a 90% void modular structure of predesigned height. The STACKED DRAINAGE CELLS must be as uniform as commercially practicable in color, capacity, density, and other physical properties.

Table GI-PPCP-DC – Stacked Drainage Cell Requirements

Property	Description	Value
Void Area	Volume available for water storage	90%
Surface Void Area	Percentage of exterior available for infiltration	90%
Compressive Strength	ASTM S2421 and ASTM F2418	240.2 psi
HS-20 Min. Cover	Min. cover required to support HS-20 loads	6 inches
Maximum Cover	Max. allowable cover depth	< 16.7 feet
Unit Weight	Weight of plastic per cubic foot	7.55 lb./cf
Service Temperature	Safe temperature range for use	-14ºF to 185ºF

(B) Visible defects, such as cracks, creases, crazing, non-uniformly pigmented areas, or undispersed raw materials must not be acceptable and will result in rejection of the STACKED DRAINAGE CELLS by the Engineer.

(C) Any fittings necessary must be manufactured to the requirements of ASTM D 3212 and this Specification.

GI-PPCP-DC.10 CONSTRUCTION METHODS

(A) Excavation

1. Base of the excavation for the STACKED DRAINAGE CELLS must be uniform, level, and free of lumps, debris, or soft yielding subgrade areas.

2. Unsuitable soils or conditions: All questions about the base of excavation shall be directed to the Engineer, who shall approve the subgrade conditions prior to placement of stone.

   a. If unsuitable soils are encountered at the subgrade, or if the subgrade is pumping or appears excessively soft, repair the area in accordance with the contract drawings and as directed by the Engineer.

   b. If indications of the water table are observed during excavation, the Engineer must be contacted to provide recommendations.

   c. Do not begin installation of STACKED DRAINAGE CELLS until unsatisfactory subgrade conditions are accepted by the Engineer.

(B) Base Preparation

1. Place a thin layer (3” unless otherwise specified) of clean open-graded stone base, over the subgrade to establish a level working platform for the STACKED DRAINAGE CELLS. Level to within ½” (+/- ¼”) or as shown on the plans. Bedding materials must be prepared in accordance with the contract documents.

(C) Installation

1. Geogrid must be in accordance with specification GI-PPCP-BXG Biaxial Geogrid.

2. Install STACKED DRAINAGE CELLS in layers in accordance with the contract drawings. STACKED DRAINAGE CELL components must be connected to all other components for each layer. Layers must stack on top of each preceding layer evenly. No vertical connection between layers is required. The panels are to be oriented and at the required depth as per the contract drawings.

3. Wrap the STACKED DRAINAGE CELLS top and sides in specified microgrid material in accordance with specification GI-PPCP-MG Microgrid. Use special care to avoid any damage to microgrid during installation.

(D) Backfilling

1. Backfill and fill with recommended materials as follows:

a. Place clean open graded stone base around the perimeter of STACKED DRAINAGE CELLS in lifts with a maximum thickness of 6". Each lift must be placed around the entire perimeter such that each lift is no more than 24" higher than the side backfill along any other location on the perimeter of the STACKED DRAINAGE CELLS.

b. Open graded stone base shall be carefully placed and compacted in the perimeter spaces around the STACKED DRAINAGE CELLS. No fill shall be placed over top of STACKED DRAINAGE CELLS until the perimeter backfill has been completed.

c. Each lift must be compacted at the specified moisture content to a minimum of 95% of the Standard Proctor Density or until no further densification is observed. The side lifts must be compacted by walk plate compactor.

d. Use special care to ensure the compaction process does not allow machinery to come into contact with the STACKED DRAINAGE CELLS due to the potential for damage to the Microgrid and STACKED DRAINAGE CELLS.

e. No compaction equipment is permissible to operate directly on STACKED DRAINAGE CELLS.

f. During construction, keep the STACKED DRAINAGE CELLS free from foreign matter. The cells must be left thoroughly clean to the satisfaction of the Engineer.

SECTION 32 14 13 PRECAST POROUS CONCRETE PANEL
EXHIBIT A
REF. SECTION GI-PPCP-MG — MICROGRID

GI-PPCP-MG.1 INTENT

This section describes the MICROGRID. The purpose of the microgrid is to prevent the clean open graded stone base from entering the stacked drainage cells, while allowing for the free flow of water within the system.

GI-PPCP-MG.2 DESCRIPTION

Under this section, the Contractor must furnish and install the microgrid in accordance with the Contract Drawings, the specifications, the NYC DEP Standard Design and Guidelines for Green Infrastructure Practices, current edition, and as directed by the Engineer.

GI-PPCP-MG.3 SUBMITTALS

(A) The contractor, prior to the start of work, must submit to the Engineer for approval two (2) labeled samples of the microgrid in accordance with the requirements of Sections 1.06.13 and 1.06.31 of the NYC DOT Standard Highway Specifications, current edition. The label must include the manufacturer's product name, the type of fabric, and the weight of grade of the material. Microgrid used in the work must conform to the approved samples.

(B) Certified material test reports showing that the microgrid meet the specified requirements must be submitted for each shipment and identified with specific lots prior to installing materials. Material test reports must meet the requirements of the criteria outlined herein.

(C) The manufacturer must submit certified test date to cover each shipment of material.

GI-PPCP-MG.4 MATERIALS

(A) Chemical and Physical Requirements

(1) The microgrid must be defined as a system that allows for long-term, adequate liquid flow normal through the microgrid with limited flow loss across the plane of the geotextile. The microgrid must be composed of high molecular weight, high tenacity multifilament polyester yarns woven into a stable network placed under tension. The high strength polyester yarns must be coated with polyvinyl chloride (PVC) material that retain their dimensional stability relative to each other, including selvages. The microgrid must have no tears or defects which adversely alter its physical properties. The microgrid must be inert to biological degradation and must be resistant to naturally encountered chemicals, alkalis, and acids.

(2) Minimum Average Roll Value (MARV): Property value calculated as typical minus two standard deviations. Statistically, it yields a 97.7 percent degree of confidence that any sample taken during quality assurance testing will exceed value reported. Typical Roll Value is represented by (TRV).

Table GI-PPCP-MG– Microgrid Requirements

Tensile Properties	**Test Method**	**MARV (lbs./s.f.)**
Ultimate Strength – Machine Direction (MD)	ASTM 4595	1,700
Ultimate Strength – Cross Machine Direction (XMD)	ASTM 4595	1,400
Creep Limited Strength - MD	ASTM 5262	1,100
Creep Limited Strength - MD	ASTM 5262	1,100
T_{al} = Long Term Design Strength - MD	NCMA 97	912 +/- 5%
T_{al} = Long Term Design Strength - XMD	NCMA 97	826 +/- 5%
Aperture Size (inches)	Measured (inches)	0.08 +/- 5%
Ultraviolet Resistance (500 hours)	ASTM D4355	78%

GI-PPCP-MG.5 METHODS

(A) Each microgrid roll must be wrapped with an overlaying material that will protect the material, including the ends of the roll, from damage due to shipment, water, sunlight, and contaminants. The protective wrapping must be maintained during periods of shipment and storage. During storage, rolls must be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, and any environmental condition that may damage the physical property values of the microgrid.

(B) Excavation must be made to dimensions enough to accommodate placement of the microgrid, clean open graded stone, stacked drainage cells, microgrid and pavement leveling course with precast porous concrete panels. Any overcut underlying soil must be removed from the excavation and the bottom must be compacted **only** as specified and required elsewhere. The extra depth will be filled with clean open graded stone materials as required after installation of geo-grid. No additional payment will be made for extra clean open graded stone used to compensate for overcut subbase. Where applicable, Temporary Support must be provided for trench walls to prevent it collapse when directed by the Engineer. The contractor must protect the pavement section at the saw cut line along the road side.

Prior to installation of microgrid, the stacked drainage cells must be set in their final configuration as approved by the Engineer. If the microgrid is damaged during installation, the damaged section(s) must be removed, and the damaged area must be covered with a patch of new fabric which will overlap the undamaged fabric with twelve (12”) inches in all directions. The Contractor must make such repair work as directed by Engineer at no extra cost to the city. Overlaying material must be placed within the same work shift whether the fabric is subject to damage from

sunlight or not.

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, and equipment required to provide concrete curbs, headers, and sidewalks, as shown, specified and required.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 31 23 16 - Excavation

B. Section 31 23 23 - Fill

C. Section 03 10 00 - Concrete Forming and Accessories

D. Section 03 30 10 - Low Carbon Cast-in-Place Concrete

E. Section 03 35 00 - Concrete Finishing

F. Section 05 50 00 - Metal Fabrications

G. Section 09 91 00 - Painting

1.04 REFERENCES

A. ASTM A36 - Carbon Structural Steel

B. New York City Department of Transportation (NYCDOT) Standard Highway Specifications (NYCDOT Specifications)

C. NYCDOT Standard Details of Construction

D. NYCDOT Street Design Manual

1.05 DESCRIPTION

A. Design Requirements

1. Concrete curbs, headers, and sidewalks which are outside the building line of the site and under jurisdiction of other City agencies, even though constructed as part of this Contract, shall be constructed in accordance with the Rules and Regulations, Standard Details and Standard Specifications of the governing agency in effect at the time of the award of this Contract and as specified and defined in the Contract Drawings.

2. Unless otherwise specified and defined in the Contract Drawings, concrete for curbs, headers, and sidewalks which are inside the building line of the site and not under the jurisdiction of other City agencies shall meet the following requirements:

a. 3500 psi minimum 28-day compressive strength.

b. Utilize type II Cement and contain aggregate conforming to ASTM #57.

c. Water-cement ratio not exceeding 0.44 for normal weight structural concrete.

d. Slump values of 1-1/2 inch minimum to 4 inch maximum.

e. Desired air-entrainment of 6.5%, with an allowable range of +/- 1.5%.

f. Concrete shall be proportioned, mixed, placed, cured and protected in accordance with the requirements of Section 03 30 10 Low Carbon Cast-in-Place Concrete.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Those required in Section 03 30 10 – Low Carbon Cast-in-Place Concrete.

2. Marked-up drawings and shop drawings including shop and field test reports of concrete samples tested in an approved laboratory.

3. Concrete sidewalk and curb layouts showing scoring and joint layouts, including joint and sealant materials to be incorporated.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Coarse aggregate, unless otherwise specified, shall conform to the requirements of Section 03 30 10 – Low Carbon Cast-in-Place Concrete.

B. Concrete shall be air-entrained in accordance with Section 03 30 10 – Low Carbon Cast-in-Place Concrete.

C. Material for foundation of curbs, headers, and sidewalks shall consist Size No. 3 broken stone or gravel complying with the requirements of Section 2.02, NYCDOT Specifications, 100 percent of which passes a 2-1/2-inch square sieve; or other approved broken concrete, 100 percent of which passes a 2-1/2-inch square sieve; or other approved granular material containing not more than 5 percent material passing a No. 200 mesh sieve and not more than 5 percent retained on a 2-inch square sieve.

D. Unless otherwise specified and defined in the Contract Drawings preformed expansion joint filler shall be Type IV as described in Section 2.15 of the NYCDOT Specifications.

E. Joint sealing compound for horizontal joints shall be Type 2 cold application sealer as described in Section 2.22 of the NYCDOT Specifications.

F. Structural steel shall be ASTM A36 and Section 05 50 00 – Metal Fabrications.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Concrete shall be tested and evaluated for strength and acceptance in accordance with the requirements of Section 03 30 00 Cast-in-Place Concrete.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Sidewalk Installation

1. Concrete sidewalk shall be of the width shown or otherwise specified and shall be laid on 6 inches thick compacted broken stone base, unless otherwise specified or shown on the Contract Drawings.

2. Sidewalk shall consist of a single course of concrete 4 inches thick, unless otherwise shown on the Contract Drawings.

3. Concrete shall be pigmented when specified and defined in the Contract Drawings.

4. Excavation and subgrade preparation shall be in accordance with the requirements of Section 31 23 16 - Excavation. All existing material within the required 6 inches of foundation shall be removed in its entirety. Additional depth of foundation material for special conditions shall be placed as required by the Engineer.

5. Materials: Foundation material shall be placed on the prepared subgrade and thoroughly compacted into a course not less than 6 inches thick. The top surface shall be parallel to the finished grade and at a distance below the grade equal to the specified thickness of concrete.

6. Forms: Forms shall be in accordance with Section 03 10 00 – Concrete Forming and Accessories.

7. Slabs: Concrete sidewalk shall be built in approximately 20-foot lengths between expansion joints. The sidewalk shall be separated from adjoining structures by expansion joints. When directed, these joints shall be filled with dry sand. Expansion joints in sidewalk shall coincide with expansion joints in curb. Tooled control joints not less than 1/2 inch in depth shall be provided where at four-foot intervals unless otherwise shown on the Contract Drawings.

8. Expansion Joints: Transverse expansion joints shall be 1/2 inch in width and shall be filled with preformed joint filler to within 1 inch of the sidewalk surface. The top 1 inch shall be sealed with Type 2 cold application sealer complying with the requirements of Section 2.22 of the NYCDOT Specifications.

9. The foundation material shall be wetted immediately before concrete is placed. The concrete shall be placed within the forms and thoroughly tamped until the surface is at the finished grade.

10. When specified and defined in the Contract Drawings, the concrete sidewalk shall be pigmented with a minimum of 2 pounds of dispersed

carbon black per bag of cement to produce a bluestone color. Either the coloring pigment shall be treated so as not to cause an increase or decrease of the entrained air content in cement mortar or in the concrete of more than 10 percent, or the amount of air-entrainment agent added to the concrete shall be adjusted to meet the specified requirements. All cement used for concrete work specified herein shall be of uniform color. Requirements for other colors are specified and defined in the Contract Drawings.

11. The top surfaces shall be finished in accordance with Section 03 35 00 – Concrete Finishing. Each rectangular slab shall have all edges neatly rounded with proper tools and be bounded on all sides by a troweled border about 1 inch in width. Surface texture of pedestrian ramps shall be transverse grooves, 1/2 inch wide by 1/4 inch deep on 2-inch centers.

12. Backfilling shall follow the removal of forms as soon as practicable and, unless otherwise permitted, shall be of clean earth, satisfactorily compacted. Backfilling shall conforming to the requirements of Section 31 23 23 - Fill.

13. Concrete sidewalk shall be cured according to Section 03 30 00 Cast-in-Place Concrete.

14. All material types of sidewalk, such as unpigmented, pigmented, bluestone or pavers, and details are outlined in the NYCDOT Street Design Manual.

B. Curb and Header Installation

1. Concrete curbs, headers, and steel faced concrete curbs, except as otherwise detailed and specified, shall be constructed in accordance with the applicable provisions of Sections 4.08 and 4.09, NYCDOT Standard Highway Specifications, except that concrete strength shall conform to Class 45 as indicated in Section 03 30 00 Cast-in-Place Concrete. Depressed curbs shall be provided where specified or shown on the Contract Drawings.

2. Steel street curbs shall conform to ASTM A36 of the size indicated on the Contract Drawings. The length of straight runs shall be not less than 10 feet nor more than 20 feet. Curved curb angles shall be bent to the radius indicated, and provided with a straight tangent at each end, 3 feet in length. Special steel curb angles of approved type shall be provided at drop curbs. Where the length of the special drop curb exceeds 20 feet, it shall be spliced with an approved type butt welded joint. Anchors shall be welded to all steel curbing. The steel curbs shall be placed within the forms, upon suitable chairs, to the proper lines and grades. The joints between units of curbing shall be 1/8 inch. All surfaces of steel curbing, including anchors, shall be thoroughly cleaned of all rust, oil, grease, scale or other foreign matter before concrete is placed. All surfaces of steel curbing which are to remain exposed in the finished work shall be painted in the shop in accordance with Section 09 91 00 - Painting. Finish coats shall be gray in color.

3. Granite and bluestone street curbs and headers shall be Class A dressed curbs and headers conforming to the requirements of Section 2.12 of the NYCDOT Standard Highway Specifications. When specified, a concrete cradle shall be used conforming to the provisions of Section 4.07 of the NYCDOT Standard Highway Specifications, except that concrete strength shall conform to Class 45 as indicated in Section 03 30 10 Low Carbon Cast-in-Place Concrete.

C. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 32 31 19 – DECORATIVE METAL FENCES AND GATES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the general requirements for decorative fences and gates. Decorative fences and gates shall conform to the requirements specified herein, and in the Contract; and as shown on the Contract Drawings. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install all decorative fences and gates Work.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 03 60 00 - Grouting

B. Section 05 06 00.01 - Schedules for Stainless Steel Work

C. Section 05 05 23.02 - Miscellaneous Metal Fastenings

D.	Section 05 05 13	-	Shop Applied Coatings for Metals
E.	Section 05 05 23.01	-	Welding
F.	Section 05 05 13.01	-	Galvanizing
G.	Section 05 12 00	-	Structural Steel Framing

1.04 REFERENCES

A.	AAMA 2603	-	Voluntary Specification, Performance Requirements and Test Procedures For Pigmented Organic Coatings on Aluminum Extrusions and Panels
B.	ASTM A 36	-	Standard Specification for Carbon Structural Steel Castings
C.	ASTM A123	-	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Product
D.	ASTM A276	-	Stainless Steel Bars and Shapes
E.	ASTM A 500	-	Standard Specification for Cold-Formed Welded and seamless Carbon Streel Structural Tubing in Round and Shapes
F.	ASTM A510	-	General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel
G.	ASTM A513	-	Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
H.	ASTM A1011	-	Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
I.	ASTM B 26	-	Standard Specification for Aluminum-Alloy Sand Castings
J.	ASTM B 209	-	Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate
K.	ASTM B 221	-	Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
L.	ASTM B 247	-	Standard Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings
M.	ASTM B 429	-	Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube
N.	ASTM F593	-	Stainless Steel Bolts, Hex Cap Screws and Studs

O.	ASTM F594	-	Stainless Steel Nuts
P.	ASTM F 1184	-	Standard Specification for Industrial and Commercial Horizontal Slide Gates, Type II, Class 2
Q.	ASTM F 2200	-	Standard Specification for Automated Vehicular Gate Construction
R.	AWS A5.12	-	Tungsten and Tungsten Alloy Electrodes for Arc Welding and Cutting
S.	AWS	-	Standard Codes for Arc and Gas Welding in Building Construction
T.	UL 325	-	Underwriters Laboratory Gate Operator Requirements

1.05 DESCRIPTION

A. Maintain the visual design concept shown, and the technical requirements specified, including modules, profiles, alignment of components and requirements for finish.

B. Thermal Control: Provide adequate expansion joints within the fabricated system which allows for all thermal expansion and contraction caused by a material temperature range of 140 degrees F to -20 degrees F without warp or bow of system components. Distance between expansion joints shall be based on providing a 1/4 inch wide joint at 70º F which accommodates a movement of 150 percent of the calculated amount of movement for the specified temperature range.

C. Certifications:

1. Cantilever Slide Gate and Operator System manufacturer shall submit test results stating that the gate panel and operator have been tested as a system for 200,000 cycles.

2. Gate manufacturer shall certify gate is manufactured in compliance with ASTM F 2200, Standard Specification for Automated Vehicular Gate Construction and the operators are UL 325 listed.

3. Gate operator shall be in compliance with UL 325 as evidenced by UL listing label attached to gate operator.

D. Provide expansion joints in decorative fencing Work where systems cross expansion joints in structure.

E. Configuration of all decorative fences and gates shall be as shown on the Contract Drawings. All details shown on the Contract Drawings are typical; similar details apply to similar conditions, unless specifically noted otherwise on the Contract Drawings. Verify dimensions at the site without causing delay in the work.

F. Fasteners and Supports:

1. When the size, length or load carrying capacity of an anchor bolt, concrete anchor or concrete insert is not shown on the Contract Drawings, provide

the size, length and capacity required to carry the design load times a minimum safety factor of four.

2. Sizes shown on the Contract Drawings shall be considered minimum. Increase size to comply with design loadings and minimum safety factor specified.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Engage a single fabricator, with undivided responsibility for detailing and performance of the decorative l fences and gates.

2. Engage a firm which can show five years previous successful experience in detailing and fabrication of decorative fences and gates of scope and type similar to the required work.

3. Materials and fabrication procedures shall be subject to inspection and tests in the mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests shall not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

4. Manufacturer shall provide a list of three recommended gate and operator maintenance companies within 150 miles of project site. List may include the installer or manufacturer.

a. Provide letter from manufacturer for each listed maintenance company indicating recommendations and maintenance company's qualifications matching installer qualifications.

B. Installer Qualifications:

1. Engage a single installer skilled, trained and with documented successful experience in the installation of decorative fences and gates and with specific skill and successful experience in the erection of the types of materials required; and who agrees to employ only tradesmen with specific skill and successful experience in this type of Work. Submit names and qualification to Engineer along with the following information on a minimum of three successful projects:

a. Names and telephone numbers of owner, architects or engineers responsible for projects.

b. Approximate contract cost of the decorative fences and gates.

c. Amount of area installed.

C. Source Quality Control:

1. Obtain all ornamental fences and gates components and accessories from the same manufacturer.

2. Provide qualified welding processes and welding operators in accordance with AWS "Structural Welding Code" D1.1, Section 5, Qualification.

3. Provide certification that all welders employed on, or to be employed for, the fabrication of the ornamental fences and gates have satisfactorily passed AWS qualification tests within the previous twelve months. Contractor shall ensure that all certifications are kept current.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittal shall include, but not limited to:

1. Full size fence section mockup and gate section with all associated connections, and mounting brackets all with specified controlled uniform finish.

2. Samples will be reviewed by Engineer for color, finish, joinery appearance and workmanship only. Compliance with all other requirements is the responsibility of Contractor.

3. Recommended maintenance schedule for gates and operators.

a. Provide gate and operator diagram or layout of items to be adjusted.

b. Provide schedule of maintenance to be performed.

c. Identify special tools and fluids necessary for maintenance.

B. Shop Drawings:

1. Drawings for the fabrication and erection of decorative fences and gates with sizes of members, components and anchorage devices, all based on specified requirements. Include copies of manufacturer's specifications, standard and custom detail drawings and installation instructions for decorative fences and gates. Include all plans and elevations identifying the location of all decorative fences and gates, and all expansion joints.

2. Profiles of decorative fences and gates components, and the details of forming, jointing, sections, connection, internal supports, trim, and accessories. Show details drawn at 1-1/2 inch scale.

3. All calculations for complete structural analysis of the systems including calculations showing compliance with the performance criteria specified.

4. Manufacturer's catalogs showing complete selection of standard and custom components and miscellaneous accessories for selection by Engineer.

C. Certificates:

1. Copies of material purchase receipts, for this job, signed by a certified and licensed Notary Public, verifying that material purchased for the Work complies with material designations specified as confirmed by approved

Shop Drawing Certification of welders and welding procedures shall be submitted as specified.

2. UL 325 certification.

3. ASTM F 2200 certification.

4. Installer qualifications.

5. Maintenance company list and qualification letter from manufacturer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Deliver decorative fences and gates and all accessories dry and undamaged, with manufacturer's protective coating intact, bearing original intact factory labels.

2. Decorative fences and gates which are damaged during delivery or while being unloaded shall not be stored on site. Remove such units from site and replace panels with new, undamaged material.

B. Storage of Materials:

1. Store decorative fences and gates and accessory materials under tarpaulin covers and in an area protected from dirt, damage, weather and from the construction activities of all Contractors. Do not store outside or allow items to become wet or soiled in any way while on site.

2. Do not store in contact with concrete, earth or other materials that might cause corrosion, staining, scratching or damage to finish. Do not install system components which become dented, scratched or damaged in any way. Remove such components from site and replace with new, undamaged material.

C. Handling of Materials:

1. Do not subject decorative fences and gates and accessory materials to bending or stress. Do not carry or transport panels in the horizontal (flat) position. Hold panels upright on edge when handling.

2. Do not damage edges or handle material in a manner that will cause scratches, warps or dents.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. A. Product and Manufacturer - provide one of the following for decorative steel bar style fences:

1. Grotto by Ametco Manufacturing Corporation, Willoughby, Ohio;
2. Grigliato (spacing to match Ametco Groto) by Metalco – MFR manufacturing Inc., Aurora, IL;
3. Or approved equal

B. Product and Manufacturer - provide one of the following for cantilever sliding gate system (TI-10):

1. Fortress Structural Cantilever Slide Gate system by Tymetal Corp, Greenwich, NY
2. Or approved equal.

C. Product and Manufacturer - provide one of the following for bi-fold gate system (TI-11):

1. Speedmaster Cantilever Bi-Fold Gate CR40 System by CLD Fencing Systems, Cova Security Gates LTD, Parsippany, NJ
2. B-70 Securfold-Trackless Cantilever Bi-Fold Gate System by Tymetal Corp, Greenwich, NY
3. Or approved equal.

D. Product and Manufacturer - provide one of the following for grout:

1. Euco N-S as manufactured by The Euclid Chemical Company, East Brunswick, NJ;
2. Masterflow 713 as manufactured by Master Builders Company, Cleveland, OH;
3. Or approved equal.

E. Product and Manufacturer - provide one of the following for Anti-graffiti coating:

1. Clear Coat 1K Siloxane as per Sherwin Williams, Cleveland, OH
2. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Materials:

1. Rectangular steel bars, angles and other shapes: ASTM A36 or ASTM A1011.
2. Steel Tubing: ASTM A513 and ASTM A500, Grade B.
3. Round steel cross rods: ASTM A510 carbon steel.

4. Steel Sheets: Steel sheets of commercial quality, complying with ASTM A1011 hot-rolled steel sheets.
5. Aluminum, General: Provide alloys and tempers with not less than the strength and durability properties of alloy and temper designated in paragraphs below for each aluminum form required.
6. Extrusions: ASTM B 221, Alloy 6063-T5.
7. Tubing: ASTM B 429, Alloy 6063-T6.
8. Plate and Sheet: ASTM B 209, Alloy 6061-T6.
9. Die and Hand Forgings: ASTM B 247, Alloy 6061-T6.
10. Castings: ASTM B 26, Alloy A356.0-T6.
11. Grout: Non-shrink type, premixed compound consisting of non-metallic aggregate, cement, and water reducing amd plasticizing additives. See Section 03 60 00, Grouting.

B. Decorative Steel Bar Fence: Fences made from bars and shapes.

1. Posts: Square steel bars and tubing.
   a. Line (Intermediate) Post / Bar: 3-1/2 by 5/16 inches .
   b. End and Corner Posts: 4 by 4 inches with 0.250-inch wall thickness.
   c. Swing Gate Posts (man gate): 2 by 2 inches with 0.125-inch wall thickness.
   d. Swing Gate Posts (vehicular): 4 by 4 inches with 0.250-inch wall thickness.
   e. Double Swing Gate Posts: 4 by 4 inches with 0.250-inch wall thickness.
   f. Horizontal-Slide Gate Post, Openings up to 12 Feet: 4 by 4 inches with 0.125-inch wall thickness.
   g. Horizontal-Slide Gate Post, Openings Wider Than 12 Feet: 4 by 4 inches with 0.125-inch wall thickness.
   h. Guide Posts for Class 1 Horizontal-Slide Gates: 4 by 4 inches with 0.125-inch wall thickness; installed adjacent to gate post to permit gate to slide in space between.
2. Post Caps: Steel castings with flat cap.
3. Fence panels:
   a. Vertical main bars: 1 by 5/64-inch flat bars spaced at 1-21/32 inches maximum.
   b. Horizontal cross rods: 3/16-inch diameter rods spaced at 5-3/16 inches maximum.

c. Top and bottom perimeter bars: 1 by 1/8-inch flat bars.

d. Panel height: 96 inches.

e. Panel width: 69 inches maximum.

4. Fasteners: Stainless-steel carriage bolts and tamperproof nuts.

C. Concrete and Masonry Anchors: Concrete and masonry anchors shall be as specified in Section 05 05 23.02 – Miscellaneous Metal Fastenings.

1. Anchors shall be of stainless steel Type 316 and a minimum size of 1/2 inch diameter.

D. Non-Shrink, Non-Metallic Grout: Pre-mixed non-staining cementitious grout requiring only the addition of water.

E. Bolting Materials: As specified in Section 05 05 23.02 – Miscellaneous Metal Fastenings.

F. Swing Gates (Man Gate):

1. Gate Configuration: Single leaf, self closing.

2. Gate Frame Height: As shown on Contract Drawing.

3. Gate Opening: As shown on Contract Drawings.

4. Frame and Bracing: Fabricate members from square steel tubes 1-1/2 by 1-1/2-inches to 2 by 2-inches with 0.140-inch wall thickness and as indicated.

5. Frame corner Construction: Welded.

6. Panel Size: Match fence panel sixe and align vertical and horizontal bars and rods.

G. Hardware for Swinging Gates: Latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf more than 5 feet wide. Fabricate latches with integral eye openings for mortise lock, padlocking; padlock accessible from both sides of gate.

1. Operation: all swing gates shall be manually operated.

2. Hinges: all hinges shall be bolted through gate post. Top and bottom hinges are to be reverses: one (1) hinge faced downwards and one (1) hinge faced upwards to ensure gates cannot be removed. Hinges' size and material shall suit gate size and material. All swing gates to allow for 180 degrees opening. All single swing gates shall be self-closing.

a. BHMA A156.1, Grade 1, suitable for exterior use.

b. Function: 39 - Full surface, triple weight, antifriction bearing.

c. Material: Wrought steel, forged steel, cast steel, or malleable iron; galvanized.

3. Mortise Locks: BHMA A156.13, Grade 1, suitable for exterior use.

a. Function: F09 - Apartment, exit lock and F17 - Deadlock.

b. Material: Brass or bronze.

c. Levers: Cast, forged, or extruded brass or bronze.

d. Mounting Box: Configuration necessary to enclose locks. Fabricate from 1/8-inch-thick, aluminum plate.

4. Ground sleeves: shall be galvanized for security drop bolt with the gate in opened and closed position. Sleeves be installed in concrete so no tripping hazard is present.

5. Strike strap: shall be continuous, welded to gate post

H. Slide and Cantilever Gate (TI10):

1. Automated vehicular gates shall comply with ASTM F 2200, Class III.

2. Gate Frame: The gate frame shall be fabricated from 6063-T6 aluminum alloy extrusions. Manufacturer's assemble shall be a minimum of the following:

a. The top member shall be a 3" x 5" aluminum structural channel/tube extrusion weighing not less than 2.6 lb/lf for external picket designs. To maintain structural integrity this frame member shall be "keyed" to interlock with the "keyed" track member. If fabricated as a single horizontal piece, the bottom member shall be a 2" x 5" aluminum structural tube weighing not less than 2.0 lb/lf. If fabricated in two horizontal pieces, the bottom member shall be a 5" aluminum structural channel weighing not less than 2.6 lb/lf. When the gate frame is manufactured in two horizontal pieces or sections, they shall be spliced in the field.

1) The overhang shall be a minimum of 50% of opening size.

a) Size: Opening – 11'-0" through 14'-0"

(1) Support overhang: 7'-6".

b) Size: Opening – 14'-1" through 22'-0"

(1) Support overhang: 10'-0".

c) Size: Opening – 22'-1" through 30'-0"

(1) Support overhang: 12'-0".

2) TI-10 Gate sizes:

a) Entry Opening – 26'-0" long by 8'-0" high.

b) Exit Opening – 26'-0" long by 8'-0" high.

b. Splicing: A galvanized steel splice plate shall be used to secure the two bottom channel members together utilizing eight plated carriage bolts with lock nuts. The top members will be spliced together using

an aluminum splice plate secured with six drive rivets on one side and welded to the top member on the other side. The track is overlapped onto the opposing section in an alternating fashion, interlocking with the top primary member.

c. Gate Track: The gate shall have a separate semi-enclosed "keyed" track, extruded from 6005A-T61 or 6105 T5 aluminum alloy, weighing not less than 2.9 lb/lf. Track members are to be located on each side of the top member. When interlocked and welded to the "keyed" top member, it forms a composite structure with the top of the gate frame. Welds are to be placed alternately along the top and side of the track at 9" centers with welds being a minimum of 2" long.

3. Gate Configuration: Single leaf. See Contract Drawings for fence/gate design to be replicated.

4. Gate Frame Height: 9'-0" minimum (align top with fixed picket panels) or as indicated.

5. Gate Opening: As shown on Contract Drawing.

6. Gate Mounting:

a. The gate frame is to be supported from the track by four swivel type, self-aligning, 4 wheeled, sealed lubricant, ball-bearing truck assemblies.

b. The bottom of each support post shall have a bracket equipped with a pair of 3" UHMW guide wheels Wheel cover protectors shall be included with bottom guides to comply with UL325.

c. Gap protectors shall be provided and installed, compliant with ASTM F 2200.

7. Diagonal Bracing: Diagonal "X" bracing of 3/16" or ¼" diameter stainless cable shall be installed throughout the entire gate frame.

8. The gate shall be completed by installation of approved filler as specified.

a. Overlay fence panel in sliding gate frame. Provide additional panel support within sliding gate framing. Where a motorized gate operator is specified to be applied to the gate and the specified picket spacing allows for openings in the gate frame that exceed 2¼", a secondary gate filler shall be secured at each end of the gate frame and tied at each 1" x 2" or 2" x 2" vertical member. The secondary gate filler shall extend to a minimum height of 72" above grade and shall be sized to prevent a 2¼" diameter sphere from passing through openings anywhere along the length of the gate frame, and in that portion of the adjacent fence that the gate covers in the open position.

9. Posts:

a. Double sets of support posts shall be minimum 4" x 4" x 3/16" wall square steel tubing, grade 500. Gate posts shall be galvanized or coated and supported in concrete footings as specified by the design team.

10. Finish:

a. Gate to be color coated with polyester powder as specified. If powder coated, the gate (including track member) and all accessories shall be pretreated chemically by sand blasting or other acceptable method to ensure proper coating adherence.

11. Gate Lock:

a. Gate system shall be furnished with a secure gate catcher. The catcher shall prevent the gate panel from being pried open while the gate is in the closed and locked position.

I. Slide Gate Operators (TI-10):

1. System Functions:

a. Operation:

1) System shall be designed so that gate movement from the closed position is impossible except by electric or mechanical means.

b. Variable Speed-Rate of Travel:

1) The gate operator shall have the ability to achieve a maximum gate speed of 2.0 feet per second, and shall be equipped with soft start and soft stop function to prevent shock load to the gate panel and operator.

c. Cycle Testing:

1) The cantilever slide gate and operator system shall be cycle tested a minimum of 200,000 cycles.

2. Provide factory-assembled automatic operating system designed for gate size, type, weight, and operation frequency. Provide operation control system with characteristics suitable for Project conditions, with remote-control stations, safety devices, and weatherproof enclosures; coordinate electrical requirements with building electrical system.

a. Provide operator designed so motor may be removed without disturbing limit-switch adjustment and without affecting auxiliary emergency operator.

b. Provide operator with UL approval.

c. Provide electronic components with built-in troubleshooting diagnostic feature.

d. Provide unit designed and wired for both right-hand/left-hand opening, permitting universal installation.

3. Provide operators and electric accessories compliant with NFPA 70, exterior wet environment.

4. UL Standard: Manufacturer and label gate operators to comply with UL 325. The gate operator shall be UL 325 compliant for Class III and IV.

5. Operator system shall be provided so that motor can be removed without disturbing limit switch adjustment and without affecting emergency auxiliary operator.

6. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for automatic gate operators on gates that must provide emergency access.

7. Motor Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, within installed environment, with indicated operating sequence, and without exceeding nameplate rating or considering service factor. Motor box is 10 gauge galvanized steel with detention grade hinges and mogul lock. Comply with NEMA MG 1 and the following:

   a. Voltage: 208/230VAC, Three Phase.

      1) Phase: Polyphase

   b. Horsepower: 1 HP.

   c. Enclosure: Totally enclosed.

   d. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.

   e. Service Factor: 1.15 for open drip-proof motors; 1.0 for totally enclosed motors.

   f. AC Drive:

      1) The variable frequency drive unit shall allow for programmable speeds and programmable soft-start and soft-stop features.

   g. Overload Protection:

      1) Motor shall be protected against overload by either a thermal or a current sensing overload device.

   h. Gear (Box) Reducer:

      1) The self-enclosed gear-head gearbox shall be manufactured as a single unit, and shall consist of a hardened steel, machine cut worm and mating bronze gear running in oil bath. Oil shall be a #634 specialty oil with a fluid pour point

of –44 degrees F. The gearbox shall perform the following functions:

a) Adjustable Clutching Device.

b) Manual disconnect by crank handle.

i. Gear Box Heater

1) Operator shall include internal gearbox heater and a heater strip for the control box.

j. Drive – Chain:

1) A #50 roller chain shall be utilized. All chain brackets and required attachment hardware shall be supplied.

k. Manual Operation:

1) Emergency Release Mechanism: Quick-disconnect release of operator drive system of the following type, permitting manual operation if operator fails. Design system so control-circuit power is disconnected during manual operation.

2) Type: Integral fail-safe release, allowing gate to be pushed open without mechanical devices, keys, cranks, or special knowledge.

l. Limits:

1) The operator shall be equipped with an integral limit system, providing accurate settings to control the open and close positions of the gate, and shall not be affected by manual operation or motor removal.

m. Control Circuit:

1) U.L. listed operator shall have 5vdc controls.

8. Gate Operators: Post mounted and as follows:

a. Mechanical Slide Gate Operators:

1) Duty: Heavy duty, commercial/industrial.

2) Gate Speed: Maximum 2 feet per second.

3) Maximum Gate Weight: 4500 lb.

4) Frequency of Use: 25 cycles per hour.

5) Operating Type: Roller chain, with manual release.

6) Drive Type: Enclosed worm gear and chain-and-sprocket reducers, roller-chain drive.

J. Bi-Fold Gate (TI-11):

1. Automated vehicular gates shall comply with ASTM F 2200, Class III.

2. Gate Frame: The gate frame shall be fabricated from rectangular hollow steel tubes and plate steel members. Manufacturer's assemble shall be a minimum of the following:

   a. The gate shall custom designed, fabricated from tube and plate steel members. Bi-fold gate assembly components shall be welded to maintain structural integrity of frame members.

   b. All frames and framing members shall be true to dimension and square in all directions, and no gate shall be bowed, warped, or out of line, in the vertical or horizontal plane of the door opening by more than 1/8 inch in 20 feet. Exposed welds and welds which interfere with the installation of various parts shall be ground smooth and flush

   c. Provide infill panels in gate leafs matching fencing panel design and spacing. Infill panel shall be centered within gate leafs. Bolted connection shall be with stainless steel bolts and shall be tampered proof, vandal resistant.

   d. Bi-fold gates shall operate without tracks at bottom or overhead.

   e. Provide two bi-folding two-panel gates.

      1) Clear Opening Width.

         a) College Point Entry: Opening – 26'-0" wide by 8'-0" high.

         b) Service Road Exit: Opening – 26'-0" wide by 8'-0" high.

   f. Gates in closed position shall be held in place and align by use of floor receptor / keeper.

   g. Gate hinge operators shall be electromechanical actuators. Hydraulic operation is not allowed.

   h. Sequence of gate operators shall allow movement of both gate panels simultaneously and fold with minimum project into site.

   i. Gate threshold gap shall be less than 4-inches.

3. Hardware: Not less than four pairs of jamb and fold hinges per opening, and all bolts, nuts, fasteners, etc. necessary for complete installation and operation. Jamb hinges shall be dual shear and have two thrust bearings and two needle bearings. Jamb hinges shall be gusseted. Fold hinges shall be dual shear with two thrust bearings. All bearings shall be completely concealed within the hinge barrel. All hinge pins shall be minimum ¾" diameter hardened steel.

4. Gate Support: The gate support column shall be fabricated from RHS steel tube members of a minimum dimension of 10" x 10".Manufacturer's assemble shall be a minimum of the following:

a. The gate support column base plate shall be recessed 6-inches below finish grade. Finish grade material shall be isolated by expansion joint around base plate.

b. All electrical wiring shall be routed though columns. Exposed conduit shall be solid metal conduit, finished to match gate.

c. Gate panel operators and electrical panel shall be mounted to gate support column on secure side.

d. Gate manufacturer shall provide concrete foundation reaction loads to general contractor and Engineer during foundation or site work shop drawing review.

5. Gate Operator and Access Control:

a. Each half of the opening shall be operated by an electro-mechanical drive unit designed for high cycle operation. Operator consists of an electric motor, dual stage gear reducer, and rotating drive arm. The gate shall be operated with connecting rods attached to the rotating drive arm on the operator and to control arms attached to the gate post section and to the gate panel. The connecting rods shall be positive drive, keeping the gate under firm control at all times. The connecting rods shall be fitted with spherical bearings and control arms shall be equipped with oil impregnated bronze bearings on polished shafts.

1) Provide operators and electric accessories compliant with NFPA 70, exterior wet environment.

b. Provide power and control panels shall be remote. One power and controls panel shall operate both gates. See contract drawing for location.

1) Electric motor shall be of sufficient size to operate gates under normal operating conditions at no more than 75 percent of rated capacity.

2) Provide operator and electrical accessories capable of using 208-3 phase power supply.

3) Panel enclosures mounted to support columns shall be finished same as gate. Remote panel enclosures shall be Type 316 stainless steel, #4 finish.

c. Operator shall open and close rapidly and start and stop gradually. Operator shall be adjustable to allow gate to fully clear the opening. Operator shall automatically lock the gate in the closed position.

1) Manual Release: The manual release shall allow the gate to be disengaged and moved manually from any position. Columns shall have an access cover to access the manual release lever. Access cover shall have the option of being

secured with a heavy duty or detention grade lock. Release lever shall be accessible from floor level and allow for easy release and engagement without the use of tools.

2) Limit switches shall be provided at each operator to stop the travel of the gate in its fully open or fully closed position.

d. Access Control:

1) Gate shall operated via access control options:

a) Remote infrared access control.

b) Keypad access control or HID access control or control station as noted in this section.

2) Provide keypad access control panel mounted on left column from unsecure side. On secure side provide control station on freestanding post adjacent to left column.

3) Provide infrared and keypad access control for exiting gate.

e. Detection Loops:

1) Provide (1) safety and (1) Auxiliary (free exit) loop detector at each gate.

2) Entry Gate: Provide vehicle detection loop on secure side and unsecure side of gate.

a) Unsecure side detection loop shall be installed beyond gate operation area, a minimum of 3’-0” from gate in closed position.

b) Secure side detection loop shall be installed beyond gate operation area, a minimum of 1’-3” from gate end in opening position.

c) Gate shall not open until vehicle is on unsecure side detection loop via radio or infrared controls. Control station entry shall be required to open gate with or without vehicle detection.

d) Gate shall not close automatically until vehicle has completely passed over detection loop on both side of gate. Control station entry shall be required to close gate without vehicle detection.

3) Existing Gate: Provide vehicle detection loop on secure side and unsecure side of gates.

a) Secure side detection loop shall be installed beyond gate operation area, a minimum of 1’-3” from gate end in opening position.

b) Unsecure side detection loop shall be installed beyond gate operation area, a minimum of 3’-0” from gate in closed position.

c) Gate shall not open until vehicle is on secure side detection loop. Control station, radio or infrared signal shall be required to open gate. Control station entry shall be required to open gate without vehicle detection.

d) Gate shall not close automatically until vehicle has completely passed over unsecure detection loop. Infrared signal shall close gate.

4) Safety edge and photo eye detection shall override gate operations.

6. UL Standard: Manufacturer and label gate operators to comply with UL 325. The gate operator shall be UL 325 compliant for Class III and IV.

a. Provide safe edges on all hinged and meeting edges.

b. Integrate photo eye sensors into the gate support columns. Photo eye sensor assembly shall not project into clear opening.

1) Provide (2) thru-beam type photo eyes integrated into the gate column and mounted at 6” and 24” above the finished floor, NEMA 4 rated.

c. Obstruction detection devices shall operate gates as noted in this section.

7. Finish:

a. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 2 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1) Color and Gloss: As indicated by manufacturer's designations.

2) Basis of Design Color: RAL 7016 Anthracite Grey.

b. Contractor shall test and apply anti-graffiti coating to fencing assembly. Application shall not void any finish warranty.

1) Applied an anti-graffiti coating on all members of the fence and gates. The anti-graffiti coating shall be Protective Marine Coating type. Color shall be Clear Coat 1K Siloxane as per Sherwin Williams or approved equal.

K. Remote Controls: Electric controls separated from gate and motor and drive mechanism, with NEMA ICS 6, Type 4 enclosure for pedestal mounting, and with

space for additional optional equipment. Provide the following remote-control device(s):

1. Control Station: Momentary-contact, three-button-operated with open, stop, and close function; located remotely from gate. Key switch to lock out open and close buttons.

L. Obstruction Detection Devices: Provide each motorized gate with automatic safety sensors. Activation of sensor causes operator to immediately function as follows:

1. Action: Reverse gate in both opening and closing cycles, and hold until clear of obstruction.

2. Internal Sensor: Built-in torque or current monitor senses gate is obstructed.

3. Sensor Edge: Contact-pressure-sensitive safety edge, profile, and sensitivity designed for type of gate and component indicated, in locations as follows. Connect to control circuit using take-up cable reel or self-coiling cable.

a. Along entire gate leaf leading edge.

b. Along entire gate leaf trailing edge.

c. Along entire length of gate posts, both side.

M. Photoelectric/Infrared Sensor System: Designed to detect an obstruction in gate's path when infrared beam in the zone pattern is interrupted.

N. Leading Edge Gate Sensor: Contact-pressure-sensitive safety edge.

O. Accessories:

1. Warning Module: Audio, strobe-light alarm sounding three to five seconds in advance of gate operation and continuing until gate stops moving; compliant with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

2. External electric-powered solenoid or magnetic lock with delay timer allowing time for lock to release before gate operates.

3. Fire box.

4. Instructional, Safety, and Warning Labels and Signs: According to UL 325.

5. Equipment Bases/Pads: Precast concrete, depth not less than 12 inches, dimensioned and reinforced according to gate operator component manufacturer's written instructions and as indicated on Drawings.

P. Accessory and Miscellaneous Materials: Provide all accessory items and system components of ASTM A666, Type 316 stainless steel, finished to match decorative fences and gates.

Q. Concrete and Masonry Anchors: Concrete and masonry anchors shall be as specified in Section 05 05 23.02 – Miscellaneous Metal Fastenings.

1. Anchors shall be of stainless steel Type 316 and a minimum size of 1/2 inch diameter.

R. Non-Shrink, Non-Metallic Grout: Pre-mixed non-staining cementitious grout requiring only the addition of water.

S. Bolting Materials: As specified in Section 05 05 23.02 – Miscellaneous Metal Fastenings.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Fabrication

1. Provide decorative fences and gates completely factory fabricated using fabrication techniques recommended for stainless steel.

2. Field Measurement: Take field measurements where required, prior to the preparation of Shop Drawings and fabrication, to ensure proper fitting of the Work.

3. Preassemble items in the shop to the greatest extent possible, so as to minimize field splicing and assembly of units at the site. Disassemble units only to the extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

4. Welding

a. Welding shall comply with the requirements of AWS, NYBC and BSA.

b. Field welding shall not be permitted unless approved by Engineer.

B. Decorative Steel Bar Fence Fabrication:

1. Assemble fences into sections by welding bar and rods.

a. Fabricate sections with clips welded to rails for field fastening to posts.

b. Drill posts and clips for fasteners before finishing to maximum extent possible.

2. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.

C. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For aluminum, provide type and alloy as recommended by producer of metal to be welded and as required for strength and compatibility in fabricated items. .

D. Assembling

1. Fencing shall be assembled as indicated in the Contract Drawings or as per Manufacturer's written instructions and recommendations.

E. Final Coating (Anti-Graffiti)

1. Baked-Enamel or Powder-Coat Finish: AAMA 2605 except with a minimum dry film thickness of 2 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2. Color and Gloss: As indicated by manufacturer's designations

a. Basis of Design Color: RAL 7016 Anthracite Grey.

3. Contractor shall test and apply anti-graffiti coating to fencing assembly. Application shall not void any finish warranty.

a. Applied an anti-graffiti coating on all members of the fence and gates. The anti-graffiti coating shall be Protective Marine Coating type. Color shall be Clear Coat 1K Siloxane as per Sherwin Williams or approved equal.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

1. Obtain all ornamental fences and gates components and accessories from the same manufacturer.

2. Provide qualified welding processes and welding operators in accordance with AWS "Structural Welding Code" D1.1, Section 5, Qualification.

3. Provide certification that all welders employed on, or to be employed for, the fabrication of the ornamental fences and gates have satisfactorily passed AWS qualification tests within the previous twelve months. Contractor shall ensure that all certifications are kept current.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examination

1. The Contractor shall examine the alignment of the substrate and conditions under which the decorative fences and gates work is to be performed and notify Engineer in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

3.02 INSTALLATION

A. All cutting, drilling, fitting, and welding shall be done in shop, not in field. If it is found that there needs to be any cutting, drilling, fitting, and welding on site then it is the Contractors responsibility to provide a written explanation to the Engineer as to why this activity needs to be done in field, and wait for the Engineers approval of such activity.

B. Upon written approval by the Engineer, all such work shall be as follows:

1. Perform cutting, drilling and fitting required for installation. Set the work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

2. Fit exposed connections accurately together to form tight hairline joints. Do not cut or abrade the surface of units, which have not been finished after fabrication, and are intended for field connections.

3. See 3.05 for Adjusting, Protecting, and Cleanup procedures and responsibilities.

C. BI-FOLD GATE and slide-gate and operators installation

D. General: Install gates and operators according to manufacturer's written instructions, aligned and true to fence line and grade.

E. The slide gate and installation shall conform to ASTM F 1184 standards for aluminum cantilever slide gates, Type II, Class 1 and Class2. Slide gate and bi-fold gate installation shall conform to ASTM F2200 Class III.

F. Excavation for Support Posts and Concrete Bases: Hand-excavate holes for bases in firm, undisturbed soil to dimensions and depths and at locations as required by gate operator component manufacturer's written instructions and as indicated.

G. Concrete Bases: Cast-in-place or precast concrete, depth not less than 36 inches, dimensioned and reinforced according to gate operator component manufacturer's written instructions and as indicated on Drawings.

H. Comply with NFPA 70 and manufacturer's written instructions for grounding of electric-powered motors, controls, and other devices.

3.03 FIELD TESTING / QUALITY CONTROL

A. The Contractor and Manufacture shall field test all gates and motors to ensure that all gate assembly systems are working together correctly.

B. Any malfunctions, and or design flaws that are witnessed during test shall be fixed immediately.

C. Any minor adjustments may be addressed in field with the approval of the Engineer.

D. All major adjustments that include dismantling and welding shall be done in the shop to prevent damaging the finished materials and to recoat materials that have been stripped of their coating.

3.04 STARTUP / DEMONSTRATION

A. Structural Cantilever Gate System:

1. The complete system shall be adjusted to assure it is performing properly.

2. The system shall be operated for a sufficient period of time to determine that the system is in proper working order.

a. Contractor shall operator slide gate for a minimum of 15 cycles per day for two weeks. Contractor shall submit daily log of the operation and outcome including any adjustment made during test period.

3. Test and Explain Safety Features: Contractor shall hold a minimum of two four-hour instruction sessions with Owner and Engineer. Each session shall be recorded and provide to owner as part of Operations and Maintenance Manual.

a. Each system feature and device is a separate component of the gate system.

b. Read and follow all instructions for each component.

c. Ensure that all instructions for mechanical components, safety devices and the gate operator are available for everyone who will be using the gate system.

d. The warning signs shipped with the gate operator must be installed in prominent position on both sides of the gate.

4. Ensure the owner is clear with regard to the safety points concerning the basic operational guidelines of the safety features of the gate operator system. These safety points are listed in the operator manual and must be read prior to system use.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting

1. Adjust fencing and gates prior to securing in place to ensure proper matching at butting joints and correct alignment throughout their length. Plumb posts in each direction.

2. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

3. Automatic Gate Operators: Energize circuits to electrical equipment and devices. Adjust operators, controls, safety devices, alarms, and limit switches.

a. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

b. Test and adjust controls, alarms, and safeties. Replace damaged and malfunctioning controls and equipment.

4. Lubricate hardware, gate operators, and other moving parts.

B. Demonstration: Engage a factory-authorized service representative to train DEP's personnel to adjust, operate, and maintain gates. Two one-day training sessions shall be provided.

C. Protection

1. Protect cast-in-place sleeves and field-drilled holes from debris and water intrusion by use of temporary covers or removable foam inserts.

D. Cleanup

1. All material that has been affected by cutting, drilling, fitting, and welding, shall also comply with the below requirements.

2. Clean exposed surfaces of decorative fences and gates before leaving the site after completion of installation. Do not use abrasives or non-approved solvent cleaners. Test cleaning techniques on an un-used section of decorative fence or gate before employing cleaning technique in the work.

   a. Remove all stains, dirt, grease and other substances by washing the decorative fences and gates thoroughly using clean water and soap. Rinse with clean water.

   b. Do not use acid cleaning solutions, steel wool or other harsh abrasives. If stains remain after washing, remove finish and restore in accordance with recommendations of the manufacturer.

3. Leave fencing system and gates, free from dents, burrs, scratches, holes and other blemishes. Refinish minor scratches to be indistinguishable from adjacent un-scarred areas. If, after refinishing and the Engineers inspection, damage remains visible when viewed from five feet away, or if finish of work has been altered to the point where it appears different from adjacent work, Contractor shall replace damaged work with new undamaged material at no additional expense to the City.

4. At the completion of the work, clean or replace adjacent work, marred by the work of this Section.

5. Remove all materials and debris and leave the site in clean condition.

END OF SECTION

SECTION 32 90 00 - PLANTING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Planting as specified herein includes, but is not limited to, the following:

1. Furnishing and installing new trees, shrubs, grasses, and all other plant materials.

2. Staking and guying of trees, only where shown on the Contract Drawings or as directed.

3. Furnishing and installing mulch.

4. Protection and maintenance of all plant materials and the replacement of plantings as required until Substantial Completion.

5. Plant replacements during guarantee period.

B. The Contractor shall implement practices and procedures to meet the Project's sustainability goals as identified in the Contract Documents. The Contractor shall ensure that the sustainability requirements of this Section are implemented to the fullest extent.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 31 23 23 - Fill

B. Section 31 25 10 - Dust, Soil Erosion and Sediment Control

C. Section 32 90 05 - Soil Mixes

1.04 REFERENCES

A. AmericanHort

1. American Standard for Nursery Stock (ASNS), ANSI Z60.1, current edition

B. New York Flora Atlas (http://newyork.plantatlas.usf.edu/Default.aspx)

C. USDA Plant Database (http://plants.usda.gov/java/) & USDA Plant Hardiness Zone Map (http://planthardiness.ars.usda.gov/PHZMWeb/)

1.05 DESCRIPTION

A. Contractor shall locate all required plant materials and be present for their inspection, as directed by the Engineer, at the nursery prior to transport or upon delivery of the materials on Site. Notify the Engineer at least 14 days in advance of the Contractor's desired inspection dates and locations. The Engineer may designate a DEP Bureau of Water Supply Restoration Specialist as the Engineer's representative.

B. Inspection at Nursery: All plants may be inspected and selected by the Engineer at the nursery for conformity to the requirements of the Contract. Whether plant materials are inspected or not at the nursery, the Contractor shall make all preselection arrangements required by the Engineer to ensure an efficient selection procedure. Approval of plant materials at the nursery shall not affect the rights to inspect or reject the materials upon delivery or later.

C. Inspection at Delivery On-Site: Notify the Engineer at least five (5) working days in advance of delivery of plants to the Site.

1. The Engineer will inspect all plants upon delivery to the Site.

2. Contractor shall schedule a time for on-site inspection prior to planting, and shall arrange for adequate labor and equipment on-site at the time of inspection to unload, open, and handle plants during inspection.

3. The Engineer may reject any plant material prior to or upon delivery to the Site.

a. All plant material that is dead, dying or appears unhealthy will be rejected.

b. All plant material that has been improperly maintained, dug, transported or handled in such a way as to impair its appearance or health will be rejected.

c. All substitutions are subject to approval by the City.

D. The Engineer will be the sole judge of the condition of the plants.

1. All material that is rejected on site shall be removed immediately from the Site, and replaced with new material selected or approved by the Engineer, at no additional cost to the City.

E. Sustainable Design Requirements:

1. Regional Materials: Provide plant materials that were grown and harvested, or extracted, within 250 miles of the Site unless otherwise required in the Contract.

1.06 QUALITY ASSURANCE

A. Comply with all rules, regulations, laws and ordinances of local, state and federal authorities having jurisdiction. Provide labor, materials, equipment and services necessary for work to comply with such requirements at no additional cost to City.

B. Procure and pay for all permits and licenses required. Obtain all required permits in a timely manner to avoid delays to the Work.

C. Plant Quality

1. Provide plant material to meet or exceed applicable standards defined by American Standard for Nursery Stock (ANSI Z60.1, latest edition). including plant names, size and grading standards.

a. Plants shall be typical of their species or variety with normal habits of growth, in accordance with ANSI Z60.1; sound, healthy and vigorous, well-branched and densely foliated when in leaf, with healthy well developed root systems; and free from disease, abrasions of the bark, insect pests, eggs or larvae.

b. Plant species native to the Eastern United States shall be provided. Non-native species shall not be considered as substitutes for native species.

c. Plants shall be true to species and, if as a variety or cultivar, said cultivar or variety shall be listed in The New York Flora Atlas (http://newyork.plantatlas.usf.edu/Default.aspx) to determine nativity.

d. Native plant material shall be derived from the local genotypes of the native plants specified to the greatest extent practicable. No plant material shall be collected or harvested from non-nursery areas.

e. Plants that have escaped cultivation, or have accidentally been introduced or naturalized into native habitats, shall not be considered native to the Eastern United States. Refer to USDA Plants Database (http://plants.usda.gov/java) for taxonomy and New York Flora Atlas to determine nativity.

D. Landscape Subcontractor

1. The Contractor shall provide evidence to the Engineer that the landscape subcontractor has experience in landscape work similar to the type and scale of work to be provided in this Project.

1.07 SUBMITTALS

A. Submit a Statement of Qualifications for the landscape subcontractor that consists of the following information:

1. Company name and address
2. Number of years in business under this name
3. Number of current full-time, part-time, and seasonal employees
4. Estimated number of employees intended for this Project
5. Current workload:
   a. Name and address of current projects
   b. Types and dollar amounts of work for which landscape subcontractor is responsible in each current project
   c. Estimated completion date for each current project
6. References for three (3) projects completed within the last six (6) years, which are similar in scope to this Project, including the following information for each project:
   a. Name and address of project
   b. General description of work
   c. Dollar amount of landscape work performed
   d. Dates of commencement and completion of the landscape work
   e. Verified contact information for at least one (1) representative of the owner or prime construction contractors in each project:
      1) Name,
      2) Mailing address,
      3) E-mail address, and
      4) Telephone numbers (Office and Direct).
7. Contact information similar to above for at least one (1) representative of the architect, engineer, landscape architect, or other representative of the designer or construction manager for each project given as reference.

B. Samples: Submit samples of the following items:

1. Mulch: One (1) pound bag with manufacturer's certification of content

C. Growers/Nurseries: Contractor shall submit a list of proposed growers/nurseries prior to the commencement of any landscaping Work, with sufficient advance notice of at least 60 days or as stated in the Contract.

D. For nurseries, a copy of state inspection certificate for current year shall be submitted.

E. Materials/Certificates: Contractor shall submit a list of all materials and certificates specified in this Section prior to the commencement of any landscaping Work, with sufficient advance notice of at least 30 days or as stated in the Contract.

F. All necessary state, federal and other inspection certificates as may be required by law.

G. Product Data - Where applicable, the following product data shall be submitted:

1. Manufacturers' product information for filter fabric, showing conformance with the specified requirements.

2. Analysis of each seed or hydroseed mix to be used, showing percentage of each species, percentage of purity, weed content and germination of seed.

3. Identification of sod source and certification that all sod material is true to name, type, purity and other criteria in conformance with these specifications.

4. Certified analysis for each treatment, amendment, and fertilizer material specified and as used, including weight for packaged material.

5. Manufacturers' product information for erosion control blankets or mats, including documentation that products are 100% biodegradable.

H. Documentation: The Contractor shall submit written documentation at least 30 days prior to scheduled start of planting that all plant material has been ordered.

I. Submit written schedule of maintenance operations proposed for the guarantee period. Schedule shall be in the form of a list of all proposed maintenance tasks, with dates showing when each maintenance task will be performed and its frequency of occurrence.

J. Sustainable Design Submittals:

1. Environmental Materials Reporting Form (EMRF) Regional Materials. Provide the following information:

a. Name of Product and Manufacturer.

b. Material cost breakdowns. Cost breakdowns must include total material-only cost (excluding installation, labor and equipment).

K. Indicate the location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. For assemblies, include the percentage by weight that is considered regional.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials in unopened bags or containers, each clearly bearing the name of the producer, the material composition, manufacturers' certified analysis, and the weight of the material.

B. Handle all plant material to prevent injury to trunks, branches and roots.

1. Do not bend or bind-tie trees in such manner as to damage bark, break branches or destroy natural shape.

2. Do not drop or throw plant material during delivery. Unloading shall be performed with appropriate equipment.

C. Pack and ship all plant material to ensure arrival at site in good condition. Provide protective covering during transport and delivery.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. All new plant material shall be guaranteed for a period of 1 year after the date of Substantial Completion, unless otherwise required in the Contract.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable suppliers of planting materials shall be as indicated below.

1. Hardscrabble Farms Nursery, North Salem, NY (www.hardscrabblefarms.com);

2. Pinelands Nursery, Columbus, NJ (www.pinelandsnursery.com);

3. New England Wetland Plants, Inc., Amherst, MA (www.newp.com);

4. One Nature Nursery, Bloomingburg, NY (www.onenaturellc.com);

5. Ernst Conservation Seed, Meadville, PA (www.ernstseed.com);

6. Sylva Native Nursery & Seed Company, Glen Rock, PA (www.sylvanative.com);

7. Octoraro Native Plant Nursery, Kirkwood, PA (www.octoraro.com);

8. Northcreek Nurseries, Oxford, PA (http://www.northcreeknurseries.com);

9. Or approved equal.

B. All nurseries supplying plant material shall have a registration certificate from the Department of Agriculture and Markets, Division of Plant Industry, New York (or similar organization in the state from which plant material is obtained) certifying

that the plant material is apparently free of injurious insects, diseases and invasive plant material.

2.02 MATERIALS / EQUIPMENT

A. Trees and Shrubs

1. All woody plant material shall be nursery grown in accordance with good horticultural practice, for at least two (2) years under climatic conditions and soils similar to those at the Site. All plants shall be of specimen quality. All trees are to be uniform and matched. All trees shall have straight trunks with leader intact, undamaged and uncut. Trees with damaged or crooked leaders, bark or abrasions, sunscald, disfiguring knots, or insect damage will not be accepted.

2. All trees shall be freshly dug for this Project. Depth of planting shall be checked on all trees being tagged at the nursery. Remove all soil or other fill material above the natural point where the tree trunk begins to spread, (the flare), prior to digging and ball and burlap operations.

3. Size:

a. Caliper measurement shall be taken on the trunk at 6 inches above the natural ground line for trees up to and including 4 inches in caliper, and 12 inches above the ground for trees greater than 4 inches in caliper.

b. Height and spread dimensions refer to the main body of plant, and not from branch tip to tip.

c. If a range of size is given, no plant shall be less than the minimum size and not less than 50 percent of the plants shall be as large as the maximum size specified.

d. Plants that meet measurements but do not possess a normal balance between height and spread shall be rejected.

e. Plants larger than specified may be used only if approved by Engineer. Use of such plants shall not increase the Contract price. If larger plants are approved, the root ball shall be increased in proportion to the size of the plant. The Contractor shall verify that the size of the root ball will fit in prepared planting pits.

4. All trees shall be either container-grown or balled and burlapped stock (B&B), with a compact natural ball of earth, firmly wrapped and tied in burlap fabric, as appropriate for the size of the plant material.

a. Root ball sizes shall be in accordance with standards specified in ASNI Z60.1

b. Plants with cracked or broken rootballs will not be accepted.

c. Only natural burlap fabric shall be acceptable for balling. Plastic and other non-biodegradable fabrics will not be accepted.

5. Staking and Guying Materials

a. Stakes (where specified only): 3-inch diameter cedar, fir, or hemlock stakes, with pointed ends. Stakes shall be straight, sound, and free from defects that may impair strength.

b. Tree tie: ¾-inch thick polypropylene woven tree tie

B. Drainage Gravel

1. Drainage fill shall conform to the requirements of Section 31 23 23 – Fill, and shall be clean, free from silt and organic materials.

C. Mulch

1. Mulch shall be a double-shredded natural forest product of a uniform grade, partially decomposed, undyed, free from sawdust, with no additives or any other treatment. Size of bark shall be from 5/8 inch to one and 1/4 inch.

2. Mulch sources shall be free of weed seeds, diseases or pest infestations including but not limited to the Emerald Ash Borer, Asian Longhorned Beetle and Spotted Lanternfly. Use of material from any areas that have been designated for quarantine of wood products by any state or federal agency is strictly prohibited.

D. Filter Fabric

1. Filter fabric shall be non-woven type conforming to the requirements of Section 31 25 10 - Dust, Soil Erosion and Sediment Control.

E. Water

The Contractor shall be supply all required water to the Site at no additional cost to the City.

a. The Contractor shall correct all Work injured or damaged because of the lack of water, or the use of too much water, or the use of contaminated water.

b. Water shall be free from impurities injurious to vegetation.

F. Tree Irrigation Bags

1. Unless otherwise shown on the Contract Drawings, required in the Contract, or directed by the Engineer, the Contractor shall furnish tree irrigation bags for all trees over 1-1/2 inch caliper. The irrigation bags shall be 100% reinforced UV stable polyethylene, at least 10 mils. thick with a polyester scrim lining, such as Tree-Gator, as manufactured by Spectrum Products, Raleigh, NC, or approved equal. The irrigation bags shall have a minimum 20-gallon capacity.

G. Erosion Control Mats

1. Erosion control blankets or mats shall be 100% biodegradable and free of any plastic.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examination

1. Approximately one (1) month prior to the expiration of the guarantee period, the Contractor shall arrange a site inspection by the Engineer.
2. At this time, the Engineer will prepare a list of all remedial Work required, including plant replacement and maintenance.
3. This Work shall be carried out before the end of the guarantee period, unless weather conditions cause delays, in which case such Work shall be carried out as soon as is practical, as determined by DEP.
4. The Contractor shall coordinate its Work with that of other Contractors. Such coordination shall include, but not be limited to:
    a. Location of all underground utility lines and structures
    b. Scheduling of planting operations
    c. Scheduling of maintenance operations
5. Drainage at tree pits: If directed by the Engineer, check drainage at tree pits prior to planting, by performing percolation tests (in dry weather) as follows:
    a. Dig out planting hole to required depth and fill hole half full of water. Monitor decrease in water level to determine if drainage is appropriate for soil type. Soils in wetter areas will drain more slowly that soils in dryer areas.
    b. If water does not drain adequately from plant pits, amend conditions at tree pits and planting beds as required for satisfactory drainage. If topsoil or subgrade has been over-compacted by the Contractor’s operations, such as by compaction equipment or by allowing vehicles or equipment to pass over the area, the Contractor shall remove and replace over-compacted materials at its own expense.
    c. Obtain approval of Engineer for proposed amendments.
    d. Do not place trees in pits until approval of drainage conditions by the Engineer.

6. The Contractor shall be liable for all damage to surrounding areas caused by planting operations and shall be required to restore or replace the damaged areas to their original condition.

7. Contractor is responsible for determining the location of all utilities, by contacting the appropriate utility company prior to any planting activities.

   a. Verify that underground utilities and irrigation systems in landscape areas are in place, at the proper location, tested (except final irrigation testing) and ready for use.

      1) Take proper precautions so as not to disturb or damage sub-surface elements.

   b. Coordinate with other trades.

8. The Contractor is liable for any damage to such utilities during the course of construction and is responsible for making necessary repairs to damaged utilities at its own expense.

B. Preparation

1. Planting

   a. Install filter fabric under planted areas, in areas shown on the Drawings.

      1) Fabric shall be overlapped by a minimum of six (6) inches.

      2) Fabric shall be held in place with wire staples of adequate quantities to prevent movement of fabric during planting operations.

      3) Fabric ends shall be secured in trenches as shown on the Drawings.

      4) No fabric shall be visible following completion of planting and seeding operations.

   b. Planting soil mix materials and installation shall be as specified in Section 32 90 05 – Soil Mixes.

   c. Exercise extreme caution during excavation to avoid damaging or interrupting existing underground utilities. Use appropriate detection equipment to locate utilities during excavation for planting.

   d. Erect barricades, warning signs, or other protective devices as may be required by local, state, or federal laws and regulations to protect open excavations.

3.02 INSTALLATION

A. For projects within New York City, plant only within the following dates, weather permitting. Do not plant in times of high wind, rain, sleet, or snow when the ground is frozen or excessively wet; or when the soil is otherwise in an

unsatisfactory condition for planting. Planting at times other than those specified will be at the Contractor's own risk, and will not invalidate any guarantees.

1. B & B Deciduous trees and shrubs:
   a. Spring: March 15 to May 15
   b. Fall: October 15 to December 15
2. The following trees shall be planted during the spring season only:
   a. Acer rubrum and A. saccharum
   b. Betula lenta, B. allegheniensis and B. populifolia
   c. Carpinus caroliniana
   d. Carya spp.
   e. Castanea dentata
   f. Cornus alternifolia and C. florida
   g. Liriodendron tulipifera
   h. Nyssa sylvatica
   i. Ostrya virginiana
   j. Pinus rigida and P. strobus
   k. Quercus spp.,except Q. palustris or Q bicolor
   l. Salix amygdaloides
   m. Sorbus americana
   n. Tilia americana
   o. Tsuga canadensis
   p. Viburnum lentago and V. prunifolium
   q. Betula sp.
   r. Crataegus sp.
   s. Liquidambar styraciflua
   t. Liriodendron tulipifera
   u. Platanus acerifolia
   v. Prunus sp.
   w. Quercus sp.
   x. Salix babylonica
   y. Tilia tomentosa
   z. Zelkova sp.
3. B & B Evergreen trees and shrubs

a. Spring: March 15 to May 15

b. Fall: September 1 to December 1

4. Container-grown perennials, vines, and ground cover plants:

a. Spring: March 15 to July 1

b. Fall: September 1 to November 1

B. Do not plant until plant material has been approved by the Resident Engineer at the Site.

C. If planting is delayed more than 6 hours after delivery, provide adequate means of protection from freezing and from the drying effects of wind and sun.

1. Protect root balls with soil, wet mulch, or other acceptable material.

2. Provide shade structures or other covering as required to protect from sunscald.

3. Water as necessary until planted. Do not allow plant material to wilt or show signs of stress from lack of water. Provide all water and equipment for water distribution at no additional cost to the City.

4. Do not remove container-grown stock from containers prior to planting.

D. Placement of Plants

1. Plants shall be set in the center of pits, plumb and straight, in accordance with the planting details, and faced to give best appearance and relationship to adjacent plants and structures.

2. Plant to such depth that the finished grade level of plant, after settlement, will be the same as that at which the plant was grown.

3. Trees must be planted at the depth of the flare, where roots spread from the trunk. The flare must be located and placed at the correct level before continuing planting operations.

E. Planting Balled and Burlapped Trees and Shrubs

1. Excavate plant pits to minimum dimensions shown on the Contract Drawings. If plant pits are mechanically dug, the sides of the pit shall be broken down or roughened with a shovel or other hand tool to eliminate surface glazing.

2. Remove any platforms, wire, and surplus binding from top and sides of ball.

3. Position plants in center of pit, using gentle handling to avoid damage to any part of the plant.

4. Set plants on a bed of compacted soil mix, to position at the correct depth, as shown on the Drawings.

5. Cut and remove burlap, rope ties, and wire baskets from the root ball, backfilling and gently removing burlap and wire basket in sections as needed to support the root ball.

6. If wire baskets are used to contain the root ball, these shall be entirely removed before planting.

7. Fully remove all burlap, non-biodegradable twine and other materials.

8. Cleanly cut off all visible broken or frayed roots.

9. Add mycorrhizal fungi inoculant, if specified, to each tree planting as per the approved manufacturer's or supplier's instructions.

10. Apply water retention additive as per approved manufacturer's or supplier's instructions.

11. Backfilling: Fill plant pit with soil mix by hand, in layers not more than six (6) inches deep, and with each layer thoroughly settled by hand tamping and with water, and free of all voids before next layer is put in place.

12. Install tree irrigation bags and fill with water, unless otherwise specified or directed by the Engineer.

F. Planting Perennials, Vines, and Container Grown Shrubs

1. Excavate plant holes to depth of container and twice the container diameter.

2. Carefully remove plant from container using gentle handling to avoid damage to any part of plant.

3. If roots are loose, spread roots out evenly over a mound of soil mix. If roots are tight and compact, loosen by pulling gently apart. If plant roots will not separate, use a sharp tool to make vertical slits in the root ball, approximately 1/2-inch deep at three or four locations around root mass.

4. Set plants on a bed of compacted soil mix, so that the root ball is level with the surface of the soil.

5. Backfilling: Fill plant pit with soil mix by hand, pushing the mix around and just over the surface of the root ball. Add soil mix in layers not more than four inches (4") deep, and with each layer thoroughly settled by hand tamping and with water, and free of all voids before next layer is put in place.

G. Saucering

1. After backfilling is completed, a saucer shall be made for the retention of water around each plant, unless impracticable because of placement of tree gratings or other paving material over planted area.

2. The saucer shall be of the same diameter as that of the hole dug.

3. The lip shall be level all around and shall be at least 4 inches high for trees, and 2 inches high for shrubs.

H. Watering

1. Immediately after installation of each plant, the soil around it shall be thoroughly saturated with water.

   a. Apply water slowly so as to penetrate the entire root system.

   b. Watering shall continue throughout the maintenance and guarantee period, as frequently as seasonal conditions require, until Final Acceptance of the Work.

   c. Contractor shall be responsible for adequate water both before and after installation of irrigation system.

I. Mulching

1. After planting operations are complete all plant bed areas shall be covered with approved mulch.

   a. Unless otherwise specified on the Contract Drawings, mulch shall be installed at an even depth of three (3) inches over tree pit and shrub areas and two (2) inches over groundcover beds.

   b. Mulch shall be contained within the plant bed areas and shall not be permitted to spread onto paved areas. Mulch shall not cover plants.

   c. Mulch shall not be placed in direct contact with tree trunks. The area of the root flare shall be left free of mulch.

J. Staking

1. Trees shall be staked only if shown on the Contract Drawings, required in the Contract, or directed by the Engineer.

   a. Trees shall stand plumb after staking.

   b. Do not use tree wrap.

K. Pruning

1. Perform pruning following planting only as shown on the Contract Drawings, required in the Contract, or directed by the Engineer and approved by the City.

   a. Excessive pruning at the time of transplanting shall be avoided.

   b. Pruning shall be performed by a Certified Arborist in accordance with current best practices of the International Society of Arboriculture.

   c. All deadwood and broken or damaged branches shall be removed. Plants exhibiting suckers should be rejected.

   d. Pruning shall be done with clean, sharp tools.

e. No leaders shall be cut. Each cut shall be made carefully, at the correct location, leaving a smooth surface with no jagged edges or torn bark. The correct anatomical location is just beyond the branch collar.

f. Large or heavy limbs shall not be removed.

L. Antidesiccant Spraying

1. Use antidesiccant only as approved by Engineer. Approval is required for each condition of use.

3.03 FIELD TESTING / QUALITY CONTROL

A. Protection and Maintenance

1. At least 30 days prior to the date of the written request for Substantial Completion, the Contractor shall submit a written protection and maintenance program and schedule to the Engineer for approval.

2. Protection and Maintenance program shall be revised and resubmitted as required until approved by Engineer.

3. During the guarantee period, the Contractor shall maintain all plant materials as specified herein, and as noted in the approved maintenance schedule, and shall replace, at no additional cost to the City, any and all plant material that has died or, in the opinion of the Engineer or Engineer's designated representative, is in unhealthy or unsightly condition.

4. The Contractor is responsible for providing and maintaining adequate protection measures for all planted areas throughout the guarantee period in order to protect plantings from any subsequent construction operations or other types of physical damage.

a. Protection measures may include, but not be limited to, approved temporary fencing, tree guards, signage and other measures as determined to be necessary during the guarantee period.

b. Local fence ordinances and guidelines may also apply to the work, requiring the Contractor to submit design drawings or other documents for obtaining the necessary local permits or approvals at no additional cost to the City.

B. Replacements

1. There will be no limit to the number of times replacements are made of individual plants, unless conditions causing the failure can be proved to be beyond the control of the Contractor.

2. The Contractor is responsible for replacing any and all plant material and any associated compacted soils that are damaged by the Contractor's own operations or the operations of any of its subcontractors, or due to other

damage resulting from a lack of adequate protective measures, at no additional cost to the City.

3. All replacements shall be in accordance with original specification or, if it is determined that specified plants are inappropriate for as-built conditions, they may be replaced with the approval of Engineer to more appropriate species as identified by a DEP Restoration Specialist, Landscape Architect or other qualified professional.

4. Cost of all replacements shall be included in the Contract price. No additional payment will be made therefor.

5. Replace unacceptable plant material no later than the next succeeding planting season.

6. Guarantee all replaced material for a period of 18 months after the date of replacement, unless otherwise required in the Contract.

7. All areas damaged or soiled by replacement planting operations are to be fully restored to their original condition at no additional cost to the City.

C. Substantial Completion

1. Contractor shall submit a written request to the Engineer, for a formal inspection of the planting Work for Substantial Completion.

2. To be accepted at the time of formal inspection of planting Work, all plant material must be alive, healthy, and installed as specified.

a. If plants are dead, dying, or unhealthy, or if landscaping does not serve its visual or soil stabilization functions, or if workmanship is unacceptable to the Engineer or Engineer's Representative for other reasons, written notice will be given to the Contractor in the form of a punch list that itemizes all remedial Work required for Substantial Completion.

b. This Work may include plant replacement or maintenance which must be carried out prior to issuance of the Certificate of Substantial Completion.

c. The Certificate of Substantial Completion will not be issued until a written maintenance program, as described herein, has been approved by the Engineer.

D. Final Acceptance

1. Following the completion of all remedial work and replacement plantings, the Contractor shall request the Engineer in writing for a formal inspection of the landscape Work for Final Acceptance.

If replacement plantings are required, Acceptance will be provisional upon a final inspection at the end of the guarantee period for the plant replacements.

3.04 STARTUP / DEMONSTRATION

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting

1. Maintenance of all plant material shall begin immediately after planting, and continue until the end of the guarantee period, unless otherwise noted.

2. Defective Work shall be corrected as soon as possible after it becomes apparent and when weather season permits. The Engineer shall be the sole judge of the condition of the plants.

3. Maintenance shall include:

   a. Watering, replanting, repair of ruts and erosion, repair of protection devices, weeding and continuous control of invasive species, fertilizing and mowing of lawn areas.

   b. The removal of all dead, dying or unhealthy plant material, and replacement of such material with new plants or seeding to meet all specifications of the original plantings.

   c. Protection from insects, disease, and invasive species to maintain optimum health. Infection or infestation may require removal and disposal off-site followed by replacement with plants free of infection at the discretion of the Engineer's designated representative.

   d. The repeating of any or all phases of planting as specified herein, or that may be required to obtain healthy plantings and a uniform, thick, and well developed stand of grass.

4. Specific Maintenance Tasks: Maintenance shall include, but not be limited to the following:

5. Watering: Water planted areas as required. Do not permit plant material to wilt or to show signs of stress from lack of water. Contractor shall supply and distribute water to all plantings during the full time of their establishment at the Site and provide all equipment for water distribution at no additional cost to the City. Plants shall be inspected by the Contractor for watering needs at least once each week, and watered as necessary to promote plant growth and vitality.

6. Fertilizers: If applicable, apply any approved fertilizers, herbicides, pesticides or fungicides as required, or as directed by the Engineer, to keep all plantings healthy and pest-free throughout the guarantee period. Any fertilizers, herbicides or pesticides must be approved in advance by DEP.

7. Rodents: Protect against and exterminate rodents, and repair of any damage caused by rodent activities.

8. Weeding: Weed to keep all planted areas weed-free throughout the guarantee period.

9. Mulching: Add mulch material as required to maintain mulch at specified depth.

10. Resetting: Reset plant material that has settled, to proper grade and position.

11. Pruning: Prune trees and shrubs to remove all dead or broken branches, throughout the guarantee period. Prune flowering shrubs as necessary to ensure flowering.

12. Trimming: Cut back dead stalks, flowers and foliage from perennials in fall after the first frost. Trim or dead-head spent flower blossoms throughout the guarantee period.

13. Anchoring: Maintain any approved tree stakes, ties and other tree anchoring systems, including tightening, repair or replacement as required, and removal at the end of the guarantee period, or as directed by the Engineer.

14. Irrigation: If applicable, coordinate with irrigation system installer for all adjustments to irrigation as required.

15. Instruct City's maintenance personnel in all maintenance procedures.

16. Maintenance Program

    a. Prior to Substantial Completion, the Contractor shall arrange a meeting with the Engineer and with the City's designated maintenance personnel to review together the submitted maintenance program and any modifications required for the duration of the guarantee period.

    b. The Contractor shall make periodic inspections, at no extra cost, during the guarantee period to determine what changes, if any, should be made in the maintenance program.

    c. Any recommended changes shall be submitted in writing to the Engineer.

    d. Additional remedial work not included in the maintenance program shall be carried out by the Contractor as deficiencies are identified and reported by the Engineer or designated maintenance personnel.

17. Replacements

    a. In accordance with the requirements for Warranty (Guarantee Period) under this Section, the Contractor shall replace, as soon as weather conditions permit, and within a specified planting period, all plants determined dead and/or dying by the Engineer or the City's designated personnel during and at the end of the guarantee period. Replacements shall be made at no additional cost to the City. Labor and all materials needed for installation of replacements shall be included in the warranty.

b. Plants shall be free of dead or dying branches and shall bear foliage of normal density, size, and color.

c. Trees having lost their central leader or exhibit crown dieback at the end of the guarantee shall be replaced.

d. Replacements shall match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in this Section.

B. Plant Protection

1. The Contractor shall provide at its own expense all protection that is deemed necessary for all plants and lawn areas against damage prior to Final Acceptance.

2. Removal of Temporary Protection Measures: All temporary protection measures employed during the construction period shall be removed prior to Substantial Completion unless otherwise directed by the Engineer. All stakes and ties used for temporary bracing of trees shall be removed and disposed of by the Contractor off site at its own expense at the end of the guarantee period, or earlier at the direction of the Engineer.

C. Clean Up

1. At the end of each work day the Contractor shall broom-clean the site, to remove all trash, debris, and loose soil materials. Store materials and equipment where directed.

2. Immediately following the completion of planting operations, the Contractor shall remove all excess materials, stockpiles, waste materials, tools, and equipment, and leave the Site in a clear and clean condition.

3. Immediately remove all rejected materials from the Site. All rejected materials and other waste or debris shall become the property of the Contractor, who shall legally dispose of same off-site.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 32 90 05 - SOIL MIXES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The work of this Section includes but is not limited to the following:

1. Supply of component materials and soil amendments for soil mixes or supply of blended soil mixes from approved off-site sources.

2. Reuse of existing topsoil stripped from site.

3. Preparation of soil mixes on site.

4. Installation, placement, spreading, and fine grading of soil mixes.

5. Testing of all soil component materials, soil amendments, and soil mixes.

B. The Contractor shall implement practices and procedures to meet the project's sustainability goals as identified in the Contract Documents. The Contractor shall ensure that the sustainability requirements of this Section are implemented to the fullest extent.

C. The following index of this Section is presented for convenience:

Article	Title	Section Page
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1.03	Related Sections	2
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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 31 23 16 -- Excavation

B. Section 31 23 23 -- Fill

C. Section 31 25 10 -- Dust, Soil Erosion and Sediment Control

D. Section 32 90 00 -- Planting

1.04 REFERENCES

A. ASTM International (ASTM) Standards

1. ASTM D1556 -- Standard Test Method for Density and Unit Weight of Soil in Place by Sand Cone Method

2. ASTM D1557 -- Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))

3. ASTM D3385 -- Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometers

4. ASTM D4318 -- Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils

5. ASTM D6938 -- Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

6. ASTM F1647 -- Standard Test Methods for Organic Matter Content of Athletic Field Rootzone Mixes

B. The Northeast Coordinating Committee for Soil Testing

1. NEC-1012 -- Recommended soil testing procedures for the Northeast United States, Northeastern Regional Publication Number 493

C. The New York City Department of Health and Mental Hygiene

1. Local Law 37 Pesticides Use by City Agencies – Pesticide Product Search Local Law 37 - NYC Health

D. The New York State Department of Environmental Conservation Bureau of Pesticide Management

1. Pesticide Product Information Portal

https://www.dec.ny.gov/nyspad/products?0

E. New York State Department of Environmental Conservation (NYSDEC)

1. 6NYCRR Subpart 360-5, Composting Facilities
2. 6NYCRR Subpart 375-6, Remedial Program Soil Cleanup Objectives
3. 6NYCRR Part 360 Part 360, Solid Waste Management Facilities

1.05 DESCRIPTION

A. System Design Requirements

1. All soil mix components shall be tested and approved prior to incorporation into blended soil mixes.
2. Provide adequate quantities of all soil mix materials to attain, after compaction and natural settlement, all design-finished grades.
3. Sustainable Design Requirements
   a. Regional Materials: Soil shall be extracted within 250 miles of the project site.

1.06 QUALITY ASSURANCE

A. Contractor shall submit written test reports as required in this Section.

1. Testing shall be carried out by an independent testing laboratory.
2. Engineer's approval of the testing laboratory shall be obtained by the Contractor before it is given any work of this Section.
3. Contractor shall be responsible for timely submittal of samples to the testing laboratory.

B. Each test shall be carried out using the categories and sieve sizes as specified herein. Failure to include any of the required criteria will be sufficient cause for rejection of the test.

C. Each test report shall include the following information:

1. Project title
2. Name of Contractor
3. Name of material supplier or location where material is extracted from
4. Testing laboratory name, address and telephone number
5. Type of test
6. Date of test
7. Test results, including identification of deviations from acceptable ranges.

D. Each sample shall be tested, as applicable, for the following:

1. Mechanical analysis: Sieve method, using sieve sizes specified.
2. pH should be measured according to Recommended Soil Testing Procedures for the Northeastern United States (NEC-1012). Where soil will

be used to support plant growth, lab analysis results must include corrective recommendations.

3. Organic matter content: Percentage of oven-dry weight of soil, determined by loss on ignition of moisture-free sample, in accordance with Method A of ASTM F1647.

4. Electrical conductivity (soluble salts): Test by saturated paste method in deciSiemens per meter (dS/m).

5. Soil Fertility Analysis: Analysis for available macronutrients including, at a minimum, phosphorus and potassium in parts per million according to methods as specified in NEC-1012. Test methods and fertility recommendations must be included with results.

6. Chemical Analyses shall include the 6 NYCRR Part 375-6 compounds detailed in Specification 02 24 20 - Soil Sampling and Analysis. All analyses shall be performed by a testing laboratory certified by the New York State Department of Health Environmental Laboratory Accreditation Program (NYSDOH-ELAP). The frequency of testing per volume of fill shall be in accordance with 6 NYCRR Part 360.13 (e)(1), Table 1, Minimum Analysis Frequency for Fill.

E. The Engineer may take and analyze at any time, such additional samples of materials as deemed necessary for verification of conformance to specification requirements. Contractor shall furnish samples for this purpose upon request and shall perform testing as requested at no additional cost to the City.

F. No component bulk material for soil mix shall be used or blended into a mix, until test reports have been received and approved by the Engineer. As necessary, make any and all soil mix amendments and resubmit test reports indicating amendments, until approved.

G. Comply with all rules, regulations, laws and ordinances of local, state and federal authorities having jurisdiction. Provide labor, materials, equipment and services necessary for work to comply with such requirements at no additional cost to City.

H. Procure and pay for all permits and licenses required for the Work of this Section.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Manufacturer’s technical information, including application instructions where relevant, for all soil amendment materials required.

a. Fertilizers

b. Soil Inoculants

c. Herbicides

d. Water-absorbent Polymer

2. Samples of Soil Mix Components (1-pound package each):
   a. Topsoil -- offsite imported material
   b. Topsoil -- stripped from site
   c. Compost
3. Samples of Blended Soil Mixes (1-pound package each):
   a. Planting Mix
   b. Lawn Mix
   c. Aquatic/Marginal Mix
4. Test Results for Soil Mix Components (written report for each bulk component):
   a. Topsoil -- offsite imported material
   b. Topsoil -- stripped from site
   c. Sand
   d. Compost
5. Test Results for Blended Soil Mixes (written report for each blended soil mix):
   a. Planting Mix
   b. Lawn Mix
   c. Aquatic/Marginal Mix
6. Sources and Manufacturers List: Submit a full list of sources and manufacturers of soil mixes, including component materials and soil amendments.

B. Sustainable Design Submittals:
1. Regional Materials: Provide the following information:
   a. Names of product and manufacturer
   b. Material cost breakdowns. Cost breakdowns must include total material-only cost (excluding installation, labor and equipment).
   c. Indicate the location and distance from the Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. (For assemblies, include the percentage by weight that is considered regional.)

1.08 DELIVERY, STORAGE, AND HANDLING

A. Conform to all governmental regulations in regard to the transportation of materials to, from, and at the job site, and secure in advance such permits as may be necessary.

B. Packaged Materials: Deliver packaged materials to the location where planting soil mixes are to be blended, in unopened bags or containers, each bearing the name and trademark of the producer, material composition, manufacturers' certified analysis, and the weight of the material.

1. All bags shall be protected from water and contamination with other materials.

2. Retain packages for inspection by Engineer.

3. All packaged materials shall be stored, handled and applied in strict accordance with manufacturer's instructions.

C. Stockpiles

1. Contractor shall employ all means necessary for stockpile maintenance to prevent unstable, noxious or anaerobic conditions including, but not exclusive to, temperature monitoring, planting, stockpile repacking, and runoff control.

2. All stockpiled materials shall be adequately handled as required in Section 31 25 10 – Dust, Soil Erosion and Sediment Control.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fertilizer shall be as manufactured by:

1. Osmocote®, The Scotts Company, Marysville, OH;

2. Meister®, The Scotts Company, Marysville, OH;

3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Topsoil - Offsite Imported Material

1. Imported topsoil or soil blends may not be mined from soils defined by the Natural Resources Conservation Service as prime farmland, unique farmland, or farmland of statewide importance. Imported topsoil shall be:

a. Of uniform quality, free from hard clods, stiff clay, hardpan, sods, roots, chips, sticks, partially disintegrated stone, cement, ashes, slag, concrete, tar residues, tarred paper, boards, or any other undesirable

material. No topsoil shall be delivered in a frozen or muddy condition.

b. Free from refuse, material toxic or otherwise deleterious to plant growth, seeds, or other viable propagules of invasive plants. Construction and demolition debris as classified under 6 NYCRR Part 360, other than uncontaminated land clearing debris, shall not be used to amend topsoil.

c. Free of stones over 1 ½ inches in diameter, and will have less than 10 percent gravel.

2. Topsoil shall conform to the following requirements:

a. pH 5.5 to 7.0

b. Organic content 4 - 6%

3. Topsoil shall conform to the following mechanical analysis:

Sieve Size	Percent Passing
1"	100
1/4"	90 - 99
# 10	80 - 100
# 40	40 - 60
# 60	40 - 60
# 100	10 - 30
# 200	10 - 20

4. When the topsoil otherwise complies with the requirements of the specification but shows a deficiency of not more than one percent (1%) organic matter content; then humus, compost, or other approved organic matter may be incorporated when or as permitted by the Engineer.

5. Topsoil shall not contain hazardous waste, petroleum spills or other chemical releases, or industrial waste. Any shipment of topsoil that does not meet this requirement will be rejected by the Engineer and shall not be brought on site.

6. Topsoil being brought on site shall be sampled and must meet the definition of Fill Type 2 as defined in NYSDEC 6 NYCRR Part 360.13 (f), Table 2: Fill Beneficial Use, unless otherwise approved by the Engineer. Topsoil to be used in ecologically sensitive sites (e.g., wetlands) shall meet the SCOs for the protection of Ecological Resources, unless otherwise approved. See Section 31 23 23 – Fill.

B. Topsoil - Stripped from Site

1. Reuse of topsoil stripped from site shall be used for this work when feasible, provided it meets:
   a. All the requirements of physical properties for imported topsoil as specified hereinbefore; and
   b. The requirements for beneficial use of excavated soil as specified under 6 NYCRR Part 360, Section 360.13(b) Waste Cessation. See Section 31 23 23 - Fill.

C. Compost
1. Shall conform to the following requirements:
   a. Material shall be capable of sustaining the growth of vegetation, with no admixture of refuse or material toxic to plant growth.
   b. Material shall be derived from organic wastes such as food and agriculture residues, composted cow or other animal manures, sewage sludge or other materials that meet the specified requirements.
   c. Material shall be screened, and shall be free of any stones, branches, roots, brush, weeds, or wood chips, and all debris such as plastic fragments, glass, and metal fragments.
   d. Organic content: 50% minimum.
   e. pH: 5.5 to 8.0.
   f. Carbon/nitrogen ratio: 25:1 to 35:1.
   g. 100% passing 1/2" screen .
2. Compost shall meet the requirements for “Monthly Average Concentration” pollutant limits, except where the Engineer specifically allows the use of the “Maximum Concentration” pollutant limits, as stated in the current version of 6 NYCRR Part 360.
3. No compost shall be delivered until the approval of samples by the Engineer, but such approval does not constitute final acceptance. The Engineer reserves the right to reject, on or after delivery, any material which does not, in their opinion, meet these specifications. When compost is stored on the job, it shall be done as directed by the Engineer.
4. Certification: Only facilities permitted to compost biosolids under 6 NYCRR Part 360, will be allowed to furnish finished compost for use in topsoil. The certification shall be supplied by the Contractor prior to the delivery of any composted biosolids, topsoil containing sewage sludge, or other such regulated material to the site.

D. Soil Amendment Materials: Within the watershed, fertilizers shall not be used unless a soil test indicating a need for soil amendment is provided. Recommended materials below may not be used except where they fulfill amendment

requirements. Where authorized for use in the Contract Documents, or by written direction of the Engineer, Soil Amendment Materials shall have the following compositions:

1. Soil Fertility Analysis: Available macronutrients including Phosphorus and Potassium should be adequate to support the intended plant community. Available macronutrients shall not be at excessive levels that could potentially impair plant growth or impact water quality. The determination as to whether available nutrients are low, optimum, or excessive shall be made and reported by the soil testing laboratory based on extraction and test methods used.

    a. Only when soil analysis indicates a need and if approved in advance by the Engineer, apply commercial fertilizer and uniformly work in to top one inch of seedbed. The rate of application shall be determined by soil analysis.

    b. Do not apply superphosphate except where specifically indicated and as approved by the Engineer. Where required, uniformly work in to top one inch of seedbed. The rate of application shall be determined by soil analysis.

2. In addition to obtaining the Engineer's approval of the type(s) and N-P-K (Nitrogen-Phosphorus-Potassium) analyses of soil amendment materials, proposed based on soil test results, the Contractor shall meet the following requirements:

    a. Bonemeal: Shall be finely ground.

    b. Commercial Fertilizer: A minimum of 50% of the nitrogen shall be derived from organic sources.

    c. Controlled-release Fertilizer: Shall be in granular form.

3. Limestone: Shall be granular limestone, produced from Dolomitic limestone specifically for use in planting, with a minimum of 88% of calcium and magnesium carbonates, conforming to the following requirements:

Sieve Size	Percent Passing
# 10	100
# 20	90 minimum
# 100	60 minimum

4. Only when chemical analysis indicates a need and where approved by the Engineer, apply ground limestone and uniformly work in to top one inch of seedbed. The rate of limestone application shall be dependent on the pH of the soil, as determined by chemical analysis, and shall be as follows:

pH of Soil	Rate: Pounds/1000 Square Feet
5.0 to 5.5	100
5.5 to 6.0	50
6.0 to 6.8	25
over 6.8	0

5. Sulfur: Lower pH if required, by use of elemental sulfur product.
   a. Peat moss or copper sulfate may not be used to lower pH.
6. Mycorrhizal Fungi Inoculant
   a. For tree plantings, the Contractor shall supply Mycorrhizal Fungi Inoculant, if specified, in granular form such as by means of a three ounce (3 oz.) premeasured dry formulation packet, such as Mycor Tree Saver Transplant®, as manufactured by Plant Health Care, Inc., Pittsburgh, PA, or approved equal.
7. Water Retention Additive
   a. Water Retention Additives for tree plantings shall be a granular polyacrylamide polymer of a potassium base and not a sodium base that slowly releases moisture into the root zone such as Terra Sorb, as manufactured by Plant Health Care, Inc., 440 William Pitt Way, Pittsburgh, Pa., or approved equal.

E. Herbicides and Pesticides shall be in compliance with NYC Local Law 37 of 2005 and in conformance with the guidelines of NYC Department of Health for determining whether a pesticide or herbicide is prohibited by the Law.

F. Planting Soil Mix
1. Planting Mix shall conform to the following requirements:
   a. Organic Matter: 4.5 % minimum
   b. pH: 6.0 to 7.0
   c. Electrical Conductivity (soluble salts): 0.7 to 2.0 dS/m
2. Mix shall consist of the following proportions by volume:
   a. Six parts topsoil
   b. Two parts compost
3. The following items shall be added to the above mix if specified in contract drawings or approved in writing by the Engineer:
   a. Five pounds bonemeal per cubic yard of soil mixture
   b. One pound commercial fertilizer per cubic yard of soil mixture

c. One pound controlled release fertilizer per cubic yard of soil mixture

d. Two pounds water absorbent polymer per cubic yard of soil mixture, or as recommended by manufacturer

e. Ground limestone as required for specified pH

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examination

1. Prior to soil mix placement, the Contractor shall examine the site to determine the status of construction and existing condition in and near the areas to be planted.

2. The Contractor shall ascertain the location of all existing and proposed electric cables, conduits, irrigation, under-drainage systems and all other underground or at grade utilities, by contacting the appropriate utility company. The Contractor shall comply with the requirements of Section 31 23 16 - Excavation prior to any excavation work.

a. Contractor shall take proper precautions so as not to disturb or damage any sub-surface elements.

b. Contractor shall be liable for any and all damage to such utilities during the course of construction, and shall be responsible for making requisite repairs to damaged utilities at Contractor's own expense.

c. Contractor shall be liable for any and all damage to surrounding areas caused by planting operations and shall be required to restore or replace damaged areas to original conditions, to the satisfaction of the Engineer.

3. The Contractor shall comply with the requirements of Section 31 25 10 - Dust, Soil Erosion and Sediment Control.

4. The Contractor shall coordinate, adjust, and relate together, work of this Section with other work of the Project and with work of other Contractors. Such coordination shall include but not be limited to the following:

a. Scheduling of planting operations

b. Scheduling of maintenance operations

5. The Contractor shall also:

   a. Verify that all work requiring access through or adjacent to areas where soil mixes are to be placed has been completed and no further access (other than landscape installation) will be required. In the event that access will be required, this must be coordinated with the Engineer.

   b. Perform soil mix blending and site soil work only during suitable weather conditions. Do not handle, haul, place, work, disc or rototill soil when frozen, excessively wet, or in otherwise unsatisfactory condition.

B. Preparation of Soil Mixes

1. Excavation of subgrade shall conform to the applicable requirements of Section 31 23 16 - Excavation.

2. Uniformly blend all ingredients as required for each soil mix type, by wind rowing and/or tilling on a hard surfaced area.

   a. The components of all soil mixes shall be blended so that ingredients are thoroughly incorporated into the mixture to assure uniform distribution.

   b. Do not over-mix, mix shall remain friable and well aerated.

   c. Organic matter shall be maintained moist, not wet, during blending.

   d. Delay mixing of any approved fertilizers if planting will not follow within a few days.

   e. Add mycorrhizal fungi inoculant, if specified, to each tree planting at rate specified by approved manufacturer.

   f. Apply water retention additive as per approved manufacturer's instructions.

C. Preparation of Sub-Grade

1. Verify as-constructed or existing sub-grade elevation and perform additional grading operations as necessary to bring the sub-grade to a true, smooth, slope parallel to the finished grade, at all areas to receive soil mixes.

2. Any sub-grades or soils polluted by gasoline, oil, plaster, construction debris, unacceptable soils, or other substances which would render material unsuitable for plant growth, shall be removed from the premises, at no additional cost to the City, whether or not such pollution occurred or existed prior to or during the Contract period. In the event that such material is placed, this material shall be removed and replaced with approved material. All remedial operations associated with soil mixes require the approval of the Engineer.

3. Clean sub-grade and dispose of all debris prior to placement of soil mixes.

a. Remove all large clods, lumps, brush, roots, stumps, litter, trash, and other foreign material and stones one-half inch in diameter or larger.

b. Dispose of removed material legally off-site in accordance with the applicable laws and regulations and the requirements for waste disposal under the Contract.

4. Where specified in contract drawings or approved in writing by the Engineer, spray all vegetation on sub-grade with a pre-emergent weed killer at the rate of application recommended by the manufacturer.

5. Protect adjacent pavements, walls, utilities and other construction from damage or staining by any soil mix placement operations.

3.02 IMPLEMENTATION

A. Placement of Soil Mixes

1. Do not place any muddy or wet Soil Mixes.

2. Place and spread soil mix over sub-grade, to a depth sufficiently greater than the depth required for planting areas so that after settlement the completed work will conform to the lines, grades, and elevations shown or otherwise indicated.

3. Place and spread soil mix over the approved sub-grade, in 6-inch lifts, or as directed by Engineer, and settle to eliminate air pockets and minimize settlement. Lightly scarify previously placed surfaces prior to placing subsequent lifts.

4. Compact gently with a light or medium weight roller, unless otherwise specified in the Contract Documents.

a. Fills shall not be so compacted as to restrict the flow of air or water through the soil.

5. After completion of compaction operations, protect the installation from additional compaction from vehicular traffic, contamination by toxic materials or trash, and from water containing cement, clay, silt or any other materials.

6. Any soils that are over-compacted or contaminated after placement or otherwise made unsuitable for plant growth shall be removed from the premises and replaced with approved material or satisfactorily remediated at no additional cost to the City.

7. The Contractor shall also meet the applicable requirements on placement of soil mixes for different planting operations in Section 32 90 00 – Planting.

B. Grading of Soil Mixes

1. After settlement has occurred, add soil to maintain finished grades. If for any reason soil is left exposed for a long duration prior to planting, add soil and regrade as required.
2. Protect placed soil mixes against construction activity with snow fencing or by other acceptable methods.
3. Protect from the eroding effects of wind and rain with filter fabric, as necessary.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Clean up

1. At the end of each work day the Contractor shall broom-clean the site, to remove all trash, debris, and loose soil materials.
2. Immediately following the completion of soil mix installation operations, the Contractor shall remove all excess materials, stock piles, waste material, tools and equipment, and leave the site in a clear and clean condition.
3. All waste materials shall be disposed offsite by the Contractor in accordance with the applicable laws and regulations and the requirements for waste disposal under the Contract.

END OF SECTION

SECTION 33 01 10.60 – DISINFECTION OF PIPING, TANKS, STRUCTURES, AND EQUIPMENT
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials (including sodium hypochlorite and other chemicals), equipment (including taps, corporation stops, temporary pumps, hoses, and miscellaneous piping), and incidentals necessary to perform disinfection of all pipelines, conduits, pumps, tanks, structures, and equipment which are to store, handle, or carry potable water. The Contractor shall remove said materials and equipment after completion of the disinfection procedure. Water for the initial disinfection procedure shall be furnished by the City.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

1. AWWA C651 - Disinfecting Water Mains
2. AWWA C652 - Disinfection of Water-Storage Facilities
3. New York City Plumbing Code Section 610 - "Disinfection of Potable Water System."
4. New York City Plumbing Code Section 606.5.4.5 - "Installation of the Building Water Distribution System - Cleaning or Painting"
5. New York City Department of Health

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Disinfection shall be in accordance with AWWA C651 for water mains and AWWA C652 for water storage facilities and equipment, except as modified herein. Disinfection procedures for new water mains and water storage facilities shall also conform to the requirements of the New York City Plumbing Code, Section 610 "Disinfection of Potable Water System" and Section 606.5.4.5 "Installation of the Building Water Distribution System - Cleaning or Painting" respectively, except as modified herein.

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Pipelines:

1. Pumps, hydrants, and other water handling equipment items that are part of the potable water distribution system shall be disinfected in the same manner as described herein for the pipelines.

2. Pipelines shall first be flushed with clean water. Disinfection shall be accomplished by the Continuous Feed Method, as specified in AWWA C651, using sodium hypochlorite solution.

3. Water-chlorine solution with a concentration not less than 50 mg/l of available chlorine shall then be added at one end of the section being disinfected and discharged at the far end. The water-chlorine solution shall be added until the water coming from each downstream blowoff has a residual of not less than 25 mg/l of chlorine.

4. The pipelines shall then be closed and the solution allowed to remain in the lines for at least 24 hs. The chlorine residual in the pipeline shall then be rechecked. If the free chlorine residual is less than 10 mg/l after 24 hrs, the procedure shall be repeated until the free chlorine residual after 24 hrs is 10 mg/l or greater.

5. After the 24-hr holding period, the pipelines and equipment shall be thoroughly flushed and filled with clean water. Flushing water shall not be permitted to enter existing water mains.

6. Flushing water shall not be discharged to sanitary or storm sewers without permission of the NYCDEP. Where necessary, Federal, State and local regulatory agencies shall be contacted to determine special provisions for the disposal of heavily chlorinated water.

7. When new potable water pipelines are to be connected to an existing water distribution system, the connecting piping shall be disinfected and tested in accordance with the procedure set forth in Section 9.1 or Section 9.2, as applicable, of AWWA C651.

B. Water Supply:

1. Water for the first filling, disinfection and flushing procedure of each pipeline, tank and piece of equipment will be furnished by the City, at no cost to the Contractor, from the nearest hydrant or other source. The Contractor shall provide all necessary apparatus to convey the water to the point of use and perform the disinfection procedure. If the water in the pipelines or storage facility fails the bacteriological tests, water for subsequent disinfection procedures shall be provided by the Contractor. If agreeable to the City, water for the subsequent disinfection procedures may

be furnished by the City but shall be metered, and the Contractor shall credit the City for the cost of water used for the subsequent procedures.

3.03 FIELD TESTING / QUALITY CONTROL

A. After the completion of disinfection, bacteriological samples shall be taken by the Contractor and tested at a certified laboratory. Samples shall be taken as required by the New York City Department of Health. The test reports shall be submitted to the Engineer for review and approval. If the samples are not satisfactory, the entire disinfection procedure shall be repeated at the expense of the Contractor until satisfactory samples are obtained.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 33 05 05 – BURIED PIPING INSTALLATION
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to install all buried piping complete and operational.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 31 23 16 – Excavation.

B. Section 31 23 19 – Dewatering.

C. Section 31 23 23 – Fill.

D. Section 33 05 05.30 – Leakage Testing for Buried Piping.

E. Section 33 06 01 – Schedule for Buried Piping.

F. Section 40 05 06 – Couplings, Adapters, and Specials for Process Piping.

G. Section 40 05 07 – Hangers and Supports for Process Piping.

H. Section 40 05 97 – Identification for Process Equipment.

1.04 REFERENCES

A. Definitions:

1.	Buried Piping:	Includes all piping beginning at the outside face of a structures or foundation and extending away from structures. Buried piping includes piping beneath structures or foundations.
2.	Exposed Piping:	Includes all piping beginning at the outside face of a structures or foundation and extending inside. Exposed piping includes interior piping. Exposed piping also includes all piping embedded in concrete, as well as all piping that is permanently or intermittently submerged and/or installed in a subaqueous environment.

B. Reference Standards:

1.	AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe.
2.	AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter.
3.	ASME	Boiler and Pressure Vessel Code.
4.	ASME B31.1	Power Piping.
5.	ASTM A193	Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
6.	ASTM A307	Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength.
7.	ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
8.	ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

9.	ASTM D2564	Standard Specification for Solvent Cements for PVC Plastic Piping Systems.
10.	ASTM D2774	Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
11.	ASTM D2855	Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining PVC or CPVC Pipe and Piping Components with Tapered Sockets.
12.	ASTM F477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
13.	ASTM F656	Standard Specification for Primers for Use in Solvent Cement Joints of PVC Plastic Pipe and Fittings.
14.	ASTM F2306	Standard Specification for 12 to 60 in. [300 to 1500 mm] Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications.
15.	ASTM F2487	Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Corrugated High Density Polyethylene and Polypropylene Pipelines.
16.	ASTM F2510	Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Corrugated Dual- and Triple-Wall Polyethylene and Polypropylene Pipes
17.	AWWA C105	Polyethylene Encasement for Ductile-Iron Pipe Systems
18.	AWWA C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
19.	AWWA C206	Field Welding of Steel Water Pipe.
20.	AWWA C600	Installation of Ductile-Iron Mains and Their Appurtenances.
21.	AWWA C605	Underground Installation of PVC and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
22.	AWWA C606	Standard for Grooved and Shouldered Joints.
23.	AWWA M11	Steel Pipe: A Guide for Design and Installation,
24.	AWWA M23	PVC Pipe – Design and Installation.
25.	AWWA M41	Ductile-Iron Pipe and Fittings.

26.	AWWA M55	PE Pipe - Design and Installation.
27.	DIPRA	Installation Guide for Ductile Iron Pipe.
28.	NSF61	Drinking Water System Components Health Effects.

1.05 DESCRIPTION

A. This scope of this Section includes the requirements for the installation of buried piping, except where installation requirements for buried piping are shown or specified elsewhere in the Contract Documents. In addition:

1. The scope of this Section includes requirements for:

a. The jointing of buried piping

b. The installation of gasket materials, specials, flexible couplings, mechanical couplings, harnessed and flanged adapters, sleeves, and tie rods.

c. Modifications and/or adjustments to existing buried piping.

d. The installation of supports, restraints, and thrust blocks.

e. The cleaning, disinfecting, and field testing of all buried piping.

2. The extent of buried process piping is shown on the Contract Drawings. The Contractor shall provide additional buried pipe as necessary and/or required to complete the Work as shown and specified. Buried pipe service, pipe diameter, coating, lining, pressure rating, joint type, and testing requirements are specified in the following section(s):

a. Section 33 06 01, Schedule for Buried Piping.

3. Where shown on the Contract Drawings, the Contractor shall provide all labor and materials for making connections between buried piping and existing lines(s) installed under other contracts, including all specials required to connect buried pipe to pipe of dissimilar material(s).

1.06 QUALITY ASSURANCE

A. Wherever the installation requirements of this Section and the referenced standards or manufacturer requirements are in conflict, the more stringent provision shall apply.

B. Ductile Iron Pipe:

1. Refer to the latest edition of the DIPRA Installation Guide for Ductile Iron Pipe and the ductile iron piping manufacturer recommendations.

a. Where requirements from the manufacturer, requirements specified by the DIRPA Installation Guide, and requirements specified herein differ, apply the most stringent requirement of the three.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. Buried piping submittals shall be submitted under the specification section number corresponding to the buried piping material. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Shop Drawings:

1) Catalog cuts and data sheets, including but not limited to:

a) Specifications for all components of the buried piping.

b) Illustrations in sufficient detail to serve as a guide for assembly and disassembly

c) A parts schedule that identifies the materials to be used for the various piping components and accessories.

d) Weights of all component parts.

e) Details on joining methods.

f) Details of pipe lining, coating, wrapping, insulation and painting.

g) Copy of details of piping, specials, joints, harnessing and thrust blocks, and connections to piping, structures, equipment, and appurtenances (pipe couplings, specials, and adapters shall be submitted for approval under Section 40 05 06, Couplings, Adapters, and Specials for Process Piping).

b. Layout and Installation Drawings:

1) Shall include plans, sections, and details showing location, elevations, and clearly marked dimensions.

2) Piece numbers which are coordinated with the tabulated pipe layout schedule shall be clearly marked.

3) The scale used shall be the greater of the following two (2) scales:

a) The scale used on the Contract Drawings that depict the process pipe for which the submittal pertains.

b) ¼-in = 1-ft - 0-in.

4) When special designs or fittings are required, the work shall be shown in large detail and the special or fitting completely described and dimensioned.

5) For HDPE Pipe, layout and installation drawings shall address locations and deflections of required fittings to prevent installation that exceeds a greater degree of bending than the manufacturer's recommended minimum bending radius for each size and class of HDPE pipe.

6) Include a north arrow.

7) Information on pipe supports, including:

a) Pipe support location.

b) Pipe support type.

c) Thrust block details.

d) All loads on the support (in either lbs. or kips.)

8) Location of pipe couplings, specials, and adapters.

9) Extent of lining, wrapping, and coatings.

c. A tabulated pipe layout schedule for each buried process pipe system. Submit a separate schedule for each pipe system and/or service. The pipe layout schedule shall include the following information for each pipe section, fitting, and appurtenance that comprises that system:

1) Service.

2) Pipe size.

3) Working pressure.

4) Weight (in lbs.)

5) Joint type.

6) Wall thickness.

7) Piece number.

8) Laying length.

d. Calculations for the design of the support structures.

1) Design calculations shall be signed and sealed by a Professional Engineer registered in the State of New York.

2) Calculations shall include a summary of design criteria used in the design, including a description of each load case and load combination considered.

3) A tabulation shall be provided giving the column vertical and horizontal reactions for each load combination.

e. For each buried process piping system that contains valves, submit a tabulated valve schedule. Submit a separate schedule for each pipe

system and/or service. The valve schedule shall include the following information for each valve:

1) Valve tag number.

2) Valve size.

3) Upstream pressure (units of psig).

2. Information Submittals:

a. Certified Letters of Compliance:

1) Certificate of compliance with the requirements of the Contract Documents for pipe, fittings, couplings, sleeves, cleanouts and harnessing.

2) For welded pipe and fittings, submit a certificate from an independent testing laboratory, approved by the City, for each welder assigned to the welding of pipe, fittings, and pipeline equipment.

3) For corrugated-wall, smooth interior HDPE gravity pipe:

a) Submit a certificate of joint compliance with ASTM F477 and these specifications for each pipe size. The statement shall include date of test.

b) Submit a certificate stating that materials used for the manufacturing of the pipe and fittings for this contract shall meet the standards per ASTM D3350

4) Linings and Coatings:

a) Manufacturer shall submit a certificates or copies thereof attesting to the fact that the applicator met the requirements of the corresponding piping specification, adherence to all standards and testing specified therein, and that the material used was as specified therein.

5) Materials Certificates of Conformance: Submit certificates of conformance with Referenced Standards specified in the corresponding piping specification section.

b. Metallic Pipe Welding Procedures and Qualifications:

1) Certificates shall be of current issue and conform to the requirements of the applicable reference standards. In addition:

a) Certificates that all welders and welding operators have been qualified in accordance with ASME Boiler and Pressure Vessel Code Section IX.

b) Certificates stating that the welding of steel and stainless steel shall conform to the requirements of ASME B31.1.

2) Copies of qualified procedures and list of names and identification symbols of qualified welders and welding operators, prior to welding operations.

c. Nonmetallic Pipe Welding Procedures

1) Certificates of HDPE pipe welder experience within the previous 12 mo. shall be submitted for all technicians performing heat fusion on HDPE pipe.

2) Submit certification of qualified persons before fabricating any HDPE saddle tees.

d. For butt welded HDPE piping, submit Heat Fusion Daily Test Reports.

1) Reports shall be submitted to the Contractor and Engineer daily.

2) Reports shall also include the results of any bent strap tests performed that day.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Polyethylene Underground Warning Tape:

1. Brady Corp., Milwaukee, WI;
2. Marking Services, Inc., Milwaukee, WI;
3. Seton Identification Products, Branford, CT;
4. Or Approved Equal.

2.02 MATERIALS / EQUIPMENT

A. Warning Tape:

1. General:

a. Tracer tape shall be of inert, acid- and alkali-resistant polyethylene.

b. All tape shall be suitable for direct burial.

c. Message:

1) Shall read as follows: "CAUTION [insert customized name of pipe service as specified in Section 40 05 97, Identification for Process Equipment] PIPE BURIED BELOW"

2) Shall be written with bold letters 2-in. high.

3) Messages shall be printed at maximum intervals of 2 ft.

4) Tape shall be custom colored the same as pipeline colors specified for associated pipe service in Section 40 05 97, Identification for Process Equipment.

2. For Metallic Pipelines:

a. Size:

1) Thickness: 4 mils.

2) Width: 6-in.

b. Tape shall:

1) Be capable of stretching to twice its original length.

3. For Non-Metallic Pipelines:

a. Size:

1) Thickness: 5 mils.

2) Width: 6-in.

b. Tape shall:

1) Have aluminum backing.

2) Have 15,000 psi tensile strength.

3) Have 140% elongation capability.

B. Polyethylene Encasement:

1. Provide polyethylene encasement for all buried ductile iron piping to prevent contact between pipe and surrounding bedding material and backfill.

2. Provide polyethylene encasement in accordance with AWWA C105.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Carefully examine pipe, fittings, valves, and specials for cracks, damage, and other defects while suspended above trench before installation.

1. Immediately remove defective materials from the Site and replace with acceptable products.

B. All pipe coating injured in any way during transit or laying shall be satisfactorily repaired prior to placing the backfill.

1. Ample provision shall be made for the prompt and efficient repair of all abrasions and injuries.

C. Inspect interior of all pipe, fittings, valves, and specials and completely remove all dirt, gravel, sand, debris, and other foreign material from pipe interior and joint recesses before pipe and appurtenances are moved into excavation. Bell and spigot-type mating surfaces shall be thoroughly wire brushed, and wiped clean and dry immediately before pipe is laid.

D. Certificates of welding qualifications conforming to the requirements of ASME B31.1, Section 6 and its Supplements, shall be submitted to the Engineer for approval prior to proceeding with any pipe welding.

3.02 INSTALLATION

A. General:

1. All piping shall be erected to accurate lines and grades, supported as shown, specified, or required.

a. Slope piping uniformly between elevations shown.

2. Where temporary supports are used during construction, sufficient strength and rigidity shall be provided to prevent shifting or distortion of the pipe.

3. All work shall be accomplished using the best methods and procedures of recognized pipe fabrication in a good and workmanlike manner in accordance with the latest edition of the applicable standards referenced in the Contract Documents, including (but not limited to):

a. For ductile iron pipe:

1) AWWA C105

2) AWWA C600.

3) AWWA M41.

b. For steel and stainless steel pipe:

1) AWWA C206.

2) AWWA M11.

c. For thermoplastic pipe:

1) ASTM D2321.

2) ASTM D2774.

3) AWWA C605.

4) AWWA M23.

5) AWWA M55.

4. All buried pipe, fittings, and appurtenances shall be installed in accordance with all of the following:

   a. The manufacturer's printed instructions and recommendations.

   b. The approved shop drawings.

   c. As specified in the Contract Documents.

5. Routing:

   a. Install piping in a neat manner with lines straight and parallel or at right angles to building walls or structures, unless otherwise shown on the Contract Drawings.

      1) Install horizontal lines true to line and elevation.

      2) Install vertical lines truly plumb in all directions.

   b. Where practicable, install piping in groups and parallel to building walls or structures.

   c. Clearance:

      1) Clearances shall be measured from the outermost edge of piping, flanges or other type of joint that extends beyond the nominal outside diameter of piping.

   d. Small diameter piping and/or piping not shown on the Contract Drawings:

      1) If specific locations and elevations are not shown on the Contract Drawings, install small diameter piping as specified herein, and as necessary and required to avoid obstructions.

6. Cuts:

   a. Use cutting methods and machines specially designed for cutting the pipe material and approved by the manufacturer. The following cutting methods are not acceptable:

      1) "Squeeze" type pipe cutters

      2) Cutting torches

      3) Diamond points

      4) Dog chisels.

b. Pipe Lengths:

1) Full standard lengths of pipe shall be used in each pipe run in so far as possible.

2) Shorter lengths than standard shall be used only to complete a straight run of pipe, to connect to established locations of valves, equipment, bends, and the like.

3) Random lengths of pipe or cuttings from standard lengths shall not be coupled together when a full standard pipe length will fit in the pipe run.

c. Pipe shall be cut square, and not upset, undersized, or out of round, except as follows:

1) Cut ends of push-on joint type pipe shall be tapered and sharp edges filed off smooth.

d. Ends shall be carefully reamed and cleaned before being installed.

e. Make cuts carefully without damage to coatings or linings.

7. Excavation:

a. Trench excavation shall conform to the requirements of Section 31 23 16 - Excavation, as applicable.

b. Dewater trench before pipe installation in accordance with Section 31 23 19 - Dewatering.

1) Keep groundwater level in trench at least 24-in. below bottom of pipe before laying pipe.

2) Do not lay pipe in water.

3) Maintain dry trench conditions until jointing and backfilling are complete.

4) Keep clean and protect interiors of pipe, fittings, valves, and appurtenances.

c. Excavate trenches below bottom of pipe by amount shown and indicated in the Contract Documents. Remove loose and unsuitable material from bottom of trench.

d. Excavate around joints in bedding as necessary and required to complete joint connection.

8. Placing:

a. Do not bring pipe into position until preceding length of pipe has been bedded and secured in its final position.

b. For coated pipe, care shall be exercised in laying and cradling the pipe to prevent injury to the coating.

c. Start laying pipe at lowest point and proceed towards higher elevations.

1) On steep slopes, prevent movement of pipe during installation.

d. Lay pipe so that pipe barrel bears uniformly on trench bottom.

e. Exercise care to avoid flotation when installing pipe in cast in-place concrete, and in locations with high groundwater.

f. Grade control equipment shall be of type to accurately maintain design grades and slopes during installation of pipe.

g. Unless otherwise specifically stated, install pipe in accordance with manufacturer's recommendations.

h. Install bell and spigot pipe so that bells face the direction of laying, unless otherwise shown on the Contract Drawings.

i. Allow extra length at future connection points to be cut to fit after backfill and prior to tie-in.

j. Notify the Engineer prior to installing pipe into trench and allow time for Engineer's inspection.

k. The Contractor shall correct irregularities found during inspection.

l. Complete tie-ins within trench whenever possible to prevent overstressed connections.

9. Bedding:

a. Backfill shall conform to the requirements of Section 31 23 23 - Fill, as applicable.

b. Carefully and thoroughly compact pipe bedding with hand held pneumatic compactors.

10. Jointing:

a. Thoroughly clean all pipe, fittings, valves, specials, and accessories before jointing.

1) Remove all cuttings and foreign matter from inside of pipe and tubing.

2) Clean joining area of pipe, fittings, and appurtenances as necessary and required and as per manufacturer instructions.

a) For cleaning pipe ends, solutions such as detergents and solvents, when required, shall be used in accordance with manufacturer's recommendations.

b. Use jointing methods recommended and approved by the pipe manufacturer.

c. Transitions from One Type of Pipe to Another:

1) Provide all necessary adapters, specials and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.

2) Connections between Dissimilar Metals:

a) Provide dielectric couplings, insulating couplings, unions, or other approved dielectric insulating devices, at all connections to pipelines or equipment of dissimilar metals, regardless of whether devices are shown on the Contract Drawings.

11. Bends and Turns:

a. Bends shall be of 45° or 90° unless otherwise shown on the Contract Drawings.

b. Pipe Flexibility:

1) Do not bend pipe to greater degree than minimum radius recommended by the pipe manufacturer for type and grade.

2) Do not subject pipe to strains that will overstress or buckle piping or impose excessive stress on joints.

12. Plugs:

a. Shall match the materials, linings, and coatings of the process piping, and shall have a square head.

13. Transitions:

a. Reducing fittings shall be used for all changes in pipe sizes, even when not specifically shown on the Contract Drawings.

1) Unless otherwise shown or specified, use eccentric reducing fittings.

b. Do not use bushings or nipples for buried piping.

c. Between pressure ratings:

1) Where lines of lower service rating tie into services, appurtenances, or equipment of higher service rating, the equipment, valve, or appurtenance between the two shall conform to the higher rating.

14. Restraints, Supports, and Thrust Blocks:

a. Provide concrete and metal cradles, collars, kickers, and blocks as shown on the Contract Drawings or as necessary and/or required to provide thrust restraint.

15. Temporary Blind Flanges, Plugs, Caps, and Bulkheads:

a. At the end of each day of work or other interruption of pipe installation, the Contractor shall provide temporary blind flanges, plugs, caps, or bulkheads as necessary and required.

1) Plug all bells at dead ends, tees, and crosses.

2) Cap all spigot and plain ends.

b. To perform the testing of buried piping as specified herein, or as per the sequence of work specified in the Contract Documents, the Contractor shall provide temporary blind flanges, line stops, plugs, and bulkheads suitable for and capable of withstanding the services and pressures for which they are intended.

1) Refer to Section 33 06 01, Schedule for Buried Piping, for service and test pressures.

2) Temporary blind flanges, line stops, plugs, and bulkhead shall be compatible with and shall not damage the piping materials, coatings, and linings specified in Section 33 06 01, Schedule for Buried Piping.

c. The Contractor shall uninstall all temporary blind flanges, plugs, caps, and when they are no longer needed for the Work.

B. Ductile Iron Pipe:

1. Cutting:

a. Where field cutting of ductile iron pipe is permitted by the Engineer, ductile iron pipe shall be cut only by means of abrasive saws, hack saws, wheel type cutters or milling type cutters.

2. End Connections:

a. Mechanical Joint:

1) Ensure that cut ends are tapered and sharp edges are filed off smooth. Thoroughly clean the plain end (spigot) and the socket of the pipe or fitting.

2) Brush the socket, spigot end, gasket, and adjacent areas immediately before making joint with soapy water in accordance with AWWA C111.

3) Slip the gland and gasket over the spigot with the small side of the gasket facing the socket and the lip side of the gland facing the socket.

4) Insert the spigot into the socket and press the gasket firmly and evenly into the gasket recess. Keep the joint straight during assembly.

5) Slide the gland towards the socket and center it around the pipe with the gland lip against the gasket.

6) Insert bolts and tighten nuts by hand.

7) With an ordinary ratchet wrench, tighten bolts evenly and alternately around. The pattern for tightening bolts shall be as per the manufacturer's recommendations. The bolt torque for mechanical joints shall be as per the DIPRA Installation Guide.

8) Do not deflect mechanical joint pipe after installation.

b. Push-On Joint:

1) Ensure that the spigot (plain) end is beveled as per the manufacturer's recommendations and that sharp edges are filed off smooth.

a) Use a heavy file or grinder to bevel the plain end.

b) Do not use a saw blade to bevel the plain end.

2) Thoroughly clean the groove and the bell socket of the pipe or fitting. Also clean the plain end of the mating pipe or fitting.

3) Except for pipe lined or coated, use a wire brush to clean the exterior surface of the spigot and the interior surface of the bell.

a) Use a method for cleaning coated or lined portions of the pipe recommended by the coating or lining manufacturer.

4) Insert gasket into joint recess and smooth out entire circumference of gasket to remove bulges and to prevent interference with proper entry of spigot of entering pipe.

a) Use a rubber gasket recommended by the pipe manufacturer.

(1) Do not use gaskets that have been scored or otherwise damaged.

b) Wipe clean rubber gaskets and flex gaskets until resilient. follow the manufacturer instructions for gasket resiliency when assembling joints in cold weather.

c) As per the DIPRA Installation Guide, make at least one (1) small loop and then insert the gasket into the socket.

(1) For pipe sizes larger than 20-in. nominal diameter, it may be necessary to make two loops in the gasket opposite each other.

(2) Make sure the gasket faces the correct direction as per the manufacturer's instructions and that it is properly seated.

5) Apply lubricant as per the manufacturer recommendations to the surface of the gasket that will come in contact with the entering spigot. Also apply lubricant to the outside of the entering spigot.

(1) As per the DIPRA Installation Guide, do not apply lubricant to the bell socket or the surface of the gasket in contact with the bell socket.

6) Push the spigot end into the bell socket of the mating pipe or fitting, ensuring the joint remains straight.

a) Pause insertion when the spigot end just makes contact with the rubber gasket.

b) After the gasket is compressed and before the pipe is inserted completely, carefully check the gasket for proper position around the full circumference of joint.

c) Final assembly shall be made by inserting the spigot end of the entering pipe past the gasket until it makes contact with the base of the bell.

7) Deflect push-on joint pipe only after the joint is assembled and not exceeding the deflection shown on the Contract Drawings and the maximum deflection specified in the DIPRA Installation Guide for the nominal diameter of pipe in question.

c. Grooved / Shouldered End Joints:

1) Grooved and shouldered end joints and their installation shall conform to the requirements of AWWA C606.

2) Thoroughly clean the joint ends to remove foreign matter. Except for coated pipe, use a wire brush to clean the exterior surface of the joint ends.

a) Use a method for cleaning the coated portion of the pipe recommended by the coating manufacturer.

3) Remove the bolts from the coupling.

4) Apply lubricant to the rubber gasket or inside of the coupling housing and joint ends as per the manufacturer recommendations.

5) Position and install the gasket over the gap between the joint ends.

6) Install the coupling housing around the gasket and over the grooved or shouldered joint ends. Insert bolts and install nuts tightly by hand.

7) Tighten the bolts uniformly and according to the manufacturer's instructions.

d. Flanged Connections:

1) All flange faces shall be in perfect alignment with the holes straddling the vertical center line of the piping.

2) Properly center the gasket. Use full-face gaskets for flat-face flanges.

3) Gaskets shall be suitable for the service conditions referenced in Section 33 06 01, Schedule for Buried Piping.

4) The gasket thickness shall be as recommended by the pipe manufacturer, with the exception that:

5) The minimum gasket thickness for raised face flanges shall be ⅛-in.

6) Bolts shall be of sufficient length so that when fully tightened, a minimum of two full threads shall extend beyond the nut.

7) Bolts shall be well lubricated over the entire thread length with a heavy graphite and oil mixture prior to the tightening operation.

8) Bolts shall be tightened with proper wrenches, care being taken to secure uniform pressure on the bolts and gasket and to avoid over stressing of the bolts, dishing of the flanges and compression of the gasket beyond its proper limits.

a) Commercial grade carbon steel bolts, ASTM A307, Grade B shall be tightened to obtain approximately 15,000 psi stress based on the root area of the thread.

b) Alloy steel bolts, ASTM A193, Grade B7 shall be tightened to obtain a stress of 45,000 psi.

c) The pattern for tightening bolts shall be as per the manufacturer's recommendations.

3. Support:

a. Ductile iron below floors that is not to be encased in concrete:

1) Where ductile iron pipe shall be buried below floor structures, the pipe shall be supported by concrete encased

adjustable clevis hangers anchored to the floor by means of bearing plates.

a) Supports shall conform to the requirements of Section 40 05 07, Hangers and Supports for Process Piping.

b) Hangers shall be spaced not more than 5 ft apart.

C. Steel Pipe:

1. General:

a. Install in accordance with the best piping practice with a minimum exposure to the elements and to other corrosive conditions.

b. Before erection, all uncoated pipes shall be placed on end and hammered to remove scale and loose particles.

c. Pipe compounds:

1) For general service: Use an approved mastic metallic compound, Teflon tape, or approved equal shall be used.

2) For oil service: Use an approved compound resistant to oil.

3) For potable water: Use a NSF61 approved pipe compound.

2. End Connections:

a. Flanged Connections:

1) All flange faces shall be in perfect alignment with the holes straddling the vertical center line of the piping.

2) Properly center the gasket. Use full-face gaskets for flat-face flanges.

3) Gaskets shall be suitable for the service conditions referenced in Section 33 06 01, Schedule for Buried Piping.

4) The gasket thickness shall be as recommended by the pipe manufacturer, with the exception that:

5) The minimum gasket thickness for raised face flanges shall be ⅛-in.

6) Bolts shall be of sufficient length so that when fully tightened, a minimum of two full threads shall extend beyond the nut.

7) Bolts shall be well lubricated over the entire thread length with a heavy graphite and oil mixture prior to the tightening operation.

8) Bolts shall be tightened with proper wrenches, care being taken to secure uniform pressure on the bolts and gasket and

to avoid over stressing of the bolts, dishing of the flanges and compression of the gasket beyond its proper limits.

a) Commercial grade carbon steel bolts, ASTM A307, Grade B shall be tightened to obtain approximately 15,000 psi stress based on the root area of the thread.

b) Alloy steel bolts, ASTM A193, Grade B7 shall be tightened to obtain a stress of 45,000 psi.

c) The pattern for tightening bolts shall be as per the manufacturer's recommendations.

b. Welded Joints:

1) All welding of the following shall be in strict conformity with the Code for Pressure Piping, ASME B31.1, Section 6 and its Supplements:

a) Steel and stainless steel pipe.

b) Steel and stainless steel butt-welding fittings.

c) Steel and stainless steel fabricated fittings.

2) Welding shall not be done when the atmospheric temperature is less than 32°F or when surfaces to be welded are wet.

3) The surface to be welded shall be free from loose scale, slag, rust, paint, oil and other foreign material. Joint surfaces shall be smooth, uniform and free from fins, tears and other defects which might affect proper welding.

4) Backing rings shall be used for all pipe welding butt joints unless otherwise specified.

a) Backing rings shall be of carbon steel with spacer nubs that strike-off or melt with the weld.

5) Field Welding of Stainless Steel:

a) No field welding of any stainless steel pipe or fittings shall be permitted unless otherwise shown on the Contract Drawings.

6) Welding of Cement Lined Steel:

a) Welding of cement lined steel pipe will be permitted only with the approval and under the observation of the Engineer where such welding is shown on the Contract Drawings.

7) The ends of the lined pipe for pipe-to-pipe joints shall be machine cut to provide an approximate bevel of 27½°.

a) Bevels shall be accurately cut by machining or by a mechanically guided cutting torch.

b) Ends may be chipped provided there is no damage to the cement lining.

8) Where fittings already having a bevel of 37½° are to be welded to pipe, pipe ends shall be beveled to a 17½° angle, making a total angle of bevel between joints approximately 55°. A ⅛-in. land shall be provided where possible.

9) Parts to be joined shall be approximately $^{1}/_{32}$-in. apart before tacking.

a) Backing rings shall not be used at welded joints.

10) Piping shall be carefully aligned before welding and maintain alignment.

11) Small tack welds shall be made using a ⅛-in. electrode.

a) Defective tack welds shall be removed before the final weld is made.

12) The first bead or layer of welding shall be laid by bridging across from bevel to bevel at the bottom of the groove just at the top of the land. A suitable crown reinforcement layer shall be made on the top of the joint to finish off.

a) All layers of welding shall be of the same quality as the final welds and shall be fused thoroughly therein.

13) Direct current (dc) shall be used for welding, with the base material on the negative side.

14) Passes:

a) The first pass shall be a stringer bead using a ⅛-in. electrode with a current of 80A to 90A at 50V to 55V.

b) The second and succeeding passes shall be woven beads using a ⅛-in. electrode and a current of 90A to 100A at 55V to 58V.

c) All passes shall be made slowly and with care not to burn through the land or the shoulder into the lining of the pipe.

d) The joint shall not be hotter than 100°F.

e) For large size pipe, a $^{5}/_{32}$-in. electrode may be used, provided the temperature of the joint is held within this limit.

f) The surface of the finished welds shall have a bright metallic luster after cleaning, a fairly smooth and uniform contour with regular ripples and be free from overlaps, undercuts and excessive convexity.

15) No stress-relieving of welded joints is necessary unless the pipe wall thickness warrants it.

16) Welds shall be sound throughout, fused thoroughly and free from gas pockets, oxide, slag inclusions and surface porosity. The inside of the pipe shall be free from globules of weld metal, spacers or other material which would restrict the pipe area or become loose to enter the fluid stream.

17) Defective or unsound welds shall be corrected by removing and replacing the welds. Pipe or fittings which cannot be re-welded satisfactorily shall be replaced with new pipe or fittings at the Contractor's expense.

18) All welded joints will be visually inspected by the Engineer for defects beyond those acceptable in ANSI B31.1. Method of repair shall be in accordance with instructions as received from the Engineer.

19) Filling of Cement Lined Joints:

a) After the weld is completed, the joints in the lining shall be filled with a special compound of a wet slurry mix of the same cement used for the lining.

b) Where accessible from the end of the pipe, the welded joint shall be swabbed with cement using a paint brush thoroughly wetted with the cement slurry.

20) Repairing of Cement Lined Joints:

a) Any defects causing leaks in welded joints shall be repaired by welding without damaging the cement lining using the procedures specified herein.

3. Connection of Steel Pipe to Cast Iron Bell and Spigot Pipe to:

a. Where connection is required between steel and bell and spigot cast iron pipe, a sleeve-type transition coupling meeting the requirements of Section 40 05 06, Couplings, Adapters, and Specials for Process Piping, shall be provided.

D. PVC Pipe Installation

1. End Connections:

a. Solvent-Welded Joints:

1) Make all solvent-welded PVC joints in accordance with ASTM D2855 and the solvent manufacturer's approved instructions.

2) Use primers and solvent cements meeting the requirements of ASTM F656 and ASTM D2564, respectively.

3) Do not make solvent cement joints if temperature is below 40°F.

4) Do not make solvent cement welded joints in wet conditions.

5) The following procedure shall be followed to ensure proper gluing of PVC pipe.

a) Ensure the end of the pipe is beveled.

b) Apply primer to the female end.

c) Apply primer to the male end.

d) Reapply primer to the female end; the primer must not dry.

e) Apply glue to the male end using an appropriately sized brush.

f) Apply glue with the brush to the female end.

g) Reapply glue to the male end.

h) Join the male and female ends with a quarter turn twist and hold for 30 sec.

6) After joint assembly, wipe excess cement from the pipe. A properly made joint will show a bead around the entire circumference. Any gaps in this bead indicate a defective joint, and the Contractor shall remake such joints at no additional cost to the City.

E. HDPE Pipe Installation:

1. End Connections:

a. Butt Welded Joints:

1) Butt weld via a heat fusion process in accordance with manufacturer's recommendation for butt fusion methods.

a) Personnel operating fusion equipment shall be certified by the HDPE pipe manufacturer.

2) Branch saddle fusions shall also be joined in accordance with manufacturer's recommendations and procedures.

a) Branch saddle fusion equipment shall be of size to facilitate saddle fusion within trench.

b. Flanged Connections:

1) Connect slip-on Type 316 stainless steel backup flanges with Type 316 stainless steel nuts and bolts.
2) Butt fuse fabricated flange adapters to pipe.
3) Observe following precautions in connection of flange joints.
   a) Align flanges or flange/valve connections to provide tight seal.
      (1) Require nitrile-butadiene gaskets if needed to achieve seal.
      (2) Integral flange adapters and gaskets are required for flange/valve connections.
   b) Place U.S. Standard round washers as may be required on some flanges in accordance with manufacturer's recommendations.
      (1) Bolts shall be lubricated in accordance with manufacturer's recommendations.
   c) Tighten flange bolts in sequence and accordance with manufacturer's recommendations. Do not over-torque bolts.
4) Pull bolt down by degrees to uniform torque in accordance with manufacturer's recommendation.
5) Install electrofusion couplers, where used, in accordance with manufacturer's specifications.

2. Fittings:
   a. Saddle tees 8-in. and smaller may be field fabricated. Saddle tees larger than 8-in. must be factory manufactured.

3. Placing:
   a. Maximum lengths of fused pipe to be handled as one section shall be placed according to manufacturer's recommendations as to pipe size, pipe SDR, and topography so as not to cause excessive gouging or surface abrasion, but shall not exceed 400 ft.
   b. Cap pipe sections longer than single joining (usually 50 ft) on both ends during placement, except during fusing operations.
   c. Allow pipe sufficient time to adjust to trench temperature prior to testing, segment tie-ins or backfilling activity.
   d. Install reducers adjacent to laterals and tees.
   e. To reduce branch saddle stress, install saddles at slope equal to and continuous with lateral piping.

f. Pipe shall be snaked in trench to allow a minimum of 12-in./100 ft for thermal contraction and expansion.

F. Corrugated-wall, smooth-interior HDPE Gravity Pipe:

1. General:

a. Corrugated-wall, smooth-interior HDPE gravity pipe shall be installed by open trench construction – directional bore installation shall not be permitted.

b. Installation shall conform to the requirements of ASTM D2321.

2. Cutting:

a. Field cuts shall be made with a handsaw or power pipe cutoff saw.

b. For pipes of annular corrugations, square cut only through a corrugation valley, never through a corrugation sidewall.

3. End Connections:

a. Bell and Spigot Joints:

1) Joint shall be soil-tight.

2) Pipe shall be joined meeting the requirements of AASHTO M252, AASHTO M294, or ASTM F2306, as applicable.

3) Gaskets:

a) Shall meet the requirements of ASTM F477.

b) Shall be installed by the pipe manufacturer and covered with a removable wrap to ensure the gasket is free from debris.

4) A joint lubricant supplied by the manufacturer shall be used on the gasket and bell during assembly.

4. Placing:

a. Pipe sections shall be lowered into the trench without damage to the pipe or pipe ends where couplings are to be made.

b. During handling, placement and joining, bell and spigot joints, other gasketed joints, and gaskets shall be free of mud, grit and other foreign material in order to enable effective joining and sealing.

c. When the assembling of pipes is interrupted, closures shall be placed at ends of pipes to prevent the introduction of dirt, water, animals and other foreign matter.

d. Lubricate joints in accordance with manufacturer's instructions for lubricant type and manner of application to the gasket, and/or the surface in contact with the gasket.

1) Each gasketed joint shall be inspected for cleanliness and proper lubrication before mating.

e. Align joint and drive the spigot end of one pipe its proper distance into the receiving bell of an adjoining pipe with a bar and block or mechanical equipment.

1) Prior to the use of such apparatus and method, demonstrate to the Engineer for approval the effectiveness and practicability of the proposed method of drawing the joints home.

2) The selected method shall avoid sudden thrusts of force and the gasket shall always remain in its intended groove.

5. Connection of corrugated-wall, smooth-interior HDPE gravity pipe to precast concrete manholes and other structures:

a. Soil-Tight Joints:

1) Grout void space between the pipe and structure with non-shrink grout.

b. Watertight Joints:

1) Provide a flexible boot fitting in accordance with ASTM F2510 and manufacturer recommendations.

6. Connection of corrugated-wall, smooth-interior HDPE gravity pipe to plastic drainage structures:

a. Provide adapter fitting in accordance with ASTM D3212, ASTM F477 and manufacturer recommendations.

G. Separation of Sewers and Potable Water Piping:

1. Requirements for the separation of sewers and potable water piping apply to all buried piping installation, regardless of piping materials.

2. In the event that the requirements specified herein differ from separations shown on the Contract Drawings and/or differ from separations required by Authorities Having Jurisdiction, the more stringent (i.e., greater separation distance) shall apply.

3. The Contractor shall install all buried potable water piping and sewers with the following separations:

a. For water mains installed parallel to sewers:

1) Where the depth to the bottom of the sewer cradle is less than 10 ft, the clearance between the outside of the water main and the centerline of the existing sewer should be not less than 6 ft plus one-half the sewer diameter.

2) Where the depth to the bottom of the sewer cradle is 10 ft or more, the clearance between the outside of the water main

and the centerline of the existing sewer shall be increased 1 ft for each additional 5 ft of depth over 10 ft, or portion thereof.

b. For water mains crossing sewers:

1) Wherever the clearance between the top of an existing sewer and the bottom of the proposed water main, at their crossing, is less than 1 ft, the water main is to be supported by a truss arrangement and the clearance space is to be filled with layers of compressible material to avoid excessive bearing pressure on the sewer pipe.

a) In no case, however, should this clearance be less than 6 in..

3.03 FIELD TESTING / QUALITY CONTROL

A. Test all buried piping in accordance with the requirements of Section 33 05 05.30 - Leakage Testing for Buried Piping.

B. Field Testing of HDPE Pipe:

1. The first butt fusion weld of each day's production welding and for each separate operator shall be tested by bent strap test method.

2. No production welds shall be performed until successful completion of bent strap test.

3. Each field fusion shall be recorded by such equipment and this information shall be made compiled into daily log reports.

C. Field Testing of corrugated-wall, smooth-interior HDPE pipe:

1. Deflection Testing

a. Measure for allowable deflection not less than 30 d following completion of installation.

b. Allowable deflection shall be no greater than 7.5%.

1) The base inside diameter used shall be calculated using the equation:

$$d_{i,base} = d_{i,design} - \sqrt{(\Delta d_{tolerance})^2 + (\Delta d_{out\ of\ round})^2}$$

where: $d_{i,base}$ = Base inside diameter
$d_{i,design}$ = Design inside diameter
$\Delta d_{tolerance} = 1.0\%$, as per ASTM F2306
$\Delta d_{out\ of\ round} = 3\%$

c. Visual Inspection:

1) Pipes 30-in. and greater in diameter shall be visually tested by entering and recording direct measurements.

2) For smaller pipes with runs no longer than 100 ft, visually inspect from the pipe end (lamping).

d. Videotape Inspection:

1) Pipes less than 30-in. diameter with runs that are greater than 100 ft, or present an environment too hazardous for an individual to enter, shall be visually inspected by video, or closed circuit television (CCTV).

e. Mandrel Testing:

1) Pipes less than 30-in. diameter may be tested by pulling a mandrel device from manhole to manhole, pre-set with the minimum allowable inside diameter specified herein.

2. Leakage Testing:

a. The Contractor shall perform infiltration or exfiltration testing in accordance with ASTM F2487.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 33 05 05.30 – LEAKAGE TESTING FOR BURIED PIPING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to test all buried piping complete and operational.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 33 05 05 – Buried Piping Installation.

B. Section 33 06 01 – Schedule for Buried Piping.

1.04 REFERENCES

A. Definitions:

1. Buried Piping: Includes all piping beginning at the outside face of a structures or foundation and extending away from structures. Buried piping includes piping beneath structures or foundations.

2. Exposed Piping: Includes all piping beginning at the outside face of a structures or foundation and extending inside. Exposed piping also includes all piping embedded in concrete, as well as all piping that is permanently or intermittently submerged and/or installed in a subaqueous environment.

B. Reference Standards:

1. ACI 350.1-10 Specification for Tightness Testing of Environmental Engineering Concrete Containment Structures and Commentary.

2. AWWA C600 Installation of Ductile-Iron Mains and Their Appurtenances.

3. Section 312 of The New York City Plumbing Code.

1.05 DESCRIPTION

A. This scope of this Section includes the requirements for the testing of buried piping, except where testing requirements for buried piping are shown or specified elsewhere in the Contract Documents. In addition:

1. The scope of this Section also includes the requirements for testing buried gravity sewers and concrete structures.

B. All buried pipelines, gravity sewers, and structures for which testing requirements are specified in this Section shall be watertight or airtight, including, but not limited to:

1. All buried piping and appurtenances installed under Section 33 05 05, Buried Piping Installation.

2. All buried piping, structures, and appurtenances installed under other Sections, but that specify testing under this Section.

C. Piping and structures which fail leakage tests shall be repaired or replaced at the Contractor's expense and to the satisfaction of the Engineer. These repaired piping and structures shall then be retested at the Contractor's expense until leakage test results meet the requirements specified herein.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. Buried piping testing submittals shall be submitted under the specification section number

corresponding to the buried piping material. In addition, submittals shall include, but not be limited to:

1. Action Submittals:
    a. Testing Procedures:
        1) Submit proposed testing procedures, methods, apparatus, and sequencing.
        2) Testing procedures shall be submitted for approval at least 30 ccd prior to the test.
    b. Testing Report:
        1) Prior to placing the piping system or structure in service, submit for review and approval a detailed bound report summarizing the leakage test data, describing the test procedure and showing the calculations on which the leakage test data is based.
2. Informational Submittals:
    a. Certificate signed by manufacturer of each product certifying that product conforms to applicable referenced standards.
    b. Results of each specified field quality control test.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. The Contractor shall provide all labor, equipment, air, water and materials, including meters, gauges, blower, pumps, compressors, hoses, fuel, water, bulkheads, temporary bracing and restraints, temporary weirs, valves, plugs, and accessory equipment necessary and required to complete the testing as specified herein.

B. Testing medium:

1. The Contractor shall provide all air or gasses necessary or required for testing.

2. Unless otherwise specified, the existing facility shall provide all water (or process fluid) required for testing.
    a. The Contractor shall provide all means to convey the fluid into the piping being tested.
3. Refer to the Contract Drawings for availability of water to be used for testing.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Notification:
1. Provide the Engineer with written notice at least 14 ccd prior to the date of testing.
    a. No tests shall be conducted without an approved written procedure.
    b. The Engineer shall respond in writing to the Contractor within 7 ccd of receiving the written notification.

B. All leakage tests shall be conducted in the presence of the Engineer.
1. All leakage tests shall be conducted in the presence of local authorities having jurisdiction, if required.

C. Remove or protect devices and appurtenances that could be damaged by testing.

D. Backfilling of buried or concealed pipelines:
1. Completely backfill all harnessed sections of buried or concealed piping before such sections are tested.
2. Non-harnessed sections of buried piping shall be tested before backfilling.

3.02 IMPLEMENTATION

A. General:
1. Perform leakage testing for all buried piping in accordance with the requirements of Section 33 06 01, Schedule for Buried Piping, except piping explicitly shown or specified as exempted from testing. For pipelines not listed in Section 33 06 01:
    a. Test all buried pipelines using a hydrostatic test.
    b. Test all gravity sewers and drain lines using either an infiltration or exfiltration test based on the groundwater elevation.

c. Test compressed air and gas pipelines using a hydrostatic test with compressed air.

d. Test all other pipelines not listed in Section 33 06 01, including outfall sewers, via a hydrostatic test with clean water.

e. Test vents and drains in plumbing systems and plumbing soil pipe lines in accordance with Section 312 of the New York City Plumbing Code, unless otherwise specified. Unless specified otherwise, test all vents and drains on process piping as for plumbing systems.

2. Operation of Existing Facilities:

a. Conduct all tests in a manner to minimize interference with operations of existing facilities or other contractors working on the site.

3. Testing of pipelines and conduit with non-circular cross-sections:

a. Leakage in pipelines of other than circular section shall not exceed an amount based on a circular section having an equivalent inner perimeter.

B. Hydrostatic Testing

1. Application:

a. Buried pipelines.

2. Test Procedure:

a. Maintain the testing medium at the specified pressure for a period of 4 hrs.

1) Unless otherwise specified, the testing medium shall be clean water.

2) Do not use air for hydrostatic testing of pipelines intended for liquid service – use compressed air (or gas) only for the hydrostatic testing of air (or gas) pipelines.

b. Test the piping as a whole or in sections.

1) The Contractor shall use valves or install temporary bulkheads at the ends of each section.

2) Remove temporary bulkheads at the conclusion of the hydrostatic testing.

c. Apply the specified hydrostatic test pressure to the piping through a tap in the pipe by means of a pump, compressor, or other approved method.

3. Test Pressures:

a. Test the pipeline at the pressure specified in Section 33 06 01, Schedule for Buried Piping.

b. If no test pressure is specified for a hydrostatic test, submit a test pressure of 1.5 times the maximum possible operating pressure of the pipeline, for approval by the Engineer

4. Leakage:

a. The allowable leakage shall not exceed the testing allowance given by the following formula from AWWA Standard C600:

$$L = \frac{S \cdot D \cdot \sqrt{P}}{148{,}000}$$

Where: L = testing allowance (makeup water) (gph).
S = length of pipe tested (ft).
D = nominal diameter of the pipe, (in.).
P = average test pressure during the hydrostatic test (psig).

5. Repair:

a. Replace broken pipe or joint assemblies found to leak.

b. When leakage occurs in excess of the specified amount, locate and repair defective valves, pipe, cleanouts or joints.

c. If defective portions cannot be located, remove and reconstruct as much of the original work as necessary to obtain piping that meets the leakage requirements specified herein and retest, all at no additional cost to the DEP.

C. Hydrostatic Testing of Valves

1. Test Procedure:

a. Prior to the application of the test pressure, operate the valve(s) through the number of complete cycles of closing and opening recommended by the manufacturer.

b. Next, apply the test pressure to one side of the valve (i.e., the first side).

1) The valve shall be in the closed position.

2) Introduce the liquid testing medium to the first side only and apply the test pressure.

a) The other side of the valve(s) (i.e., the second side) shall be dry and unpressurized (0 psig).

3) Maintain the testing medium at the specified pressure for a period of 4 hrs.

c. Then, reverse the side to which the test pressure is applied.

1) The valve shall still be in the closed position.

2) Now apply the test medium and pressure to the other side of each valve (i.e., the second side).

3) The side tested first (i.e., the first side) shall now be unpressurized (0 psig).

4) Maintain the testing medium at the specified pressure again for a minimum period of 4 hrs.

d. Hydrostatic testing of valve(s) may be concurrent with hydrostatic testing of pipeline section(s) to the extent permissible by the testing requirements specified herein.

e. The Contractor shall be responsible for draining and disposing of the test medium in accordance with the requirements of the Contract Documents, as necessary and required to test both sides of each valve in this manner.

2. Test Pressure:

a. Hydrostatic test each valve such that the differential pressure across the valve at the same test pressure specified for the pipe in which the valve is installed.

3. Leakage:

a. Stop all external and internal leakage through the valves.

b. No leakage across the valve shall be acceptable.

4. Movement:

a. Stop all valve movement or structural distress.

b. No movement of the valve is acceptable.

D. Infiltration Test

1. Application:

a. Gravity sewers where the groundwater level is above the crown of the sewer.

2. Test Procedure:

a. Do not start testing until normal infiltration conditions are established in the work to be tested.

1) Inspect the gravity sewer visually for infiltration.

2) If necessary, pump the sewers dry and make sure the groundwater level is above the crown of the sewer.

a) The Contractor shall dispose of water pumped from the sewer in accordance with the requirements of the Contract Documents.

3) Inspect the sewer on the inside and seal all visible leaks completely.

4) Conduct the infiltration test only after the sewer has been pumped out.

b. Measure the infiltrated flow of water by means of a weir set up in the invert of the sewer at a known distance from a temporary bulkhead or other limiting point of infiltration.

1) The leakage rate shall be defined as the amount of groundwater passing over the weir.

c. Carry on tests for a minimum of 8 hrs with readings at 60 min intervals.

3. Leakage:

a. In computing the length of sewer contributing to infiltration, include the length of house connections tested, if any, in the total length.

b. The leakage infiltration for any section of the sewer system shall not exceed 100 gal/in. diameter/mi length/24 hrs.

4. Repair:

a. When the measured leakage exceeds the specified amount, locate and repair defective manholes, pipe, and/or pipe joints.

1) If the defective portions cannot be located, remove and reconstruct as much of the original work as necessary and required to obtain a sewer within the allowable infiltration limits upon such retesting as necessary.

b. Regardless of the amount of infiltration or leakage measured, repair and seal in an approved manner all visible or detectable leaks in the sewers, manholes, structures, and other appurtenances.

E. Exfiltration Test

1. Application:

a. Gravity sewers where the groundwater level is below the crown of the sewer.

2. Test Procedure:

a. Construct a bulkhead in the sewer at the manhole at the lower end of the section under test.

b. Fill the section being tested with water until the level of water is 4 ft above the crown of the sewer in the manhole at the upper end of the test section.

1) For concrete sewers, allow the water to remain in the piping for at least 12 hr before conducting the tests.

c. Leakage will be the measured amount of water added to maintain the water at that level once the test commences.

d. Carry on tests for a minimum of 8 hr with readings at 60 min intervals.

3. Leakage:

a. In computing the length of sewer contributing to leakage, include the length of house connections tested, if any, in the total length.

1) The leakage exfiltration for any section of the sewer system shall not exceed 100 gal/in. diameter/mi length/24 hrs.

4. Repair:

a. When the measured leakage exceeds the specified amount, locate and repair defective manholes, pipe, and/or pipe joints.

1) If the defective portions cannot be located, remove and reconstruct as much of the original work as necessary and required to obtain a sewer within the allowable infiltration limits upon such retesting as necessary.

b. Regardless of the amount of infiltration or leakage measured, repair and seal in an approved manner all visible or detectable leaks in the sewers, manholes, structures, and other appurtenances.

F. Tests for Concrete Structures

1. Application:

a. Wet wells, tanks, channels, containment areas, and other water retaining structures.

2. Test Procedure:

a. Test according to the requirements of ACI 350.1 and as specified herein.

b. The Contractor shall supply all materials and labor needed to conduct the test as specified herein.

c. Prior to start of leakage testing, the following requirements shall be met:

1) All elements of the structure which resist any portion of the retained liquid pressure shall be in place and at specified strength levels. All concrete shall be fully cured.

2) Structure walls shall not be backfilled prior to leakage testing.

3) All valves, gates, blind flanges, and other non-concrete items which control the flow or otherwise retain the liquid contents of the structure, shall be checked for water-tightness. If not

water-tight, means shall be taken to assure water-tightness during the period of the leakage test.

4) The portions of the structure to be tested shall be cleaned of all construction debris, standing water, soil, foreign materials and any other material which interferes with the exposed concrete surfaces of the structure.

5) Defective concrete shall be repaired.

6) The Contractor shall notify the Engineer a minimum of 24 hrs prior to start of filling of structure for leakage testing.

7) Leakage testing shall not start until the structure is inspected by the Engineer.

d. Filling the Structure with Water:

1) The portion of the structure to be tested shall be filled at a rate not to exceed 2 ft/hr.

2) The structure shall be filled to the normal operating depth of the structure as indicated on the Contract Drawings.

a) Where no operating depth is indicated or where operating depth is controlled by flowing over a weir, the structure shall be filled to a depth 6 in. below the weir or top of wall elevation, whichever is lower.

3) Water in the structure shall be maintained at the specified test elevation for a minimum of 3 d prior to the start of the leakage test.

e. After water has been brought to the test elevation, the exposed elements of the structure shall be inspected for leakage.

1) All locations which exhibit any amount of leakage flow shall be repaired prior to the start of leakage testing.

f. Unless otherwise specified, the leakage test duration shall be based on ACI 350.1 or last 3 d, whichever is greater.

g. Measure for leakage at the test locations:

1) Structure cells which are less than 1000 ft^2 in area: measurements of water shall be taken at two (2) locations which are located approximately 180° apart.

2) Structure cells which are greater than 1000 ft^2 in area: measurements of water level shall be taken at four (4) locations which are located approximately 90° apart.

3) Each test location shall be marked and given a reference number.

a) A reference point shall be marked on the face of the wall above the test water surface in a manner which will prevent its movement or deterioration during the period of the test.

4) Test locations must be approved by the Engineer.

h. Account for evaporation and precipitation while measuring for leakage:

1) In open structures, a clear plastic calibrated open-top container not less than 18 in. in diameter and depth shall be partially filled, floated in the tank, and held in position near each measurement location.

2) The container shall be located so as not to be shaded by tank walls and away from any items passing over it such as beams or pipes.

i. Leakage tests shall not be started when periods of severe weather conditions or major changes in average daily temperature are predicted.

j. The following measurements shall be recorded at each test location at the start of the test period and at 24-hr intervals thereafter:

1) Distance from reference point to test water surface.

2) Depth of water in the floating container.

3) Temperature of the test water at 18 inches below water surface.

4) Temperature of the water in the evaporation-precipitation container at mid-depth.

3. Leakage:

a. The change in water surface elevation at each test location shall be averaged.

b. The total change in test water surface elevation shall then be adjusted by the average change in water surface elevation in the evaporation-precipitation containers.

c. Where averaged water temperature measurements vary by more than 3°F from start to completion of the test period, adjustment in tank volume shall be determined by change of water density resulting from the change in the average water temperature.

d. Leakage Allowance

1) For unlined concrete structures: the maximum allowable leakage rate shall be 0.075% of the volume per 24-hr period.

2) For concrete structures with walls lined by a waterproof material, the maximum allowable leakage rate shall be 0.050% of the volume per 24-hr period.

4. Retesting and Repair:

a. The leakage test shall be considered as failed if the specified leakage allowance is exceeded or if any leakage is observed.

b. If the test becomes unreliable due to excessive precipitation or other external factors, it shall be restarted.

c. If a leakage test fails, it may be retested immediately without repairs if approved by the Engineer.

d. If subsequent leakage tests fail, the Contractor shall repair all probable areas of leakage and the leakage test shall be repeated.

1) The structure shall be retested until it meets the specified leakage criteria.

2) Repairs shall be made to the probable leakage areas before each retest.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 33 06 01 – SCHEDULE FOR BURIED PIPING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to furnish, install, and test all buried piping as indicated in the buried piping schedule, complete and operational.

B. The following index of this Section is presented for convenience:

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A. The following schedule(s), attached after the end of section designation, are a part of this Section:

1. Schedule 33 06 01-1, Schedule of Buried Piping.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. 40 05 19 – Ductile Iron Process Pipe

B. 40 05 31 – Thermoplastic Process Pipe

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SCHEDULE 33 06 01-1
BURIED PIPING SCHEDULE

Service Name	Material	Wall Thickness /Schedule/ Class	Type of Joint	Working Pressure (psig)	Test Type	Test Pressure (psig)	Interior Coating	Exterior Coating	Remarks
HYPO-F	DC	See Note 1	See Note 1	10 psi	Hyd	See Note 1	N/A	N/A	Chemical fill lines at TI-010 Chlorination Facility
DR	DC	See Note 1	See Note 1	5 psi	Hyd	See Note 1	N/A	N/A	Truck containment drain lines at TI-010 Chlorination Facility
SBS	DC	See Note 1	See Note 1	10 psi	Hyd	See Note 1	N/A	N/A	
SMP	PVC	Sch 80	See Note 3	30	Hyd	45	N/A	N/A	Buried sample lines
STRM	RCP	See Note 2	See Note 2	5	Hyd/Inf	10	N/A	N/A	
SAN >6”	RCP	See Note 2	See Note 2	5	Hyd/Inf	10	N/A	N/A	
SAN <6”	PVC	Sch 80	BS	5	Hyd/Inf	10	N/A	N/A	See Note 3
FIRE	DI	Special Thickness Class 56	RMJ	60	Hyd	90	CL	AC, PEL	See Note 4
PW	DI	Special Thickness Class 56	RMJ	60	Hyd	90	CL	AC, PEL	See Note 4; For sizes above 4 inches
PW	Cu	Type L	Sld	60	Hyd	90	None	None	See Note 5; For sizes above

Notes:

(1) See Section 40 05 32 - Double Containment Chemical Piping
(2) See Section 33 42 19 Reinforced Concrete Sewer Pipe
(3) See Section 40 05 31 Thermoplastic Process Pipe
(4) See Section 40 05 09 Ductile Iron Process Pipe
(5) See Section 22 11 16 - Domestic Water Piping

A. The following service abbreviations are used in Schedule 33 06 01-1:

Service:	**Abbrev:**	**Service:**	**Abbrev:**
Sodium Hypochlorite Fill	HYPO-F		
Storm Sewer	STRM	Sanitary Sewer	SAN
Drain	DR	Potable Water	PW
Firewater	FIRE	Sample Line	SMP

B. The following pipe material abbreviations are used in Schedule 33 06 01-1:

Pipe Material:	**Abbrev:**	**Pipe Material:**	**Abbrev:**
Double-Contained Polyethylene	DC	Reinforced Concrete Pipe	RCP
Polyvinyl Chloride	PVC	Copper	Cu
Ductile Iron	DI		

C. The following joint type abbreviations are used in Schedule 33 06 01-1:

Joint Type:	**Abbrev:**	**Joint Type:**	**Abbrev:**
Bell and Spigot	BS	Soldered	Sld
Brazed	Brz	Solvent Weld	SW
Butt Weld	BW	Restrained Mechanical Joint	RMJ
Flanged	Flg	Restrained Push-on Joint	RPOJ
Lap Welded	LW	Threaded	Thd
Mechanical Joint	MJ	Welded	Wld
Push-on Joint	POJ		

D. The following interior coating abbreviations are used in Schedule 33 06 01-1:

Interior Coating	**Abbrev:**	**Interior Coating:**	**Abbrev:**
Asphalt Coated	AC	Cement Lined	CL
Basalt Coated	BC	EPDM (M-class) Rubber	EPDM
Ceramic Epoxy Coated	CEC	Glass Lined	GL
Ceramic Epoxy Lined	CEL	Polyethelene Lined	PEL

E. The following exterior coating and treatment abbreviations are used in Schedule 33 06 01-1:

Exterior Coating, Treat.:	Abbrev:	Exterior Coating, Treat.:	Abbrev:
Asphalt Coated	AC	Galvanized	Galv
Epoxy	Epx		

F. The following testing abbreviations are used in Schedule 33 06 01-1:

Test Type:	Abbrev:	Test Type:	Abbrev:
Exfiltration	Exf	Infiltration	Inf
Hydrostatic	Hyd	--	--

SECTION 33 39 10 – SANITARY AND STORM SEWER STRUCTURES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for furnishing and installing precast and cast-in-place manholes, catch basins, trench drains, and other structures in sanitary sewers and storm sewers including all appurtenances.

B. Concrete drainage structures include, but are not limited to, inlets, catch basins, trench drains, area drains, manholes, pipe cradles and encasements, and splash pads.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 03 21 00 - Reinforcing Steel

B. Section 03 30 10 - Low Carbon Cast-in-Place Concrete

C. Section 05 56 00.01 - Miscellaneous Metal Castings

D. Section 33 05 05.30 - Leakage Tests for Buried Piping

1.04 REFERENCES

A. ASTM C32 - Sewer and Manhole Brick (Made from Clay or Shale)

B. ASTM C39 - Standard Test Method for Compressive Strength for Cylindrical Concrete Specimens

C. ASTM C78 - Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)

D. ASTM C139 - Concrete Masonry Units for Construction of Catch Basins and Manholes

E. ASTM C140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units

F. ASTM C144 - Aggregate for Masonry Mortar

G. ASTM C279 - Chemical-Resistant Masonry Units

H. ASTM C443 - Joints for Concrete Sewer and Manholes, Using Rubber Gaskets

I. ASTM C478 - Circular Precast Reinforced Concrete Manhole Sections

J. ASTM C666 - Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing Freeze Thaw Stability of Concrete Specimens

K. AWWA C302 - Reinforced Concrete Pressure Pipe, Non-cylinder Type

L. City of New York Department of Environmental Protection Sewer Design Standards

1.05 DESCRIPTION

A. Design Requirements

1. Except as otherwise shown or specified, construct sewer manholes and catch basins of precast reinforced concrete sections conforming to ASTM C478.

2. Unless otherwise shown, manholes and catch basins shall be built in accordance with the Sewer Design Standards of the Department of Environmental Protection, except that they shall be constructed without steps.

B. Construction of Manholes

1. Manhole Base Section: Unless otherwise shown, provide manhole base sections consisting of a base riser section with an integral floor. When benches are made at the manufacturing site, provide concrete used for benched inverts conforming to the requirements for concrete used for precast sections. When benches are made in the field, Class 45 concrete may be used. Benches shall be float finished and sloped to drain.

2. O-ring Joints: Join riser, cone and flat slab top sections with O-ring rubber gasket joints or self-sealing butyl gaskets, as shown in the Sewer Design Standards. Fill voids in the joints completely with mortar after assembly of the sections.

C. Precast Products

1. Unless otherwise shown or specified, precast concrete products shall be used for sanitary and storm sewer structures.

2. The number of joints in manhole and catch basin riser sections shall be kept to a minimum by using sections 8'-0" long in so far as possible. Joints shall be tongue and groove type conforming to AWWA C302, with continuous steel reinforcement in the tongue and bell.

3. Wet-cast methods only shall be used. Forms shall leave the surfaces smooth and free of irregularities or honeycombing.

4. Unless otherwise shown or specified, the following design loadings shall be used with 30 percent impact allowance in roads and 15 percent elsewhere.

a. Earth = 130 pcf

b. Wheel = H-20

5. Unless otherwise shown or specified, wall thickness for manholes and catch basins shall be not less than:

a. 5 inches for walls

b. 8 inches for top slab

6. No more than two (2) tapered lifting holes shall be provided per section of manhole or lifting holes shall be filled with tapered rubber plugs.

7. The point of intersection (P.I.) of pipes shall be marked with a pin in the manhole floor.

8. The date of manufacture and the manufacturer’s trademark shall be marked inside each manhole and catch basin barrel.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Shop and field test reports of concrete samples tested in an approved laboratory.

1.08 DELIVERY, STORAGE, AND HANDLING

A. General: Take every precaution to prevent injury to the structures during transportation and unloading. Unload manhole sections and other precast items using skids, pipe hooks, rope slings, or suitable power equipment, if necessary, and

keep the items under control at all times. Do not allow the items to be dropped, dumped or dragged under any conditions. Follow applicable requirements specified in Contract Documents Damaged Section: If any precast manhole section or other structural unit is damaged in the process of transportation or handling, reject and immediately remove the item from the site, and replace it at no increase in Contract Amount.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Precast Manholes shall be as manufactured by:

1. Precast Concrete Sales Company, Valley Cottage, NY;
2. Long Island Precast, Inc., Holtsville, NY;
3. Oldcastle Infrastructure, Middle Island, NY
4. Or approved equal.

B. Precast Inlets shall be as manufactured by:

1. Penn-Cast Products, Inc., Fredericksburg, VA;
2. Precast Concrete Sales Company, Valley Cottage, NY;
3. Oldcastle Infrastructure, Middle Island, NY
4. Or approved equal.

C. Precast Catch Basins shall be as manufactured by:

1. Penn-Cast Products, Inc., Fredericksburg, VA;
2. Long Island Precast, Inc., Brookhaven, NY;
3. Precast Concrete Sales Company, Valley Cottage, NY;
4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Concrete, Steel Reinforcement and Aggregates: For precast manholes, catch basins, inlets, and other sanitary and storm sewer structures, reinforced concrete, cementitious materials, aggregates and steel reinforcement shall conform to the requirements of ASTM C478. If concrete rings are used for adjusting manhole frames to grade, they shall conform to the requirements of ASTM C139. For cast-

in-place structures, these materials shall conform to Sections 03 30 10 – Low Carbon Cast-in-Place Concrete and 03 21 00 – Reinforcing Bars.

B. Brick: If brick is used for adjusting manhole and catch basin frames to grade, it shall conform to ASTM C32, Grade MS, with minimum dimensions of 2 1/4 by 3 1/2 by 7 1/2 inches. Brick shall be new, solid, sound, hard burned throughout and uniform in size and quality.

C. Mortar: Provide mortar that is composed of one part Type II Portland cement or Portland pozzolan cement to two parts sand. Sand shall be natural sand that conforms to the requirements of ASTM C144.

D. Frames and Covers: Frames, covers, gratings and miscellaneous metal castings shown in the Sewer Design Standards or on the Contract Drawings for installation on manholes, catch basins, trench drains and other sanitary structures shall be gray iron and shall meet the requirements of Section 05 56 00.01- Miscellaneous Metal Casting. Grating for trench drains shall be compatible with the trench drain manufacturer's systems and recommendations.

E. O-Ring Rubber Gaskets: Provide O-ring rubber gaskets conforming to ASTM C443 for joining manhole sections.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Concrete Strength: Manhole sections will be inspected and tested by an independent, certified testing laboratory, retained by the City, to establish the strength of the concrete and the adequacy of curing, to certify the date that the sections were cast and to confirm that the reinforcing steel has been properly placed. This inspection and testing will be performed by the laboratory at the manufacturing plant prior to shipment.

1. A minimum of one set of three cylinders will be taken each day that manhole sections are cast, with batch samples to be designated by the laboratory representative. At least one set of cylinders will be taken from each 9 cubic yards of concrete used in manhole section construction. These samples will be tested for strength. If the samples fail to meet specified minimum concrete strength requirements, all manhole sections manufactured from the concrete from which the cylinders were made will be rejected.

2. The City reserves the right to core manholes either at the job site or point of delivery to validate strength of concrete and placement of steel. If cores fail to demonstrate the required strength or indicate incorrect placement of reinforcing steel, all sections not previously tested will be considered rejected until sufficient additional cores are tested, at no increase in Contract Amount, to substantiate conformance to these requirements.

B. Acceptance of flat slab tops will be based on the tops passing a proof-of-design test in accordance with ASTM C478. One flat slab top for each design shall be tested.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Manhole Frames: Firmly embed manhole frames in mortar. Provide wedges or shims for accurate and level placing of the frames.

B. Connections to Riser Section: Manufacture riser sections with openings properly located for making connections to sewers. The minimum distance between a joint in a manhole section and the nearest edge of an opening for a connecting sewer and the diameter of such openings shall be as shown in the Sewer Design Standards.

C. Coatings: No exterior coating shall be used for precast structures.

D. Laying Masonry:

1. Bricks shall be wetted before applying mortar.
2. Full bed, end and side joints shall be formed in one operation.
3. Horizontal joints shall be 3/8 inch maximum and radial joints shall be 1/4 inch maximum.
4. Keyways shall be completely filled with mortar.
5. The total amount of adjustment by bricks or concrete rings shall not exceed 12 inches.

E. Precast Items:

1. Place on crushed stone bed or concrete cradle set level as shown.
2. Place backfill in even lifts on all sides to prevent overturning loads.

F. Stubs for Future Connections: Where shown, provide stubs or bells cast in walls and provide approved plugs or caps.

G. Grading:

1. Manholes and catch basins shall be installed such that covers will be at final grade.
2. Structures shall not project above finished pavements.
3. Structures in areas with temporary working grades shall be initially installed to match the temporary grade, and adjusted later to final grade prior to regrading.
4. Contractor shall be responsible for setting structures to the proper grade. The Engineer's review will be general and will apply to components only.

3.03 FIELD TESTING / QUALITY CONTROL

A. Test for leakage as required by Section 33 05 05.30 – Leakage Tests for Buried Piping.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 33 42 10 - REINFORCED CONCRETE SEWER PIPE
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish and install reinforced concrete sewer pipe, fittings and specials.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 33 05 05.30 - Leakage Testing for Buried Piping

B. Section 03 30 10 - Low Carbon Cast-in-Place Concrete

C. Section 03 41 00 - Precast Structural Concrete

1.04 REFERENCES

A. ASTM A283 - Low and Intermediate Tensile Strength Carbon Steel Plates

B. ASTM A1011 - Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

C. ASTM B127 - Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip

D. ASTM C31 - Making and Curing Concrete Test Specimens in the Field

E. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

F. ASTM C76 - Reinforced Concrete Culvert, Storm Drain and Sewer Pipe

G. ASTM C361 - Reinforced Concrete Low-Head Pressure Pipe

H. ASTM C443 - Joints for Concrete Pipe and Manholes, Using Rubber Gaskets

I. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile

J. AWWA C302 - Reinforced Concrete Pressure Pipe, Noncylinder Type

1.05 DESCRIPTION

A. Design Requirements

1. Concrete shall conform to Sections 03 30 00 – Cast-in-Place Concrete and 03 41 00 – Precast Structural Concrete, and when tested at the end of 28 days shall have the following minimum compressive strengths:

a. PRECAST PIPE - 4,000; 5,000; 6,000 psi

b. MONOLITHIC SEWERS - 3,500 psi

c. CRADLES AND ENCASEMENT - 3,500 psi

2. Design: Provide the classes of reinforced concrete sewer pipe as shown or specified. Conform pipe designs to the following requirements.

a. Use diameter, wall thickness, compressive strength of concrete and area of circumferential reinforcement as prescribed for Classes I to IV in Tables 1 to 5 in ASTM C76, except do not use Wall A thickness, elliptical reinforcing cages or quadrant reinforcing mats. Do not substitute modified designs for designs shown in the tables.

b. Provide special designs only for pipe with diameters and loads beyond those shown in Tables 1 to 5, pipe diameters that do not have steel reinforcement areas shown in the tables and pipe subject to

thrust forces encountered in jacking operations. Conform special designs with the requirements of Section 7.2.2 of ASTM C 76, except do not use Wall A thickness, elliptical reinforcing cages or quadrant reinforcing mats without prior approval. Retain a Registered Professional Engineer, licensed in the State of New York, to prepare, sign and seal all special designs for pipe.

3. Precast reinforced concrete pipe shall conform to the requirements of ASTM C76 for circular steel reinforcement and the three-edge bearing strength test requirements for the load to produce the 0.01 inch crack and for the ultimate load. When the strength test requirements specified in the Contract Documents are greater than the strength test requirements of ASTM C76, the thickness of the pipe wall may be increased, the area of circular steel reinforcement increased, or a combination of these, all as approved by the Engineer.

4. Joints:

   a. Provide joints for pipe, fittings and specials in gravity sewer and drain lines meeting the requirements of ASTM C443 and this Specification.

   b. Provide joints for pipe, fittings and specials in concrete pressure lines with test pressures of 125 ft. or less meeting the requirements of ASTM C361 and these specifications.

   c. Provide joints for pipe, fittings and specials in concrete pressure lines with test pressures over 125 ft. as described in the Contract Documents.

B. Schedules

1. Refer to the schedule contained in the Contract Documents for information on the piping that is to be constructed using the pipe materials and methods specified herein.

1.06 QUALITY ASSURANCE

A. General: Provide concrete pipe, fittings and specials that are precast or machine made and are the product of a company that can demonstrate by tests and installation records satisfactory experience in manufacturing concrete pipe of the quality and type specified.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

B.

1. All diameters and classes of reinforced concrete pipe, fittings and specials and for concrete sills showing dimensions, strength and materials specifications and standards, joint details and reinforcement position
2. Area of all cages of reinforcing steel
3. A minimum clearance of one inch for each cage of circumferential reinforcing steel shown
4. Angle of the joint
5. Length and thickness of bell and spigot
6. Length and thickness of joint
7. Manufacturer, size and type of gasket
8. Manufacturer's recommendations for gap dimension and tolerance for a properly installed pipe joint
9. Signature and title of authorized representative of the manufacturer
10. All requirements of the latest ASTM Specifications for Precast Reinforced Concrete Pipe as called for in these specifications will be complied with in the manufacture of the pipe

C. Joint Compliance: Submit notarized affidavit of joint compliance with ASTM C443 and these specifications for each pipe size. The statement shall include date of test.

D. Quality Control: Submit certified results of all shop tests for approval.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Do not ship pipe to the site of the work until the pipe test results are certified by the Engineer.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

Not Used

2.02 MATERIALS / EQUIPMENT

Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Reinforced Concrete Pipe

1. Manufacture:

a. Do not use admixtures or blends in concrete without prior approval.

b. The manufacturer shall maintain a satisfactory manufacturing schedule and shall have adequate storage facilities so that the work will not be delayed.

c. Cast pipe in steel forms to the exact dimensions shown, specified or required. Unless otherwise shown or specified, the inner and outer rings of reinforcement shall be concentric. Provide chairs and spacers to insure and maintain the proper position of reinforcement steel with respect to the protective concrete covering. Pipes in which reinforcing steel is placed beyond the tolerances allowed by ASTM C76 will be rejected. Use metal spacers at the top between the inner and outer forms to maintain uniform wall thickness in casting pipe. Where reinforcement mesh is used in the pipe, curve such reinforcement to shape on rolls having grooves for the longitudinal wires. In casting pipe, do not cut wires for form spacers or for other purposes. Provide continuous internal vibration of concrete during the pouring operation.

d. The Contractor will be responsible for meeting all requirements for the manufacture of precast pipe and checking at regular intervals all such requirements.

2. Lengths: Manufacture all reinforced concrete pipe in lengths of not more than 16 feet and not less than 8 feet as follows, except where shorter lengths are required and approved for pipeline curves or at junctions with structures.

a. Furnish subaqueous pressure pipe in lengths of not less than 16 feet for pipe up to and including 84 inches in diameter. Pipe larger than 84 inches in diameter may be of lengths less than 16 feet, decreased on a sliding scale in accordance with the manufacturer's recommendations and as approved by the Engineer.

b. Furnish pressure pipe to be installed inland in lengths not less than 12 feet, except that pipe to be laid in sheeted trench shall be furnished in lengths not less than 8 feet.

3. Labeling: Immediately after the stripping of forms, all pipe manufactured for the Department of Environmental Protection as required under this contract shall be marked and identified with the following data: DEP, contract name and number, class and diameter of pipe, number of pipe, date of manufacture and the name of the manufacturer. The numbering of the pipe shall be consecutive for each diameter of pipe. Brass lettering templates designed to stencil this information on each pipe shall be provided by the pipe manufacturer. The aforementioned data shall be stenciled on the inside and outside of each length of pipe with waterproof ink or paint. Any pipe arriving at the location of the work without this information stenciled thereon will be rejected. At the end of each day of casting of the

pipe, the manufacturer shall forward to the Engineer three copies of a report giving the diameters and the respective numbers of pipe cast that day.

4. Monolithic Sewers:

   a. Forms for monolithic concrete sewers shall be smooth, regular and true to shape. Forms which do not meet these requirements or which result in interior surfaces or thicknesses inferior to commercial precast concrete pipe shall not be used. Forms shall be thoroughly cleaned and approved by the Engineer before re-use. Sheeting shall not be used as exterior forms for monolithic concrete sewers.

   b. Concreting, unless otherwise approved by the Engineer, shall proceed in lengths of not less than 12 feet.

   c. Construction joints both longitudinal and transverse in monolithic concrete sewers shall have fabricated nickel-copper roofing sheet water stops conforming to the requirements of ASTM B127.

B. Reinforced Concrete Fittings and Specials

1. General: Provide reinforced concrete fittings and specials where shown, specified or required, and manufactured in accordance with the applicable sections of the respective standard for the adjoining pipe. Provide joints the same as in the adjoining pipe. Provide the interior surface of bends of the same smoothness and diameter as the adjoining pipe. Provide the center line radius of curvature of bends to be equal, in dimension, to the inside diameter of the pipe.

2. Strength: Design all reinforced concrete fittings and specials to have the same strength as the class of the adjoining pipe. Retain a Registered Professional Engineer, licensed in the State of New York to prepare, sign and seal all designs for fittings and specials.

3. Standard fitting such as bends, tees, wyes and reducers shall be formed of steel, cut, shaped and welded to the proper form. Interior and exterior concrete or mortar shall be placed in approved manner.

4. Special pieces and openings in standard pipe such as closures, wall fittings, adapters, manholes, air valve outlets, blow-offs and branches shall conform to details approved by the Engineer.

C. Joints:

1. General: Rubber gaskets shall be stored in as cool a location as practicable, preferably at 70 degrees F or less. In no case shall gaskets be exposed to the direct rays of the sun for a total of more than 24 hours.

2. Gravity Sewer and Drain Lines:

   a. Manufacture all gravity sewer and drain pipe, fittings and specials with watertight joints using rubber gaskets in accordance with the requirements of ASTM C443. Provide a preformed groove in the

tongue or spigot of sufficient depth to hold the gasket securely in place and produce the proper gasket compression. Reinforced concrete pipe joints shall be optional as to shape, except that no joint shall have a groove in which the wall thickness of the pipe is reduced to less than one-half, other than by a slight draw or taper, unless approved by the Engineer in writing.

b. Manufacture the pipe with perfectly machined castings for forming the bells and spigots so that they will be true circles and when laid together the annular space for the rubber gasket will be perfectly uniform. The diameters of the bell and spigot surfaces, depended upon to compress the gasket, shall not vary from the theoretical diameters by more than 1/16 inch. The joint shall not project beyond the body of the pipe.

c. Reinforce the bells of the pipe with a single cage of steel in which the circumferential members are the same gauge as those in the body of the pipe, but spaced on no more than 1 inch centers.

d. The type and the manufacturer of the flexible rubber gaskets to be used shall be submitted for approval before pipe laying begins.

D. Concrete Pressure Lines:

1. Provide all concrete pressure pipe, fittings and specials with watertight joints using rubber gaskets in accordance with the requirements of ASTM C361 and this Specification.

2. Connect adjacent pipes by self-centering steel joint rings sealed with a continuous round rubber gasket. The joint shall be tight under normal conditions of service, and shall be sufficiently flexible to permit expansion and contraction as well as slight deflection due to normal earth settlement.

3. Specially shape the rings which form the joint so that they will join with a close, sliding fit. The joint surfaces shall be such that the rubber gasket will be confined on all sides.

4. Provide the spigot ring with an external groove accurately sized to receive the gasket. Special section steel for spigot rings shall conform to ASTM A283/A283M, Grade A or B.

5. Place the bell ring to permit gradual deformation of the gasket when the joint is assembled. The minimum thickness of bell rings shall be 3/16 inch. Bell rings for pipe sizes 42 inches and larger shall have a minimum thickness of 1/4 inch. Bell rings 1/4 inch and thicker shall conform to ASTM A283/A283M, Grade A or B. Bell rings less than 1/4 inch thick shall conform to ASTM A570/A570M, Grade A.

6. Precisely size each ring by expansion beyond the elastic limit of the steel and then gaging on an accurate template. Protect all exposed surfaces of both rings with a corrosion-resistant coating of zinc applied by an approved metalizing process after cleaning.

7. Provide a continuous rubber gasket with smooth surfaces free from imperfections. It shall be circular and shall fill the grooved recess between the assembled joint rings. Rubber compound used shall conform to the requirements of Section 4.4.10 of AWWA C302.

E. Curing

1. Cure all pipe, fittings and specials by steam or membrane curing. Water curing is not permitted.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Shop Testing

1. Test concrete sewer pipe in accordance with the applicable provisions of ASTM C497, as required by the ASTM Specification for the pipe and as specified herein.

2. Test cylinders: Each day the Contractor shall prepare two test cylinders made from the concrete used for manufacturing the pipe under this contract.

a. Make test cylinders in accordance with the requirements of ASTM C31 and cure and store them under identical conditions with the pipe. Test cylinders shall be properly marked for identification and dated.

b. The Engineer will have the cylinders tested to determine whether the concrete complies with the strength requirements. Of each pair of test cylinders, one cylinder will be tested at 7 days, and the other test cylinder will be tested at 28 days. Test cylinders will be tested in accordance with ASTM C39 and the cost of such tests will be borne by the City.

3. Test Pipe Sections:

a. When lengths of pipe are 8 feet or less, the Engineer will select one length from every fifty lengths of each diameter and class.

b. When lengths of pipe are more than 8 feet, the Contractor shall provide a pipe test specimen four feet long for every 50 lengths of each diameter and class. Each test specimen shall be manufactured, marked for identification and shall meet the strength test requirements as specified for the pipe it represents. The manufacturing and marking of the pipe test specimen shall be witnessed by the Engineer.

c. Where less than 50 lengths are required for any pipe diameter, one eight-foot length of pipe will be selected by the Engineer or one pipe test specimen shall be provided for testing purposes; however, the Engineer may waive this requirement at his discretion.

d. Age of Pipe: Pipe selected or pipe tested specimens provided as specified for testing purposes shall be at least twenty-eight days old but shall not be over thirty days old at the time of testing.

1) Due to unforeseen conditions beyond the control of the Engineer and the manufacturer, special permission will be given in writing by the Engineer to delay a test beyond the 30 day aging period.

2) The three-edge load bearing strength at 0.01-inch crack and the ultimate load strength of pipe tested after twenty-eight days will be corrected to the 28 day strength by deducting 1/2 of one percent of the recorded strength for each day beyond the twenty-eight day age.

3) The Contractor may request tests to be made on pipe which has aged at least fourteen days and not more than 28 days but the tests must meet the 28 day strength test requirement in order to be accepted by the Engineer for installation in the work.

4. Basis of Acceptance: Conform the basis of acceptance for reinforced concrete pipe to Section 5.1.1 of ASTM C76 and this Specification.

a. The Engineer will reject all pipe of the lot which the tested length of pipe represents if the actual or corrected strength of the pipe tested fails to meet the three-edge load bearing strength test requirements. However, if the eight-foot length of pipe selected by the Engineer fails to meet the three-edge loading bearing strength test requirements, the Contractor may request that tests be made on two other eight-foot lengths of pipe representing that lot from which the original pipe tested was selected. The Engineer will select these two lengths of pipe. Should the tests on these two lengths of pipe prove satisfactory, the lot, represented by these lengths of pipe will be accepted. Should the tests on one or two of these lengths of pipe prove unsatisfactory, no further tests on any other lengths of pipe from this lot will be made, and all the pipe in this particular lot will be rejected.

b. The Engineer may accept precast pipe which meets the 0.01-inch crack strength test requirements but does not meet the ultimate load strength test requirements; however, the City will deduct 1/2 of one percent of the price bid per linear foot for that item which covers that particular pipe diameter and test strength requirements, for each one percent by which the ultimate load is below the required ultimate load. This deduction will be made on all pipe represented by the test specimen.

5. Proof-of-Adequacy Tests for Special Designs: Prior to manufacturing production run pipe of special design, test one pipe of at least four feet in

length of each diameter and class by the three-edge-bearing method to confirm that the pipe meets both the 0.01-inch crack and ultimate load requirements for which it is designed.

6. Joint Adequacy Tests:

   a. Prior to manufacturing production run pipe, fittings and specials, conduct all tests required by Sections 9 and 10 of ASTM C443 for each diameter of pipe.

   b. Give two weeks' notice in writing, before the day of testing, to both the Engineer and the approved laboratory, to witness the tests. The Department of Environmental Protection reserves the right to have an inspector or authorized representative present at the time of the tests.

   c. All manufacturers supplying reinforced concrete pipe to the Department of Environmental Protection shall, for each size of pipe and gasket combination submitted for approval, have on file with the Department a Certified Statement attested thereto by the City inspector or representative that the hydrostatic test on pipe and on rubber gasket was performed in accordance with the above-mentioned ASTM designation and passed.

7. Location of Tests: The pipe selected or the pipe test specimen provided for test shall be delivered by the Contractor to an approved testing laboratory and removed by the Contractor after the test has been made. The Contractor may request that tests be made at the manufacturer's plant; however, the pipe manufacturer shall provide an approved and certified testing machine with a hydraulically-operated jack and direct-reading gauges requiring no calibration.

8. Test Witnessing: All strength tests will be witnessed by the Engineer.

9. Costs of Tests: The Contractor shall pay all costs associated with tests and test witnessing.

B. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Install all reinforced concrete sewer pipe, fittings and specials in accordance with the manufacturer’s recommendations and approved shop drawings, and as follows.

1. Precast pipe lines shall be true to line and grade. The interior surface shall be smooth and uniform.

2. Season pipe 28 days prior to laying.

3. With the gasket in place, align the pipe, and draw the joints home with an approved tackle and apparatus. Prior to the use of such apparatus and method, demonstrate to the Engineer for approval the effectiveness and practicability of the proposed method of drawing the joints home.

4. The position and condition of the gasket will be examined from the inside of the pipe before successive pipe lengths are installed. If an unsatisfactory condition is located, the pipe shall be taken out and the operation of drawing the pipe together repeated with a new gasket.

5. Provide approved concrete sills for the temporary support of pipes which are to be permanently supported on concrete cradles for maintaining proper alignment and grade until the concrete cradle is poured. Completely embed such sills in the concrete cradle.

6. Cast concrete cradles for pipe in one pour to the exact size and dimensions shown on the Contract Drawings.

B. Jointing Pipe at Structures:

1. At manholes and other structures in precast concrete pipe lines, the construction may be of monolithic concrete. Submit details of such joints to the Engineer for approval.

2. Where precast concrete pipe for pressure pipe lines is joined to monolithic concrete pipe, cast iron or steel pipe, or other structure, the joint shall be similar to the joint between individual precast concrete pipes, enlarged if required. Submit details of such joints to the Engineer for approval.

3. Where provisions for future connections are required, provide similar joints and coat with an approved asphaltic compound for protection. If necessary, in the opinion of the Engineer, place a suitable collar entirely around the pipe at all such joints.

3.03 FIELD TESTING / QUALITY CONTROL

A. Test the reinforced concrete sewers for leakage after completion in accordance with Section 33 05 05.30 - Leakage Testing for Buried Piping

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 40 05 05 – EXPOSED PIPING INSTALLATION
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to install all exposed piping complete and operational.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 03 30 10 – Low Carbon Cast-in-Place Concrete.

B. Section 05 12 00 – Structural Steel Framing.

C. Section 22 07 19 – Plumbing Piping Insulation

D. Section 40 05 05.30 – Leakage Testing for Exposed Piping.

E. Section 40 05 06 – Couplings, Adapters, and Specials for Process Piping.

F. Section 40 05 07 – Hangers and Supports for Process Piping.

G. Section 40 05 53 – Process Valves Four-inch Diameter and Larger.

H. Section 40 05 56 – Process Valves, Smaller than Four-inch Diameter.

I. Section 40 05 97 – Identification for Process Equipment.

J. Section 40 06 01 – Schedule for Exposed Piping.

1.04 REFERENCES

A. Definitions:

1.	Buried Piping:	Includes all piping beginning at the outside face of a structures or foundation and extending away from structures. Buried piping includes piping beneath structures or foundations.
2.	Exposed Piping:	Includes all piping beginning at the outside face of a structures or foundation and extending inside. Exposed piping includes interior piping. Exposed piping also includes all piping embedded in concrete, as well as all piping that is permanently or intermittently submerged and/or installed in a subaqueous environment.

B. Reference Standards:

1.	ANSI/SMACNA	Seismic Restraint Manual.
2.	ASME	Boiler and Pressure Vessel Code.
3.	ASME B1.1	Unified Inch Screw Threads.
4.	ASME B31.1	Power Piping.
5.	ASME B31.3	Process Piping.
6.	ASTM A193	Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
7.	ASTM A307	Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength.
8.	ASTM B32	Standard Specification for Solder Metal
9.	ASTM D2564	Standard Specification for Solvent Cements for PVC Plastic Piping Systems.
10.	ASTM D2855	Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining PVC or

		CPVC Pipe and Piping Components with Tapered Sockets.
11.	ASTM F493	Standard Specification for Solvent Cements for CPVC Plastic Pipe and Fittings.
12.	ASTM F656	Standard Specification for Primers for Use in Solvent Cement Joints of PVC Plastic Pipe and Fittings.
13.	AWWA C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
14.	AWWA C206	Field Welding of Steel Water Pipe.
15.	AWWA C600	Installation of Ductile-Iron Mains and Their Appurtenances.
16.	AWWA C606	Standard for Grooved and Shouldered Joints.
17.	AWWA M11	Steel Pipe: A Guide for Design and Installation,
18.	AWWA M23	PVC Pipe – Design and Installation.
19.	AWWA M41	Ductile-Iron Pipe and Fittings.
20.	DIPRA	Installation Guide for Ductile Iron Pipe.
21.	NSF61	Drinking Water System Components Health Effects.

1.05 DESCRIPTION

A. The scope of this Section includes the requirements for the installation of exposed piping, except where installation requirements for exposed piping are shown or specified elsewhere in the Contract Documents. In addition:

1. The scope of this Section includes requirements for:

a. The jointing of exposed piping

b. The installation of gasket materials, specials, flexible couplings, mechanical couplings, harnessed and flanged adapters, sleeves, and tie rods.

c. Modifications and/or adjustments to existing exposed piping.

d. The installation of supports, restraints, and other anchors.

e. The cleaning, disinfecting, and field testing of all exposed piping.

2. The extent of exposed process piping is shown on the Contract Drawings. The Contractor shall provide additional exposed pipe as necessary and/or required to complete the Work as shown and specified. Exposed pipe service, pipe diameter, coating, lining, pressure rating, joint type, and testing requirements are specified in the following section(s):

a. Section 40 06 01 - Schedule for Exposed Piping.

3. Where shown on the Contract Drawings, the Contractor shall provide all labor and materials for making connections between exposed piping and existing lines(s) installed under other contracts, including all specials required to connect exposed pipe to pipe of dissimilar material(s).

1.06 QUALITY ASSURANCE

A. Not Used.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. Exposed piping submittals shall be submitted under the specification section number corresponding to the exposed piping material. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Shop Drawings:

1) Catalog cuts and data sheets, including but not limited to:

a) Specifications for all components of the exposed piping.

b) illustrations in sufficient detail to serve as a guide for assembly and disassembly

c) A parts schedule that identifies the materials to be used for the various piping components and accessories.

d) Weights of all component parts.

e) Details on joining methods.

f) Details of pipe lining, coating, wrapping, insulation and painting.

g) Copy of pipe coupling, special, and adapter details (pipe couplings, specials, and adapters shall be submitted for approval under Section 40 05 06 - Couplings, Adapters, and Specials for Process Piping).

h) Copy of expansion joint details (expansion joints shall be submitted for approval under the specification section in which they are specified)

i) Copy of pipe hanger details (pipe hangers shall be submitted for approval under Section 40 05 07 - Hangers and Supports for Process Piping).

j) Copy of pipe insulation details (insulation shall be submitted for approval under Section 22 07 19 – Plumbing Piping Insulation).

b. Layout and Installation Drawings:

1) Shall include plans, sections, and details showing location, elevations, and clearly marked dimensions.

2) Piece numbers which are coordinated with the tabulated pipe layout schedule shall be clearly marked.

3) The scale used shall be the greater of the following two (2):

a) The scale used on the Contract Drawings that depict the process pipe for which the submittal pertains, or

b) A minimum scale of ¼-in = 1-ft - 0-in.

4) When special designs or fittings are required, the work shall be shown in large detail and the special or fitting completely described and dimensioned.

5) Include a north arrow.

6) Information on pipe supports, including:

a) Pipe support location.

b) Pipe support type.

c) hanger rod size.

d) Insert type.

e) All loads on the support (in either lbs. or kips.)

7) Locations where pipe and valve identification signs will be placed.

8) Location of pipe couplings, specials, and adapters.

9) Location of expansion joints.

10) Locations of pipe hangers and supports.

11) Extent of pipe insulation.

12) Extent of lining, wrapping, and coatings.

c. A tabulated pipe layout schedule for each exposed process pipe system. Submit a separate schedule for each pipe system and/or service. The pipe layout schedule shall include the following information for each pipe section, fitting, and appurtenance that comprises that system:

1) Service.

2) Pipe size.

3) Working pressure.

4) Weight (in lbs.)

5) Joint type.

6) Wall thickness.

7) Piece number.

8) Laying length.

d. Calculations for the design of the support structures.

1) Design calculations shall be signed and sealed by a Professional Engineer registered in the State of New York.

2) Calculations shall include a summary of design criteria used in the design, including a description of each load case and load combination considered.

3) A tabulation shall be provided indicating vertical and horizontal deflections for the supports and individual members, determined for each load combination identified above.

4) A tabulation shall be provided giving the column vertical and horizontal reactions for each load combination.

e. For each exposed process piping system that contains valves, submit a tabulated valve schedule. Submit a separate schedule for each pipe system and/or service. The valve schedule shall include the following information for each valve:

1) Valve tag number.

2) Valve size.

3) Whether the valve is manual or actuated. If actuated, the type of actuator.

4) 100% open Cv value for control valves.

5) Upstream pressure (units of psig).

2. Information Submittals:

a. Certified Letters of Compliance:

1) Certificate of compliance with the requirements of the Contract Documents for pipe, fittings, couplings, sleeves, cleanouts and harnessing.

2) Certificate from an independent testing laboratory, approved by the City, for each welder assigned to the welding of pipe, fittings, and pipeline equipment.

3) Materials Certificates of Conformance: Submit certificates of conformance with Referenced Standards specified in the corresponding piping specification section.

b. Welding Procedures and Qualifications:

1) Certificates shall be of current issue and conform to the requirements of the applicable reference standards. In addition:

   a) Certificates that all welders and welding operators have been qualified in accordance with ASME Boiler and Pressure Vessel Code Section IX.

   b) Certificates stating that the welding of steel and stainless steel shall conform to the requirements of ASME B31.1.

2) Copies of qualified procedures and list of names and identification symbols of qualified welders and welding operators, prior to welding operations.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Structural Attachments:

1. Structural steel brackets required to support piping and appurtenances but not shown on the Contract Drawings shall be provided under this section.

2. Material for structural attachments shall be as specified under Section 05 12 00 - Structural Steel Framing.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Identification:

1. Provide in accordance with Section 40 05 97 - Identification for Process Equipment.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. All pipe coating injured in any way during transit or laying shall be satisfactorily repaired prior to placing the backfill.

1. Ample provision shall be made for the prompt and efficient repair of all abrasions and injuries.

B. Certificates of welding qualifications conforming to the requirements of ASME B31.1, Section 6 and its Supplements, shall be submitted to the Engineer for approval prior to proceeding with any pipe welding.

3.02 INSTALLATION

A. General:

1. All piping shall be erected to accurate lines and grades, permanently supported as shown, specified, or required.

2. Where temporary supports are used during construction, sufficient strength and rigidity shall be provided to prevent shifting or distortion of the pipe.

3. All work shall be accomplished using the best methods and procedures of recognized pipe fabrication in a good and workmanlike manner in accordance with the latest edition of the applicable standards referenced in the Contract Documents, including (but not limited to):

a. For thermoplastic pipe:

1) AWWA M23.

4. All exposed pipe, fittings, and appurtenances shall be installed in accordance with all of the following:

a. The manufacturer's printed instructions and recommendations.

b. The approved shop drawings.

c. As specified in the Contract Documents.

5. Routing:

a. Install piping in a neat manner with lines straight and parallel or at right angles to walls or column lines, unless otherwise shown on the Contract Drawings.

1) Install horizontal lines true to line and elevation.

2) Install vertical lines truly plumb in all directions.

b. Where practicable, install piping in groups and parallel to building walls.

c. Avoid installing piping through ductwork or directly under electric light outlets, or interfering with other pipe, lines, conduit, etc.

d. Leave all corridors, walkways, work areas, and similar spaces unobstructed.

e. Clearance:

1) Clearances shall be measured from the outermost edge of piping, flanges or other type of joint that extends beyond the nominal outside diameter of piping.

2) Provide a minimum clearance of 1-in. between pipe and other work.

3) Avoid installing pipe beyond furring lines as determined by the Architectural Drawings.

4) Provide a minimum headroom clearance under piping and pipe supports of 7.5 ft.

f. Small diameter piping and/or piping not shown on the Contract Drawings:

1) If specific locations and elevations are not shown on the Contract Drawings, install small diameter piping as specified herein, and as necessary and required to avoid ducts, equipment, beams, and other obstructions.

g. Multiple Pipe Runs:

1) In the support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the base support member.

2) Spacing of the base support members shall not exceed the hanger and support spacing required for any individual pipe in the multiple pipe run.

6. Placing:

a. Install bell and spigot pipe so that bells face the direction of laying, unless otherwise shown on the Contract Drawings.

b. For coated pipe, care shall be exercised in laying and cradling the pipe to prevent injury to the coating.

7. Cuts:

a. Use cutting methods and machines specially designed for cutting the pipe material and approved by the manufacturer. The following cutting methods are not acceptable:

1) "Squeeze" type pipe cutters

2) Cutting torches

3) Diamond points

4) Dog chisels.

b. Pie Lengths:

1) Full standard lengths of pipe shall be used in each pipe run in so far as possible.

2) Shorter lengths than standard shall be used only to complete a straight run of pipe, to connect to established locations of valves, equipment, bends, and the like.

3) Random lengths of pipe or cuttings from standard lengths shall not be coupled together when a full standard pipe length will fit in the pipe run.

c. Pipe shall be cut square, and not upset, undersized, or out of round, except as follows:

1) Cut ends of push-on joint type pipe shall be tapered and sharp edges filed off smooth.

d. Ends shall be carefully reamed and cleaned before being installed.

e. Make cuts carefully without damage to coatings or linings.

8. Jointing:

a. Thoroughly clean all pipe, fittings, valves, specials, and accessories before jointing.

1) Remove all cuttings and foreign matter from inside of pipe and tubing.

2) Clean joining area of pipe, fittings, and appurtenances as necessary and required and as per manufacturer instructions.

a) For cleaning pipe ends, solutions such as detergents and solvents, when required, shall be used in accordance with manufacturer's recommendations.

b. Use jointing methods recommended and approved by the pipe manufacturer.

c. Unions:

1) Provide a union downstream of each valve with screwed connections.

2) Provide screwed or flanged unions at each piece of equipment, where shown, and where necessary to install or dismantle piping.

d. Transitions from One Type of Pipe to Another:

1) Provide all necessary adapters, specials and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.

2) Connections between Dissimilar Metals:

a) Provide dielectric couplings, insulating couplings, unions, or other approved dielectric insulating devices, at all connections to pipelines or equipment of dissimilar metals, regardless of whether devices are shown on the Contract Drawings.

b) Refer to Section 40 05 15 - Copper and Brass Process Pipe, for additional requirements for dielectric insulating devices for use with copper and brass process pipe.

9. Bends and Turns:

   a. Do not spring or deform piping to make up joints.

   b. Bending of pipe is not permitted.

      1) Use fittings for all changes in direction.

   c. Bends shall be of 45° or 90° unless otherwise shown on the Contract Drawings.

10. Plugs:

   a. Shall match the materials, linings, and coatings of the process piping, and shall have a square head.

11. Transitions:

   a. Reducing fittings shall be used for all changes in pipe sizes, even when not specifically shown on the Contract Drawings.

      1) Unless otherwise shown or specified, use eccentric reducing fittings.

   b. Do not use bushings, except where specifically shown on the Contract Drawings.

   c. Nipples shorter than 4-in in length shall be Schedule 80.

   d. Between pressure ratings:

      1) Where lines of lower service rating tie into services, appurtenances, or equipment of higher service rating, the equipment, valve, or appurtenance between the two shall conform to the higher rating.

12. Drainage:

   a. The Contractor shall provide all pipelines with a means for drainage at all low points in the lines.

      1) Provide appurtenances for condensate drainage, regardless of whether such means is shown on the Contract Drawings and/or the approved shop drawings.

   b. Drainage valves and appurtenances shall be:

1) A minimum of 1-in. nominal diameter, unless otherwise shown on the Contract Drawings.

2) Adequately sized.

3) Of the same size as the drain pipeline specified herein.

4) Meet the requirements of Section 40 05 56 - Process Valves, Smaller than Four-inch Diameter.

c. Where drainage valves or appurtenances are located so that liquids can discharge and cause damage to a structure or equipment, the Contractor shall provide drain pipe to the nearest gutter or drain.

1) Provide a single drain pipe, matching the size of the drain valve and appurtenances, for each drain valve on the carrier pipe.

2) Unless otherwise shown on the Contract Drawings, the drain pipe shall be of Schedule 80 CPVC conforming to the requirements of Section 40 05 31, Thermoplastic Process Pipe and the installation requirements for thermoplastic piping specified herein.

3) A quick connect coupling shall be provided at the end of the drain line for attachment of a hose.

13. Venting:

a. The Contractor shall provide all pipelines for liquids with vents at all high points in the lines.

1) Provide vents regardless of whether vent valves are shown on the Contract Drawings and/or the approved shop drawings.

b. Vents shall consist of the following three (3) components:

1) An automatic air release/vacuum relief valve.

a) The valve shall have a cast or ductile-iron body and cover, stainless steel internals, and Viton or Buna N seal, unless otherwise specified.

2) An outlet vent line.

a) The outlet vent line from the valve shall be of Schedule 80 CPVC conforming to the requirements of Section 40 05 31, Thermoplastic Process Pipe and the installation requirements for thermoplastic piping specified herein.

b) Vent line shall terminate at a point approximately 3 ft above the floor.

3) An isolation ball valve:

a) A ball valve shall be provided between the carrier pipe and the automatic air/vacuum release valve to allow removal of the automatic air/vacuum release valve for repair or replacement.

b) The body of the isolation valve shall be:

(1) For vents < 4-in.: Type 316 Stainless Steel.

(2) For vents ≥ 4-in.: The same material as the body of the automatic air/vacuum release valve.

c. Sizing:

1) For carrier pipelines ≤ 1-in.: Vents shall be the same size as the carrier pipe.

2) For carrier pipe > 1-in.: Vents shall be the size shown on the Contract Documents or 1-in., whichever is greater.

d. Vent valves (both the automatic air/vacuum release and isolation valve) shall meet the requirements of one (1) of the following Sections, depending on the size of the vent valve:

1) Section 40 05 53 - Process Valves Four-inch Diameter and Larger.

2) Section 40 05 56 - Process Valves, Smaller than Four-inch Diameter.

14. Insulation:

a. Refer to Section 40 06 01 - Schedule for Exposed Piping, and the Contract Drawings for the extent of insulated exposed piping.

b. Insulation shall be installed after the installation and testing of exposed piping.

15. Hangers and Supports:

a. Install pipelines with supporting devices in accordance with requirements of Section 40 05 07 - Hangers and Supports for Process Piping.

b. No piping shall be supported from metal stairs, ladders and walkways.

16. Restraints, Supports, and Thrust Blocks:

a. Provide concrete and metal cradles, collars, kickers, and blocks as shown on the Contract Drawings.

17. Seismic Requirements:

a. All piping and attached valves shall be supported and braced to resist seismic loads and in accordance with the SMACNA Seismic Restraint Manual.

18. Expansion and Contraction:

a. The Contractor shall provide ample provisions for flexibility in all pipelines to compensate for expansion and contraction.

1) Unless other forms of expansion compensation are shown or specified, the Contractor shall:

a) Provide lengths of pipe shorter than the theoretical length to the extent of one half of the expansion, and install said lengths of pipe such that they may be free to expand without increasing the stresses imposed when cold.

2) Otherwise, the Contractor shall install all piping with expansion devices to allow for proper expansion and contraction.

a) Expansion devices shall allow the pipe to expand and contract freely without damage to any part of the piping system.

b) Expansion devices shall include, but not be limited to: expansion joints, expansion couplings, swivel or swing joints or pipe bends, including such anchors as may be shown, specified, or required to make the devices effective.

b. Cold sprung pipe:

1) Install with metal filler pieces bolted between flanges or tack welded between weld joints.

2) After the pipe, anchors, hangers and supports have been installed, the spacers shall be removed and the joint made.

c. Swing Joints:

1) For pipelines 2-in. nominal diameter or smaller, rated at working pressures up to 150 psig:

a) Screwed end swing or swivel joints may be used.

b) Otherwise expansion shall be taken up with nipples and fittings as required.

2) A sufficient number of fittings and pipe lengths in connection with swing joints shall be provided to assure the absence of distortion of either the pipelines or branches.

d. Branch Tees:

1) Install branch tees on risers in locations that will allow the branch lines, when expanded by heat, to drain properly.

e. Pipe Expansion Bends:

1) Pipe bends of approved design for compensating thermal expansion when shown, specified or required shall be fabricated and furnished as herein specified.

2) In pipelines operating under high pressures or high temperatures in which offsets occur in alignment that may be subject to bending stresses excessive for the fittings, or where otherwise deemed necessary, use appropriate pipe bends to make the offset.

3) Where possible, all bends shall have radii equal to a least six diameters ($r = 6 \times d$) of the pipe and tangents or straight lengths of the pipe shall be neatly made, true to radius, free from buckles and flat surfaces.

f. Application guide and anchor requirements for expansion joints shall be in accordance with the recommendations of the manufacturer or the Standards of the EJMA.

g. The Contractor shall adjust all expansion devices after installation (but prior to operation) so that the pipelines shall be fluid-tight through the full range of operating conditions.

19. Wall Sleeves:

a. Where piping passes through walls, partitions, floors, roofs, or structures, provide wall sleeves of wearing material to prevent abrasion damage to piping.

1) Pipe sleeves shall be Schedule 40.

2) Sleeves through walls shall be flush with wall face.

b. Anchor sleeves to concrete and masonry walls as shown on the Contract Drawings.

c. All annular spaces in exterior walls or walls subjected to hydrostatic pressure shall be completely watertight.

d. Do not install sleeves and pipes through structural members unless specifically shown on the Contract Drawings.

20. Temporary Blind Flanges, Plugs, Caps, and Bulkheads:

a. At the end of each day of work or other interruption of pipe installation, the Contractor shall provide temporary blind flanges, plugs, caps, or bulkheads as necessary and required.

1) Plug all bells at dead ends, tees, and crosses.

2) Cap all spigot and plain ends.

b. To perform the testing of exposed piping as specified herein, or as per the sequence of work specified in the Contract Documents, the Contractor shall provide temporary blind flanges, line stops, plugs, and bulkheads suitable for and capable of withstanding the services and pressures for which they are intended.

1) Refer to Section 40 06 01 - Schedule for Exposed Piping, for service and test pressures.

2) Temporary blind flanges, line stops, plugs, and bulkhead shall be compatible with and shall not damage the piping materials, coatings, and linings specified in Section 40 06 01 - Schedule for Exposed Piping.

c. The Contractor shall uninstall all temporary blind flanges, plugs, caps, and when they are no longer needed for the Work.

21. Flow Measuring Devices:

a. If not shown on the Contract Drawings, position flow measuring devices in pipe lines so that they have the amount of straight upstream and downstream runs recommended by the manufacturer, unless specific location dimensions are shown.

B. PVC and CPVC Pipe Installation

1. End Connections:

a. Solvent-Welded Joints:

1) Make all solvent-welded PVC and CPVC joints in accordance with ASTM D2855 and the solvent manufacturer's approved instructions.

2) For PVC pipe, use primers and solvent cements meeting the requirements of ASTM F656 and ASTM D2564, respectively.

3) For CPVC pipe, use solvent cements meeting the requirements of ASTM F493.

4) Do not make solvent cement joints if temperature is below 40°F.

5) Do not make solvent cement welded joints in wet conditions.

6) The following procedure shall be followed to ensure proper gluing of PVC and CPVC pipe.

a) Ensure the end of the pipe is beveled.

b) Apply primer to the female end.

c) Apply primer to the male end.

d) Reapply primer to the female end; the primer must not dry.

e) Apply glue to the male end using an appropriately sized brush.

f) Apply glue with the brush to the female end.

g) Reapply glue to the male end.

h) Join the male and female ends with a quarter turn twist and hold for 30 sec.

7) After joint assembly, wipe excess cement from the pipe. A properly made joint will show a bead around the entire circumference. Any gaps in this bead indicate a defective joint, and the Contractor shall remake such joints at no additional cost to the City.

b. Threaded Joints:

1) Cut the end of the thermoplastic pipe square and smooth with a knife or a file.

2) Thread the pipe in accordance with the pipe manufacturer's recommendations. Brush threads clean.

3) After threading pipe, starting with second full thread, and continuing over the thread length, wrap 100% virgin Teflon thread tape in the direction of the thread. Overlap each wrap by one-half width of tape.

4) After application of the Teflon thread tape, screw fitting or coupling onto the pipe end to be joined. Hand tighten. Then tighten the connection an additional one or two threads past the point of hand tightness.

3.03 FIELD TESTING / QUALITY CONTROL

A. Test all exposed piping in accordance with the requirements of Section 40 05 05.30 - Leakage Testing for Exposed Piping.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 40 05 05.30 – LEAKAGE TESTING FOR EXPOSED PIPING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to test all exposed piping complete and operational.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 40 05 05 – Exposed Piping Installation.

B. Section 40 06 01 – Schedule for Exposed Piping.

1.04 REFERENCES

A. Definitions:

1. Buried Piping: Includes all piping beginning at the outside face of a structures or foundation and extending away from structures. Buried piping includes piping beneath structures or foundations.

2. Exposed Piping: Includes all piping beginning at the outside face of a structures or foundation and extending inside. Exposed piping also includes all piping embedded in concrete, as well as all piping that is permanently or intermittently submerged and/or installed in a subaqueous environment.

B. Reference Standards:

1. AWWA C600-10 Installation of Ductile-Iron Mains and Their Appurtenances

2. Section 312 of The New York City Plumbing Code.

1.05 DESCRIPTION

A. This scope of this Section includes the requirements for the testing of exposed piping, except where testing requirements for exposed piping are shown or specified elsewhere in the Contract Documents.

B. All exposed pipelines for which testing requirements are specified in this Section shall be watertight or airtight, including, but not limited to:

1. All exposed piping and appurtenances installed under Section 40 05 05 - Exposed Piping Installation.

2. All exposed piping and appurtenances installed under other Sections, but that specify testing under this Section.

C. Piping and structures which fail leakage tests shall be repaired or replaced at the Contractor's expense and to the satisfaction of the Engineer. These repaired piping and structures shall then be retested at the Contractor's expense until leakage test results meet the requirements specified herein.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. Exposed piping testing submittals shall be submitted under the specification section number corresponding to the exposed piping material. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Testing Procedures:

1) Submit proposed testing procedures, methods, apparatus, and sequencing.

2) Testing procedures shall be submitted for approval at least 30 ccd prior to the test.

b. Testing Report:

1) Prior to placing the piping system or structure in service, submit for review and approval a detailed bound report summarizing the leakage test data, describing the test procedure and showing the calculations on which the leakage test data is based.

2. Informational Submittals:

a. Certificate signed by manufacturer of each product certifying that product conforms to applicable referenced standards.

b. Results of each specified field quality control test.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. The Contractor shall provide all labor, equipment, air, water and materials, including meters, gauges, blower, pumps, compressors, hoses, fuel, water, bulkheads, temporary bracing and restraints, valves, plugs, and accessory equipment necessary and required to complete the testing as specified herein.

B. Testing medium:

1. The Contractor shall provide all air or gasses necessary or required for testing.

2. Unless otherwise specified, the existing facility shall provide all water required for testing.

a. The Contractor shall provide all means to convey the fluid into the piping being tested.

3. Refer to the Contract Drawings for availability of water to be used for testing.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Notification:

1. Provide the Engineer with written notice at least 14 ccd prior to the date of testing.

a. No tests shall be conducted without an approved written procedure.

b. The Engineer shall respond in writing to the Contractor within 7 ccd of receiving the written notification.

B. All leakage tests shall be conducted in the presence of the Engineer.

1. All leakage tests shall be conducted in the presence of local authorities having jurisdiction, if required.

C. Remove or protect devices and appurtenances that could be damaged by testing.

D. Concealed pipelines:

1. Test all pipelines prior to concealment.

3.02 IMPLEMENTATION

A. General:

1. Perform leakage testing for all exposed piping in accordance with the requirements of Section 40 06 01 - Schedule for Exposed Piping, except piping explicitly shown or specified as exempted from testing. For pipelines not listed in Section 40 06 01:

a. Test all pipelines not listed in Section 40 06 01 via a hydrostatic test with clean water.

b. Test vents and drains in plumbing systems and plumbing pipe lines in accordance with Section 312 of the New York City Plumbing Code, unless otherwise specified. Unless specified otherwise, test all vents and drains on process piping as for plumbing systems.

2. Operation of Existing Facilities:

a. Conduct all tests in a manner to minimize interference with operations of existing facilities or other contractors working on the site.

B. Hydrostatic Testing:

1. Application:

a. Exposed pipelines:

2. Test Procedure:

a. Maintain the testing medium at the specified pressure for a period of 4 hrs.

1) Unless otherwise specified, the testing medium shall be clean water.

2) Do not use air for hydrostatic testing of pipelines intended for liquid service – use compressed air (or gas) only for the hydrostatic testing of air (or gas) pipelines.

b. Test the piping as a whole or in sections.

1) The Contractor shall use valves or install temporary bulkheads at the ends of each section.

2) Remove temporary bulkheads at the conclusion of the hydrostatic testing.

c. Apply the specified hydrostatic test pressure to the piping through a tap in the pipe by means of a pump, compressor, or other approved method.

3. Test Pressures:

a. Test the pipeline at the pressure specified in Section 40 06 01 - Schedule for Exposed Piping.

b. If no test pressure is specified for a hydrostatic test, submit a test pressure of 1.5 times the maximum possible operating pressure of the pipeline, for approval by the Engineer

4. Leakage:

a. The allowable leakage shall not exceed the testing allowance given by the following formula from AWWA Standard C600:

$$L = \frac{S \cdot D \cdot \sqrt{P}}{148{,}000}$$

Where: L = testing allowance (makeup water) (gph).
S = length of pipe tested (ft).
D = nominal diameter of the pipe, (in.).
P = average test pressure during the hydrostatic test (psig).

5. Repair:

a. Replace broken pipe or joint assemblies found to leak.

b. When leakage occurs in excess of the specified amount, locate and repair defective valves, pipe, cleanouts or joints.

c. If defective portions cannot be located, remove and reconstruct as much of the original work as necessary to obtain piping that meets the leakage requirements specified herein and retest, all at no additional cost to the DEP.

C. Hydrostatic Testing of Valves:

1. Test Procedure:

a. Prior to the application of the test pressure, operate the valve(s) through the number of complete cycles of closing and opening recommended by the manufacturer.

b. Next, apply the test pressure to one side of the valve (i.e., the first side).

1) The valve shall be in the closed position.

2) Introduce the liquid testing medium to the first side only and apply the test pressure.

a) The other side of the valve(s) (i.e., the second side) shall be dry and unpressurized (0 psig).

3) Maintain the testing medium at the specified pressure for a period of 4 hrs.

c. Then, reverse the side to which the test pressure is applied.

1) The valve shall still be in the closed position.

2) Now apply the test medium and pressure to the other side of each valve (i.e., the second side).

3) The side tested first (i.e., the first side) shall now be unpressurized (0 psig).

4) Maintain the testing medium at the specified pressure again for a minimum period of 4 hrs.

d. Hydrostatic testing of valve(s) may be concurrent with hydrostatic testing of pipeline section(s) to the extent permissible by the testing requirements specified herein.

e. The Contractor shall be responsible for draining and disposing of the test medium in accordance with the requirements of the Contract Documents, as necessary and required to test both sides of each valve in this manner.

2. Test Pressure:

a. Hydrostatic test each valve such that the differential pressure across the valve at the same test pressure specified for the pipe in which the valve is installed.

3. Leakage:

a. Stop all external and internal leakage through the valves.

b. No leakage across the valve shall be acceptable.

4. Movement:

a. Stop all valve movement or structural distress.

b. No movement of the valve is acceptable.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 40 05 06 – COUPLINGS, ADAPTERS, AND SPECIALS FOR PROCESS PIPING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified, and required to furnish, install, and test all couplings, adapters, and specials in pipelines, complete and operational.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Reference Standards:

1. ASTM A47 Ferritic Malleable Iron Castings.

2.	ASTM A193/A193M	Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
3.	ASTM A194/A194M	Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
4.	ASTM A276	Stainless and Heat-Resisting Steel Bars and Shapes.
5.	ASTM A283/A283M	Low and Intermediate Tensile Strength Carbon Steel Plates.
6.	ASTM A513	Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
7.	ASTM A536	Ductile Iron Castings.
8.	ASTM A635	Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.
9.	ASTM A744	Corrosion-Resistant Iron-Chromium-Nickel and Nickel-Base Alloy Castings for Severe Service.
10.	ASTM B26	Aluminum-Alloy Sand Castings.
11.	ASTM D2000	Classification System for Rubber Products in Automotive Applications.
12.	ASME B1.1	Unified Inch Screw Threads (UN and UNR Thread Form).
13.	ASME B18.2.2	Fasteners in Customary Uses - Hex Nuts.
14.	ASME B31.1	Power Piping.
15.	AWWA	C606 Joints, Grooved and Shouldered Type.
16.	AWWA Manual M11	Steel Pipe - A Guide for Design and Installation.

1.05 DESCRIPTION

A. This Section includes requirements for providing couplings, adapters, and specials in accordance with applicable standards and regulations. In addition:

1. The scope of this Section shall include all buried and exposed process pipe.

2. The extent of process piping is shown on the Contract Drawings. Process pipe service, pipe diameter, pressure rating, joint type, and testing requirements are specified in the following section:

a. Section 40 06 01, Schedule for Exposed Piping.

1.06 QUALITY ASSURANCE

A. Qualifications of Manufacturers:

1. The manufacturer(s) shall have a minimum of five (5) years of experience in the design and fabrication of coupling, adapter, and specials of similar size, capacity, and type to those shown on the Contract Drawings and specified in the Contract Documents, and shall show evidence of at least five (5) substantially similar installations in satisfactory operation.

B. Supply and Compatibility:

1. Couplings, adapters, and specials shall be designed, fabricated, and installed in accordance with the latest standards referenced herein.

C. Regulatory Requirements:

1. Use only NSF61-approved materials in potable water lines.

2. Pipe couplings for making field joints between plain end, grooved end, and shouldered end pipe and fittings shall meet the requirements of ASME B31.1.

D. Quality Assurance Inspections

1. Quality Assurance inspections may be made by NYC DEP Bureau of Engineering Design and Construction, Quality Assurance Section or its representative at the manufacturer's facility.

2. Quality Assurance inspections shall be in accordance with the requirements of the Contract Documents.

3. The Contract shall give ample notice to the Engineer prior to the beginning of any fabrication, so that Quality Assurance inspection may be made.

4. Quality Assurance inspections shall include (but are not limited to) the following activities:

a. Obtain copies of Certified Materials Test Reports (both chemical and physical) and Manufacturer Certificates of Conformance.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition:

1. Action Submittals:

a. The Contractor shall submit the following Shop Drawings and material specifications for the approval of the Engineer:

1) Location of couplings, adapters, and specials in pipeline.

2) Catalog data showing dimensions, materials, and component parts of each type of coupling, adapter, or special.

3) Harnessing and restraints where required.

4) Associated pipeline materials.

5) Working and test pressures.

6) Additional product data sufficient to demonstrate compliance with the Contract Documents.

2. Information Submittals:

a. Manufacturer instructions for handling, storing, installing, and adjusting of products.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver equipment and materials provided under this Section in accordance with the requirements of the Contract Documents.

B. The Contractor shall store equipment and materials provided under this Section in accordance with the requirements of the Contract Documents.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sleeve type couplings shall be as manufactured by:

1. For ductile iron pipelines:

a. ≤ 12-in.:

1) Style 138, as manufactured by Dresser Manufacturing, a Division of Dresser Industries, Bradford, PA.

2) 12" and smaller - Type 441, as manufactured by Smith-Blair Co., Texarkana, AR.

3) Or approved equal.

b. > 12-in.:

1) Style 38 , as manufactured by Dresser Manufacturing, a Division of Dresser Industries, Bradford, PA.

2) Larger than 12" - Type 411, as manufactured by Smith-Blair Co., Texarkana, AR.

3) Or approved equal.

2. For joining dissimilar piping materials:

a. Style 162, as manufactured by Dresser Manufacturing, a Division of Dresser Industries, Bradford, PA.

b. Type 441, as manufactured by Smith-Blair Co., Texarkana, AR.

c. Or approved equal

B. Groove and shoulder type couplings shall be as manufactured by:

1. For copper pipelines:

a. Grooved-type coupling:

1) Rigid Type:

a) Victaulic® Style 606, as manufactured by Victaulic Co., Easton, PA.

b) Or approved equal.

C. Groove and shoulder type full flow fittings shall be as manufactured by:

1. Victaulic Co., Easton, PA.

2. American Cast Iron Pipe Co., Birmingham, AL.

3. U.S. Pipe and Foundry Co., Bessemer, AL.

4. Or approved equal.

D. Flexible couplings:

1. Victaulic® Depend-O-Lok® EXE Type 1 or Type 2, as manufactured by Victaulic Co., Easton, PA.

2. Or approved equal.

E. Thread Lubricant:

1. G-N paste (Molykote), as manufactured by Dow-Corning Industries, Auburn MI.

2. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. General:

1. Coupling design and construction shall facilitate easy assembly in the field.

2. Flexible couplings shall be designed and constructed to ensure permanently tight joints under all conditions of expansion, contraction, shifting and settlement to which the pipelines may be subjected as a result of the operation and layout of the process system in which they are installed.

3. Rigid couplings shall be designed and constructed to provide a tight joint and prevent pipe movement at the joint.

B. Couplings shall be either one of the following three types:

1. Sleeve Type:

a. Sleeve type couplings shall be solid (axially un-split/unbolted) and have a middle ring or sleeve placed around the pipe joint.

b. The middle ring shall be sealed by two wedge-shaped gaskets evenly compressed by follower flanges or rings tightened by bolts and nuts.

2. Groove and Shoulder Type:

a. Groove and shoulder type couplings shall have a C-shaped (cross section) sealing gasket placed around the joint.

b. The gasket shall be enclosed in a split-type housing which shall engage shoulders or grooves in the pipe.

c. The housing shall be assembled by bolts and nuts.

3. Bolted Split Sleeve Type.

C. Sleeve Type Couplings:

1. General:

a. The maximum working pressure of the sleeve-type couplings shall be not less than:

1) For pipe sizes ≤ 54 in.: 250 psig.

2) For pipe sizes > 54 in. 200 psig.

2. For Ductile Iron Pipe Lines:

a. Materials of Construction:

1) For pipe sizes ≤ 12 in.: ductile iron or steel.

2) for pipe sizes > 12 in.: steel.

b. The middle ring or sleeve shall be steel, ASTM A513 or ASTM A635.

c. The middle ring or sleeve shall have flared or beveled ends.

d. The follower rings or flanges shall be of ductile iron, ASTM A536, or malleable iron, ASTM A47 (Grade 32510), for pipe sizes 12-in. and smaller, and shall be of steel ASTM A283/A283M (Grade A) for pipe larger than 12-in.

e. The middle ring shall not have a center pipe stop, unless otherwise specified, and shall have the same minimum dimensions as specified above for couplings for steel pipe.

3. Gaskets:

a. Gaskets shall be resilient, wedge-shaped gaskets with a maximum angle of 40° at the wedge end.

b. Gasket material shall be compatible with the type and temperature of the fluid in the pipeline, and shall be the material recommended

by the manufacturer for the service specified in Section 40 06 01, Schedule for Exposed Piping.

D. Groove and Shoulder Type Fittings:

1. For Copper Pipe:

a. Grooved end fittings shall be provided with rolled grooves and shall be designed for a working pressure not less than 300 psig.

E. Bolted Split-Sleeve Type Couplings:

1. General:

a. Bolted split sleeve type couplings shall consist of four (4) basic components: two-piece housing, gasket assembly, bolts and nuts with restraining end rings as required for pipe restraint.

b. The selected couplings shall be designed for the type, size and working pressure of the pipe with which they are to be used.

2. Materials and Construction:

a. For stainless steel pipe: Coupling housing shall be manufactured from Type 316 stainless steel.

b. For carbon steel pipe: Coupling housing shall be manufactured from carbon steel.

3. The split-sleeve coupling shall be constructed with a double arch cross section which closes around either:

a. pipe section ends that have been smoothed for expansion or contraction, or

b. pipe section ends with steel end rings affixed for restraining purposes.

4. The coupling shall confine an elastomeric gasket beneath the sleeve arches to create a radial seal as the coupling closes.

5. Elastomeric gasket materials shall have properties as designated by ASTM D2000 suitable for air service up to 240°F with intermittent exposure to 280°F.

6. Gasket sealing members shall consist of two O-ring gaskets and an elastomeric sealing pad bonded to an integral sealing plate. Internal pressure shall not be a requirement for fully completing the sealing function.

7. Restraining rings shall be furnished with the couplings and shall be of the same material as the coupling housing.

a. Restraining rings for fixed type couplings shall be shop welded to the piping by the piping fabricator.

b. The restraining rings shall be forwarded to the piping fabricator for shop mounting and welding in place.

c. The coupling manufacturer's recommendation for size and amount of welding required for properly attaching the restraining rings shall be followed without exception.

8. When deflection is required at a pipe joint, a flexible coupling shall be provided.

a. Minimum deflection for basic, lighter duty split sleeve (non-shouldered) design (e.g., Victaulic® Depend-O-Lok® Type 1) couplings shall be as specified in Table 40 05 06-3:

TABLE 40 05 06-3
MINIMUM DEFLECTION FOR BASIC, NON-SHOULDERED SPLIT SLEEVE COUPLINGS

Nominal Pipe Diameter: (in.)	**Minimum Deflection: (deg.)**
8 - 14	4.50
16-24	4.00
30 and 36	3.00
42 - 54	2.00
60	1.75
66 and 72	1.50
≥ 84	1.00

b. Maximum deflection for heavier duty (shouldered) design (e.g., Victaulic® Depend-O-Lok® Type 2) couplings shall be as recommended by the manufacturer.

c. Coupling width shall not be less than 10-in. for pipe sizes 8-in. through 84-in., and not less than 12-in. for larger size pipe.

d. Minimum wall thickness of couplings shall be computed by the following formula:

$$t = \frac{P \cdot d}{2s}$$

Where: P = Design pressure in psig.
d = Pipe O.D. in in..
s = 18,000 psig design stress.

9. Bolts, nuts and miscellaneous hardware shall be furnished by the coupling manufacturer and shall be Type 316 stainless steel conforming to ASTM A276 and having a minimum tensile strength of 85,000 psig.

F. Bolts and Nuts:

1. Bolts:

a. Bolts shall be Type 316 stainless steel, ASTM A 193/A 193M, Grade B8, Class 2.

b. Bolts shall have American Screw Threads, Coarse Thread Series, ASME B1.1.

c. For all sleeve-type couplings, bolts shall be double radius head or buttonhead track type. The collars under the heads shall fit oval or square holes in the follower rings.

d. For all groove-and shoulder-type couplings, bolts shall be track type oval neck bolts. The collars under the heads shall engage the oval slots in the housing.

2. Nuts:

a. Nuts shall be Type 316 stainless steel conforming to ASTM A194/A194M.

b. Nuts shall be American Standard Heavy Dimension Series, ASME B18.2.2.

G. All flexible couplings shall be harnessed.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Inspection:

1. The Contractor shall not install damaged items until repairs are made in accordance with manufacturer's written instructions and approval by Engineer.

a. All damaged items requiring remedial work shall be returned to the manufacturer for repair or replacement.

B. Preparation:

1. Ends of pipe, fittings and couplings shall be cleaned of all scale, dirt and thick outside coatings.

2. Before assembly, the ends of pipe and/or fittings and the outside of the coupling gasket shall be lubricated as recommended by the manufacturer.

3. Fasteners shall be assembled using a thread lubricant.

3.02 INSTALLATION

A. Install couplings, adapters, and specials for process piping in complete accordance with the manufacturer's printed installation instructions and the approved shop drawings. In addition:

1. Couplings shall be assembled by tightening diametrically opposite bolts evenly and progressively.

a. Bolts on sleeve-type couplings shall not be tightened beyond the point of stretching (when the mill scale on the shank begins flaking off).

b. Bolts on groove- and shoulder-type couplings shall be tightened only until there is metal to metal contact between housing segments and the pipe.

B. Field Assembly of Groove-type Couplings:

1. Field grooving of pipe shall not be done unless approved by the Engineer, and then shall be limited to steel pipe 24-in. or under nominal diameter and to ductile and cast iron pipe 12-in. or under nominal diameter.

2. Field grooving shall be done only with special tools provided by the coupling manufacturer.

C. Harness for Sleeve-type Couplings:

1. In all pipelines under pressure, and elsewhere where shown, specified or required, sleeve-type couplings shall be harnessed.

a. On all pressurized steel pipe, cast steel "crow-foot" lugs shall be welded on diametrically opposite sides of the pipe, and the joint shall be harnessed with stainless steel tie-bolts and nuts.

1) The dimensions, sizes, spacing and materials for lugs, tie-bolts and nuts shall be based on the use of a minimum of two bolts and four lugs per joint, in conformity with Section 13 (Table 13.4) of AWWA Manual M11 or the standard specifications of the coupling manufacturer for the pipe size, wall thickness and test pressure specified.

2) Welding shall conform to the requirements specified under Section 40 05 22 - Steel and Stainless Steel Pipe.

b. On all pressurized ductile iron pipe, couplings shall be harnessed with stainless steel tie bolts and nuts connected to flanges or fittings installed on the pipe on each side of the coupling as shown, specified or required for the pipe sizes and specified test pressures.

1) The harnessed length from flange to flange shall not exceed 3 ft.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 40 05 07 – HANGERS AND SUPPORTS FOR PROCESS PIPING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified, and required to furnish, install, and test all hangers, supporting devices, and appurtenances shown, specified or required for process pipes, fittings, valves, and other in-line equipment, complete and operational, excluding the supports and hangers for double containment piping within trench boxes.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 03 30 10 – Low Carbon Cast-in-Place Concrete.

B. Section 03 60 00 – Grouting.

C. Section 05 05 13.01 – Galvanizing.

D. Section 05 50 00 – Metal Fabrications.

E. Section 09 91 00 – Painting.

1.04 REFERENCES

A. Reference Standards:

1.	ASTM A 36	Standard Specification for Carbon Structural Steel.
2.	ASTM A 48	Standard Specification for Gray Iron Castings.
3.	ASTM A 276	Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
4.	ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars.
5.	ASTM A778	Standard Specification for Welded, Un-annealed Austenitic Stainless Steel Tubular Products.
6.	ASME - B31.1	Power Piping.
7.	N.Y. Spec 32-P-6	Pipe, Special Castings, Valve Box Castings: Cast-Iron.
8.	MSS SP-58	Pipe Hangers and Supports - Materials, Design and Manufacture.
9.	MSS SP-59	Short Radius Welding Fittings.
10.	MSS SP-69	Pipe Hangers and Supports - Selection and Application.
11.	MSS SP-89	Pipe Hangers and Supports - Fabrication and Installation Practices.
12.	MSS SP-90	Guidelines on Terminology for Pipe Hangers and Supports.
13.	ASTM A 123	Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

14. Latest Edition of the New York City Building Code.

1.05 DESCRIPTION

A. This Section includes requirements for providing hangers and supports for process piping in accordance with applicable standards and regulations.

1. Included are rod hangers; clevis hangers, spring hangers; stanchion, roller and pipe pole supports and saddle stands; supports of structural steel; concrete saddles, concrete anchor blocks and bases, and all necessary

guides, restraints, fastening devices, anchor bolts, pipe anchors and appurtenances.

2. The Contractor shall provide all temporary pipe supports required during construction.

3. The Contractor shall provide hangers and supports of sufficient strength to maintain the pipelines and appurtenances in proper position and alignment under the maximum combination of peak loading conditions to include pipe weight, process fluid/gas weight, process fluid/gas movement and pressure forces, thermal expansion and contraction, vibrations, seismic forces, and all probable externally applied forces for all operating conditions.

4. The Contractor may retain the services of a pipe support designer for providing the design of all piping hangers and support systems in accordance with the requirements of this Section, unless otherwise shown or specified.

5. Stressors in hangers, rods and brackets shall be in accordance with Table 2 of MSS-SP-58.

1.06 QUALITY ASSURANCE

A. Qualifications of Manufacturer and Pipe Support Designer:

1. Pipe hangers, supports, and appurtenances shall be standard products of the manufacturer specified herein.

2. Each type of hanger and support shall be the product of a single manufacturer.

3. The pipe support designer, if retained by the Contractor, shall have a minimum of five (5) years of experience in the design of pipe supports and shall show evidence of having completed at least five (5) substantially similar, successful pipe support projects of equal complexity as the systems specified.

a. The pipe support designer shall be a New York State Registered Professional Engineer.

B. Supply and Compatibility:

1. All hangers and supports for process piping included in this section shall be provided by the Contractor through a single, qualified ductile iron process pipe manufacturer.

2. The pipe and fittings shall be designed, fabricated, and installed in accordance with standards referenced herein.

C. Regulatory Requirements:

1. All hangers and supports shall conform to the applicable requirements of ASME B31.1, MSS SP-58, SP-59, SP-69 and SP-90, except as modified herein, and be of standard manufacture wherever possible, and best suited for the service required.

2. Unless otherwise approved, all hangers, supports and concrete inserts shall be listed with Underwriters' Laboratory, Inc.

D. Quality Assurance Inspections

1. Quality Assurance inspections may be made by NYC DEP Bureau of Engineering Design and Construction, Quality Assurance Section or its representative at the manufacturer's facility.

2. Quality Assurance inspections shall be in accordance with the requirements of the Contract Documents.

3. The Contract shall give ample notice to the Engineer prior to the beginning of any fabrication, so that Quality Assurance inspection may be made.

4. Quality Assurance inspections shall include (but are not limited to) the following activities:

a. Obtain copies of Certified Materials Test Reports (both chemical and physical) and Manufacturer Certificates of Conformance.

b. Perform visual inspection of welding, as per applicable welding code.

c. Perform visual and dimensional inspection of completed work.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Shop Drawings shall include, but not be limited to:

1) Detailed drawings showing all hangers and supports for each piping system. Drawings shall show:

a) Location, installation, material, loads, forces, stresses and deflections of all hangers and supports.

b) Reaction forces imparted to structures to which hangers and supports are attached shall be shown.

c) Contractor shall provide detailed drawings of each pipe support. Each drawing shall contain enough information to verify the pipe support design and to allow the manufacture of the device. At a minimum, the Contractor shall submit:

(1) Scaled details of the device with dimensions.

(2) A table of applied forces and moments.

(3) A complete bill of materials.

(4) An isometric showing the applied forces and moments.

(5) Detailed connections to existing structure.

(6) Shop and field welds.

2) Manufacturer's catalogs and engineering data on all hangers and supports.

3) Load ratings.

4) Materials.

5) Installation details.

b. Submit the name and qualifications of the support and hanger engineer.

c. All drawings and design calculations included in the shop drawings shall be signed and sealed by a New York State Registered Professional Engineer.

d. Pipe support design shall include detailed load and movement calculations:

1) In the design of hangers, supports and anchors, unless otherwise shown or specified, pipe pressures shall be the maximum test pressures specified for pipelines carrying gases and twice the maximum test pressures specified for pipelines carrying liquids.

2) The following loads shall be included in pipe support design and pipe stress analysis:

3) The gravity force, including the weight of the pipeline plus the weight of any appurtenances, contents, insulation, etc.

4) The thermal expansion force developed by the restraint of free end displacement of the piping.

5) Hydrostatic forces developed by internal pressure during operation of the piping system.

6) Loading due to expansion joint reaction forces.

7) Seismic forces, as required by the latest edition of the New York City Building Code.

8) Occasional load calculations and pipe stress analysis shall be provided where required by the Contract Documents, Building Codes, or Standards referenced herein. Occasional loads include:

a) Seismic forces.

b) Pressure waves produced by sudden changes in fluid momentum, commonly referred to as water hammer.

c) Wind, snow or ice loads.

d) Safety valve thrust loads.

e. Calculated forces shall be included in the pertinent shop drawings as called for by the submittal requirements specified herein.

2. Information Submittals:

a. Qualifications Statements:

1) Installer's Qualifications.

B. Each submittal package for pipe hangers and supports shall have the stamp of a New York State Registered Professional Engineer experienced in pipe support design.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver equipment and materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. Hanger inserts which are to be embedded in low carbon cast-in-place concrete shall be delivered in ample time not to delay the Work.

B. The Contractor shall store equipment and materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. Hangers and supports shall be protected from condensation, corrosion, and deterioration.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Standard pipe supports and components shall conform to the requirements of MSS SP-69 and MSS SP-58, as manufactured by:

1. B-Line

2. Carpenter & Patterson

3. Grinnell

4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. General:

1. The Contractor shall provide hangers and supports for all process piping and associated appurtenances, including, but not limited to valves, fittings, and specials, as follows:

a. Where shown on the Contract Drawings: Provide hangers and supports as shown and as specified herein.

b. Where not shown on the Contract Drawings: Provide hangers and supports in compliance with MSS SP-58 Table 2, and the requirements specified herein.

2. All hangers and supports shall allow minimum 3-in. of vertical adjustment.

B. Types:

1. Hangers for Single Pipes:

a. Single pipes shall be supported by hangers suspended by rods from structural steel members, inserts in concrete ceilings and beams, bottom of trapeze hangers and wall mounted steel angle brackets. The strength of the rod shall be based on its root diameter.

b. Except for piping subject to thermal expansion and contraction or as otherwise shown or specified, pipe hangers shall be adjustable clevis type MSS SP-58 Type-1.

c. Piping subject to thermal expansion and contraction shall be supported on rollers.

2. Hangers or Supports for Multiple Pipes:

a. Multiple pipes, running parallel in the same horizontal plane, and adjacent to each other, shall be suspended by trapeze type hangers or supported on wall brackets. Trapeze hangers shall consist of channel sections supported from threaded rods or attached to concrete walls, columns or structural steel support members.

b. Except as otherwise specified herein, pipe anchors used for attaching pipe to trapeze or multiple pipe wall brackets, shall be anchor or pipe chairs as required.

3. Supports for Single Pipe:

a. Single pipes located in a horizontal plane close to the floor shall be supported by one of the methods specified herein or as shown on the Contract Drawings.

b. Pipes shall be supported by adjustable stanchions, pipe saddle or roll supports with "U" bolts. Stanchions shall provide at least 4-inches adjustment and be flanged-mounted to floor.

c. Stanchions and saddle stands shall be of Type 316L stainless steel.

d. Pipe pole supports for pipe runs above ground, out-of-doors, and where otherwise required, shall consist of a suitable length of stainless steel pipe set upright in at least four feet of concrete; two stainless steel angles secured to the top of the pipe, at right angle and on each side; a stainless steel plate welded to the top of the angles to serve as a horizontal support for the pipes. Supports shall be provided with attachments in the form of stands, clamps, rolls, rods or similar devices of the screw adjustable type in the vertical direction.

e. Where specified or shown, column supports of built-up welded stainless steel shall be provided, as approved by the Engineer.

f. Pipe rollers shall be cast ductile iron, unless otherwise shown or specified. Hardware and appurtenances shall be stainless steel.

4. Wall Supported Pipes:

a. Single or multiple pipes located adjacent to walls, columns or other structural members, and an excessive distance from ceilings or underside of beams, shall be supported using stainless steel wall brackets, MSS SP-58 Type 32 or 33.

b. Where pipes rest on top of bracket pipe supports, pipe anchors used for attaching pipe to trapeze or multiple pipe wall brackets shall be anchor or pipe chairs as required

5. Supports for Base Elbows:

a. Where pipes change direction from horizontal to vertical through a bend, a welded or cast base anchor support shall be installed at the bend to carry the load.

6. Supports for Vertical Pipes:

a. Pipe riser clamps shall be used to support all vertical pipes extending through floor slabs.

b. Riser clamps shall be MSS SP-58 Type 42 or 8.

c. Insulation shall be removed from insulated pipes prior to installing riser clamps.

7. Supports for Pipelines with Thermal Expansion:

a. Pipe rolls for single rod hangers: Stainless steel frame construction, ductile iron roller and stainless steel roller rod provided with threaded nuts; vertical adjustment permitted; for pipe sizes 6 in. or less unless otherwise approved.

b. Pipe rolls for double rod hangers: Ductile iron roller, stainless steel roller rod, malleable iron threaded sockets which permit vertical adjustment.

8. Supports for Pipelines Subject to Temperatures Greater than 300°F:

a. Spring hangers of heavy stainless steel construction.

9. Supports for Thermoplastic Pipes:

a. All thermoplastic pipe attachments shall have a continuous bearing cradle or saddle on the lower 120° of pipe circumference and a minimum length of one quarter pipe diameter, but not less than 6-in. nor more than 12-in.

10. Supports for Copper & Brass Pipes:

a. All copper and brass pipe supports shall be specifically manufactured for use with copper and brass pipe.

b. Hangers shall be provided with a copper finish.

11. Concrete Supports:

a. Where pipeline or mechanical equipment is shown, specified or required to be supported on concrete supports, supports shall be as specified herein.

b. Concrete supports for equipment shall be of a size and mass that will resist all forces, both static and dynamic, which may be developed by the equipment.

c. Concrete supports for pipe, fittings, valves and appurtenances shall be designed to carry the weight of the pipeline and appurtenances.

1) Cradles and anchor blocks shall safely withstand all stresses imposed by the pipelines, under all operating conditions.

2) Concrete cradles shall be shaped to fit the contour of the pipe.

d. Concrete supports shall be anchored to the floor of main structures by doweling or other approved means.

1) Anchor bolts, extension plates, saddle yokes and other hold-down devices in concrete bases shall be placed before pouring of concrete.

2) Expansion bolts shall not be used on new concrete supports except with the specific approval of the Engineer.

e. Concrete supports shall be not less than Class 25 as specified in Section 03 30 00, Cast-in-Place Concrete.

12. Protection Saddles for Insulated Pipe:

a. Contractor shall furnish steel protection saddles on all supports for insulated pipe.

b. For insulated pipes < 12-in. nominal diameter:

1) Provide saddles of No. 14 U.S. gauge stainless steel curved 180° for use with roller hangers or structural trapeze hangers.

2) Provide saddles of No. 16 U.S. gauge stainless steel curved 120° for use in clevis hangers.

3) Saddles shall be at least 12-in. long.

4) Saddle gripping side edges shall be turned up at least to the thickness of insulation.

c. For insulated pipe ≥ 12-in. nominal diameter:

1) Provide saddles of No. 12 U.S. gauge stainless steel with a welded centerplate to provide three-edge support.

2) Saddles shall:

a) Be at least as long as the pipe diameter.

b) Provide 120 degree coverage.

c) Have edge and centerplate depths equal to the insulation thickness.

C. Materials:

1. Hangers and supports shall conform to ASME B31.1 and be compatible with the chemicals contained in the supported pipe.

2. Structural steel shall conform to ASTM A36 and ASTM A283.

3. Iron castings shall conform to ASTM A48 (Class No. 35).

4. Stainless steel shall conform to ASTM A 276:

a. Use type 316 stainless steel for non-welded items.

b. Use type 316L stainless steel for welded or fabricated items.

c. Tensile Strength: 70,000 psi, minimum.

d. Yield Strength: 25,000 psi minimum.

e. Elongation in 2-in.: 35%.

f. Reduction of area: 45%.

g. For stainless steel pipe and tube: Use type 316L stainless steel conforming to the requirements of ASTM A778.

5. Rollers:

a. Rollers, including stands and bases, shall be of cast iron, hot-dipped galvanized conforming to ASTM A123.

6. Expansion anchors for use in existing concrete structure:

a. Material shall be Type 316 stainless steel.

7. Hanger Rods:

a. Material shall be Type 316 stainless steel.

b. Maximum allowable working stress shall be 5,800 psi, calculated based on the root diameter.

c. Rods shall have a square head nut on top and running thread on bottom end.

8. Supports:

a. Material shall be Type 316 stainless steel.

9. Appurtenances:

a. Brackets, guides, restraints, rods, bolts, nuts and anchors shall be Type 316 stainless steel unless otherwise specified.

b. Concrete inserts shall be of malleable iron with galvanized finish.

D. Sizing:

1. Size single and double rods based on the nominal pipe diameter in accordance with the Table 40 05 07-1.

a. Hanger loads shall be calculated based on the weight of pipe filled with water plus 50 psf of dead load.

TABLE 40 05 07-1
MINIMUM PERMISSIBLE HANGER ROD DIAMETER FOR NOMINAL PIPE SIZES

Pipe Size (in.)	Single Rod (in.)	Double Rod (in.)	Max. Load per Hanger (lbs.)
¾ to 1½	⅜	⅜	300
2	⅜	⅜	325
2½	½	⅜	350
3	½	⅜	400
3½	½	⅜	450
4	⅝	½	850
5	⅝	½	950
6	¾	⅝	1,075
8	*⅞	⅝	1,350
10	*⅞	⅝	1,750
12	*⅞	¾	2,200
14	*1	⅞	2,500

* To be used subject to the Engineer's specific approval

E. Concrete Inserts, Attachment Plates, and Clamps:

1. Hanger Rods:

a. Hanger rods up to ⅞-in. diameter: Shall be attached to new concrete structures using concrete inserts of Type 18 in MSS SP-58.

1) Inserts shall be malleable iron with galvanized finish.

a) The use of steel inserts is prohibited.

2) Design of the inserts shall permit the rods to be adjusted laterally in one plane and to lock the rod nut or head to the body.

3) The inserts shall be provided with openings or recesses to receive reinforcing rods.

4) To facilitate installation, slots shall be provided in the exposed flanges of the insert.

5) Inserts shall be rated to safely carry the maximum load which can be supported by the hanger rod.

b. Hanger rods larger than ⅞-in. diameter: Shall be attached to new concrete by means of approved hook anchors as shown on the Contract Drawings.

c. All hanger rods shall be attached to existing concrete structures using stainless steel expansion anchors as specified in Section 05 50 00 - Metal Fabrications.

2. Steel beam clamps:

a. Shall be malleable iron.

b. For wide flange or I-beams: conform to MSS SP-58 Type 28 or Type 29.

c. For channel sections or where it is necessary to locate the hanger rod off the beam centerline: conform to MSS SP-58 Type 20.

3. Steel U-shape beam attachments welded to the underside of beams and welded steel brackets fastened to structural steel columns:

a. Shall be subject to specific approval of the Structural Steel and Pipe Supports Shop Drawings.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Galvanizing:

1. Conform to the requirements of Section 05 05 13.10, Galvanizing, except as follows:

a. Malleable iron and concrete inserts shall be galvanized in conformance with the manufacturer's specifications.

B. Painting:

1. Conform to the requirements of Section 09 91 00, Painting.

C. Surfaces Protection:

1. Surfaces of hangers and supports in contact with aluminum, brass, plastic and copper pipelines or pipeline equipment shall be protected with an approved plastic coating to prevent abrasion.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. The City may elect to conduct shop inspections. The inspections may include but not be limited to: mechanical and chemical testing, material sampling, material certifications, traceability of parts, blasting and painting, visual and dimensional inspection, and free iron contamination check on stainless steel parts.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. The Contractor shall coordinate the Work such that all process piping hangers, supports, and restraining systems shall be installed and secured prior to the testing or activation of the process pipeline on which they are installed.

3.02 INSTALLATION

A. Design:

1. Types of hangers and supports shall be kept to a minimum.

2. Wherever possible, pipe supports shall be designed using manufacturer's standard catalog products.

3. Hangers and supports shall be located to prevent vibration or swaying and to provide for expansion and contraction.

4. Hanger and support units installation methods shall be in accordance with manufacturer's recommendations.

5. Hangers and Supports for piping systems subject to thermal expansion and contraction, or to similar movements imposed by other sources, shall be designed to provide flexibility, and pipe stress analysis shall be provided.

a. Hangers and supports shall provide for expansion and contraction throughout the full operating temperature range.

6. Where resonance with imposed vibration and/or shock occurs during operation, suitable dampeners, restraints, anchors, etc., shall be added to remove those effects.

7. Hangers' rods shall be straight and vertical. Chain, wire, strap or perforated bar hangers shall not be used. Hangers shall not be suspended from piping.

8. Contact between dissimilar metals shall be prevented by use of copper plated, rubber or vinyl coated hangers or supports.

B. Hangers and Supports Embedded in Concrete:

1. Concrete embedded items shall be installed before concrete placement.

2. Embedded items shall be fastened securely to prevent movement during concrete placement.

3. Hangers and supports shall be adjusted and grout placed as specified in Section 03 60 00, Grouting, to bring pipelines to specified elevations.

C. Supports and Hangers for Horizontal Pipes:

1. Supports and hangers for all piping shall be placed no farther apart than shown below, unless otherwise shown or specified:

a. For thermoplastic pipe, based on the following nominal pipe diameters:

1) ≤ 1-in. dia.: 2 ft-6 in. center to center.

2) 1½-in. to 3-in. dia.: 4 ft-0 in. center to center.

3) 4-in. to 8-in. dia.: 6 ft-0 in. center to center.

4) > 8-in. dia.: 8 ft-0 in. center to center.

b. Tubing less than 1-inch diameter: In accordance with best piping practice and ASME B31.1, and as approved by the Engineer.

2. Hangers, supports, and accessories shall be located within maximum span lengths specified to support continuous pipeline runs unaffected by concentrated loadings.

3. Where hanger or support spacing does not correspond with joist or rib spacing, structural steel channels shall be attached to joists or ribs, and the pipes suspended therefrom.

D. Supports for Vertical Piping:

1. Spacing:

a. Vertical piping shall be supported at each floor and between floors by stays or braces to prevent rattling and vibration. Maximum spacing shall not exceed 25 ft.

2. Riser Clamps:

a. Riser clamp shall be placed under hub, fitting or coupling with approved solid bearing on steel sleeve.

b. Where riser clamps are used with plastic piping they shall be modified so as not to exert any compressive forces on the pipe.

3. Base elbows or welded equivalent shall be provided at vertical piping bases.

4. Top support shall have a horizontal connection, and provide for pipe expansion.

E. Pipelines installed under plumbing work shall be spaced in conformity with the requirements of the New York City Building Code or as specified herein.

F. Additional Supports:

1. In addition to any and all requirements for the placement of supports specified herein, the Contractor shall provide additional supports as follows:

a. Additional supports shall be placed immediately adjacent to any change in piping direction, at equipment, and on both sides of valves, expansion joints and couplings.

b. Suspended or supported ductile iron pipe shall have a hanger or support adjacent to each hub or flanged end.

c. Except where otherwise shown or required, horizontally valves 6-inches and larger shall be supported on each side of the valve, by pipe hangers or supports.

d. At all flexible couplings, supports shall be placed on each side and as close to the coupling as possible. Supports shall be the guide type which prevent axial movement from resulting in pipe deflection and misalignment.

e. Supports, anchorage and guidance for grooved end pipe shall be in accordance with the applicable sections of these specifications and the recommendations of the manufacturer.

G. Anchors and Sway Braces:

1. Anchors and sway braces shall be provided when required to hold the pipelines and equipment in position or alignment. Pipe anchors and braces for rigid fastening to the structures shall be attached to stainless steel anchor plates and anchor bolts set into the forms when placing concrete of new structures. Brackets and braces shall be attached to existing concrete structures with through bolts or expansion anchors.

2. Anchors, guides and restraints shall be provided for the proper operation of pipeline expansion joints.

3. All pipe anchors, guides and restraints shall be designed to conform to ASME B31.1.

H. Expansion Joints and Flexible Couplings:

1. Supports, guides and anchors for flexible couplings and expansion joints shall be in accordance with the coupling and joint manufacturer's specification and the standards of the Expansion Joints Manufacturers Association.

I. Protection Saddles for Insulated Pipe:

1. Before placing the saddles, saddles shall be filled with either insulating cement or high density insulation cut to fit. For vapor barrier insulation, the barrier must be maintained; contact between hanger and support and bare pipe will not be permitted.

J. Adjustability:

1. Hangers and supports shall be capable of adjustment after placement of piping.

2. All points of adjustment for pipe and duct hanger rods shall be locked securely in place using double-nutting. Double-nutting means two nuts torqued directly against each other under each point of adjustment in addition to a third nut on top of the bracket. Damaging threads or tack welding as a method of locking adjustment is not permitted.

3. All threaded assemblies shall be double nutted or provided with pinned nuts. Alternately, tack welding of bolted assemblies may be acceptable unless provisions for vertical adjustment is required.

K. Any required pipe supports, for which the supports called for in this Section are not applicable, shall be fabricated or constructed from standard stainless steel shapes, concrete and anchor hardware, and shall be subject to the approval of Engineer.

3.03 FIELD TESTING / QUALITY CONTROL

A. Each pipe support system shall be tested in conjunction with the respective piping pressure tests.

1. Tests shall include cycling the piping system to duplicate operating conditions.

2. If any part of the pipe support system proves to be defective or inadequate, as evidenced by vibration or excessive movement, it shall be repaired or augmented at no additional cost to the City.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Touch-up shall be provided in the field, as required. Coating touchup shall be applied in accordance with the manufacturer's recommendations, and shall be free from spots and brush marks, to the satisfaction of the Engineer.

END OF SECTION

SECTION 40 05 19 – DUCTILE IRON PROCESS PIPE
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified, and required to furnish, install, and test all ductile iron process pipe complete and operational.

B. The following index of this Section is presented for convenience:

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C. Schedules:

1. Refer to the following Section(s) for additional information on the piping that is to be constructed using the pipe materials and methods specified herein:

   a. Section 33 06 01 - Schedule for Buried Piping.

   b. Section 40 06 01 - Schedule for Exposed Piping.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 09 91 00 – Painting.

B. Section 22 07 19 - Plumbing Piping Insulation.

C. Section 33 01 10.60 – Disinfection of Piping, Tanks, Structures, and Equipment.

D. Section 33 05 05 – Buried Piping Installation.

E. Section 33 06 01 – Schedule for Buried Piping.

F. Section 40 05 05 – Exposed Piping Installation.

G. Section 40 05 06 – Couplings, Adapters, and Specials for Process piping.

H. Section 40 05 07 – Hangers and Supports for Process Piping.

I. Section 40 06 01 – Schedule for Exposed Piping.

1.04 REFERENCES

A. AWWA C104 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

B. AWWA C110 Ductile-Iron and Gray-Iron Fittings, 3-in. through 48-in., for Water and Other Liquids

C. AWWA C111 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

D. AWWA C115 Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges

E. AWWA C151 Ductile-Iron Pipe, Centrifugally Cast, for Water

F. AWWA C153 Ductile-Iron Compact Fittings, 3-in. through 24-in. and 54-in. through 64-in., for Water Service

G. AWWA C606 Grooved and Shouldered Joints

H. ASTM B98 Copper Silicon Alloy Rod, Bar and Shapes

I. ASTM C283 Resistance of Porcelain Enameled Utensils to Boiling Acid

J. ASTM B117 Standard Practice for Operating Salt Spray (Fog) Apparatus

K. ASTM D714 Standard Test Method for Evaluating Degree of Blistering of Paints

L. ASTM D5162 Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates

M. ASTM E96 Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials

N. ASTM G22 Antibacterial Test

O. ASTM G95 Standard Test Method for Cathodic Disbondment Test of Pipeline Coatings (Attached Cell Method)

P. ANSI/ASME B16.1 Cast Iron Pipe Flanges and Flanged Fittings

Q. DIPRA Handbook of Ductile Iron Pipe

R. NY Spec 24-C-38 Caulking

S. New York City Building Code

T. CEN-EN-598 Ductile iron pipes, fittings, accessories and their joints for sewerage applications – Requirements and test methods

1.05 DESCRIPTION

A. This Section includes requirements for providing ductile iron process pipe and accessories in accordance with applicable standards and regulations. In addition:

1. The scope of this Section shall include all ductile iron process pipe, fittings, and specials.

2. The extent of ductile iron process piping is shown on the Contract Drawings. Ductile iron process pipe service, pipe diameter, coating, lining, pressure rating, joint type, and testing requirements are specified in the following section(s):

a. Section 33 06 01 - Schedule for Buried Piping.

b. Section 40 06 01 - Schedule for Exposed Piping.

3. Ductile iron process pipe, fittings, appurtenances, and specials shall be furnished and installed complete with all necessary jointing materials, wall castings, wall sleeves, specials, adapters, and other appurtenances as shown on the Contract Drawings, as specified herein, and/or as necessary and required for a complete installation.

a. Couplings for ductile iron process pipe shall be provided as specified in Section 40 05 06 - Couplings, Adapters, and Specials for Process piping.

b. Hangers and support for ductile iron process pipe shall be provided as specified in Section 40 05 07 - Hangers and Supports for Process Piping.

4. Where shown on the Contract Drawings, the Contractor shall provide all labor and materials for making connections between ductile iron process pipe and existing lines(s) installed under other contracts, including all specials required to connect ductile iron process pipe to pipe of dissimilar material(s).

5. The scope of this Section shall include all painting, coating, lining, gaskets, harnesses, bolts, nuts, and other appurtenances and material required to provide and assemble the lines.

1.06 QUALITY ASSURANCE

A. Qualifications of Manufacturer:

1. The manufacturer shall have a minimum of five (5) years of experience in the design and fabrication of ductile iron process pipe, fittings,

appurtenances, and specials of similar size, capacity, and type to those shown on the Contract Drawings and specified in the Contract Documents, and shall show evidence of at least five (5) substantially similar installations in satisfactory operation.

2. Linings and coatings:

   a. Lining and coating manufacturer shall have a minimum of five (5) years of experience in protecting pipelines exposed to the service conditions specified in the Contract documents, and shall show evidence of at least five (5) substantially similar installations in satisfactory operation.

3. When linings and coatings are not applied by the manufacturer, the lining and coating Subcontractor shall have a minimum of five (5) years of experience in the application of the specified linings and coatings for the specified service, and shall show evidence of at least five (5) substantially similar installations.

B. Quality Assurance Inspections

1. Quality Assurance inspections may be made by NYC DEP Bureau of Engineering Design and Construction, Quality Assurance Section or its representative at the manufacturer's facility.

2. Quality Assurance inspections shall be in accordance with the requirements of the Contract Documents.

3. The Contract shall give ample notice to the Engineer prior to the beginning of any fabrication, so that Quality Assurance inspection may be made.

4. Quality Assurance inspections shall include (but are not limited to) the following activities:

   a. Obtain copies of Certified Materials Test Reports (both chemical and physical) and Manufacturer Certificates of Conformance.

   b. Perform visual and dimensional inspection of completed work.

C. Supply and Compatibility:

1. All ductile iron process pipe, fittings, appurtenances, and specials included in this Section shall be provided by the Contractor through a single, qualified ductile iron process pipe manufacturer.

2. The pipe and fittings shall be designed, fabricated, and installed in accordance with standards referenced herein.

3. The Contractor shall bear responsibility for the quality of all factory-applied linings and coatings, regardless of the location of application.

4. The Contractor shall verify compatibility between the ductile iron process pipe, fittings, appurtenances, specials, and other Work.

D. Regulatory Requirements:

1. Ductile iron process pipe shall conform to the American National Standards Institute (ANSI) and American Water Works Association (AWWA) Standards specified herein and recommendations as given in the Ductile Iron Pipe Research Association (DIPRA) "Handbook of Ductile Iron Pipe."
2. Ductile iron pipe for City water shall conform to the rules and regulations of the Bureau of Water Supply; requirements contrary to such rules and regulations specified herein shall be disregarded.

1.07 SUBMITTALS

A. Submittals for all ductile iron process pipe shall comply with the requirements of Section 33 05 05 - Buried Piping Installation, and Section 40 05 05 - Exposed Piping Installation.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. Pipes shall be loaded on properly padded saddles not less than 6-in. in width so that they do not bear against each other.
2. The whole load shall be securely fastened together as well as to any vehicle to prevent movement in transit.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. Special care in handling shall be exercised during delivery, storage and handling of pipe to avoid damage and setting up stresses. Pipe and specials stored prior to use shall be stored in such a manner as to keep the interior free from dirt and foreign matter.
2. The Contractor shall maintain the circular shape of the pipe and prevent distortion. Each length of pipe shall be temporarily braced with an approved type of internal spider in each end of the pipe during erection.
3. Handling Coated Pipe:
   a. Coated pipe shall be protected at all times and handled with equipment designed to prevent damage to the coating, such as stout wide canvas slings and wide padded skids.
      1) The use of bare chains, cables, hooks, metal bars or narrow skids in contact with the coating will not be permitted.
   b. All pipe handling and hauling equipment shall meet the approval of the Engineer before use.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Ductile iron process pipe and fittings shall be as manufactured by the following:

1. American Cast Iron Pipe Co., Birmingham, AL;
2. McWane Inc., Birmingham, AL;
3. U.S. Pipe and Foundry Co., Birmingham, AL;
4. Or approved equal.

B. Ceramic Epoxy Lining:

1. Protecto 401, as manufactured by Induron Protective Coatings, Birmingham, AL.
2. Or approved equal.

C. Expansion Joints:

1. Series 500, as manufactured by Mercer Rubber Company, Hauppauge, NY;
2. Or approved equal.

D. Flanged Adapters:

1. McWane Inc., Birmingham, AL;
2. Smith-Blair, Inc., Texarkana, AR;
3. Victaulic Co., Easton, PA;
4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Pipe shall be in accordance with AWWA C151 for push-on or mechanical joint pipe and AWWA C115 for flanged pipe and shall be of grade 60-42-10 ductile iron. The above standards cover ductile iron pipe with nominal pipe sizes from 3-in. up to and including 64-in. in diameter. Working pressure for the pipe shall be as called for in these Standards.

B. Pipe:

1. All pipe, including flanged pipe, for sizes up to and including 12-in. shall have a wall thickness equal to Special Thickness Class 56 as specified in AWWA C151.

2. All pipe, including flanged pipe, for sizes over 12-in. and up to 54-in. shall have a wall thickness equal to Special Thickness Class 54 as specified in AWWA C151.

3. All pipe sizes 60-in. and 64-in. shall have a wall thickness equal to pressure class 350.

C. Fittings:

1. Fittings shall be ductile iron and shall be in accordance with AWWA C110. Any other fittings, not included in AWWA C110, shall conform in design and performance to the requirements of this Standard.

2. Blind, filler, companion and reducing flanges shall conform to ANSI/ASME B16.1.

3. Where compact fittings are shown or indicated, items shall be in accordance with AWWA C153.

D. Flanged Joints:

1. Threaded Flanges: Shall be solid, threaded, ductile-iron, flanges meeting the requirements of AWWA C115. Threaded flanges and pipe shall be assembled and faced by the pipe manufacturer; field or shop assembly will not be accepted. Threaded flanges shall be screwed on tight without overstressing the threads and, when properly assembled, shall be concentric with the pipe.

2. The dimensions of all flanges for pipe fittings and specials and the number and sizes of bolts, up to and including 54-in., shall be in accordance with ANSI B16.1, Class 125 standard flanges.

3. For pipe larger than 54-in., flanged pipe shall have ANSI Class 125 flanges integrally cast solid and at right angles to the pipe axis, and accurately faced and drilled smooth and true. Flange bolt holes shall be backfaced or spot-faced as required by ANSI specifications.

4. Flanges shall be tapped where tap or stud bolts are required.

5. Bolts: Bolts shall be in accordance with Appendix A of AWWA C115 and as follows: Flanged joints shall be made with bolts or stud-bolts with a nut on each end. Bolts, stud-bolts and nuts shall be ANSI heavy dimension, semi-finish, with square heads and cold-punched hexagonal nuts. For bolts 1¾-in. in diameter and larger, stud-bolts shall be used. Bolt size shall be American Standard for ANSI Class 125 flanges. Where flanged joints are in manholes or submerged in tanks, bolts, stud-bolts, and nuts shall be silicon bronze, ASTM B98, Alloy A, of dimensions and sizes equal to steel bolts, stud-bolts, and nuts specified in Appendix A of AWWA C115.

6. Gaskets: Flange gaskets shall be in accordance with Appendix A of AWWA C115. They shall be full-face gaskets for flanged joints on 12-in. diameter and smaller pipe and shall be of the ring type for flanged joints on larger pipe.

7. After each flanged joint has been made, all bolt heads and nuts, and all surfaces of the flanges not to be painted shall be given two coats of asphaltic coating meeting the requirements of AWWA C151.

E. Grooved-Type Joints:

1. Shall be in accordance with AWWA C606 and Section 40 05 06 - Couplings, Adapters, and Specials for Process piping

F. Push-On Type Joints

1. Shall be in accordance with AWWA C111.

G. Expansion Joints:

1. Heavy Duty Rubber Expansion Joints shall be installed where shown on the Contract Drawings.

2. Each Expansion Joint shall be installed with minimum of two control rods and compression sleeves, and as shown on the Contract Drawings.

H. Mechanical Joints:

1. Mechanical joints shall be assembled in accordance with AWWA C600 where required or shown on the Contract Drawings. Joints shall be restrained or harnessed to withstand test and surge pressure.

I. Flanged Adaptors:

1. Bolt hole and bolt patterns shall conform to the mating flange patterns as specified in the piping paragraphs. Bolts, nuts, and flange gaskets shall conform to the specifications for the adjacent piping.

2. Shall have ductile iron bodies.

3. Shall have a rated working pressure of 175 psig.

4. Pipe shall be anchored by using anchor studs drilled into the coupling and connected pipe for nominal pipe size 12-in. and smaller. For nominal pipe sizes over 12-in., pipe shall be restrained by harnesses or pipe supports as specified for sleeve type couplings.

J. Harnesses:

1. Where shown, specified or required, harnesses for pipe with mechanical joints shall be provided.

2. For ductile-iron pipe and fittings with mechanical joints that require harnessing, restrained type mechanical joint pipe will be considered as an alternate upon submission to the Engineer for approval.

3. Joint Assemblies: Joint assemblies shall be designed to resist pullout of the joints at the test pressures specified for the piping system.

K. Sleeves:

1. Sleeves shall be in accordance with AWWA C110. They shall be of ductile iron and shall be provided at all points where pipes will pass through walls and floors and where wall or floor castings are not provided. Unless otherwise shown, sleeves shall have intermediate collars not less than ½-in. thick and 1½ to 2-in. high located at the center of the wall.

2. For exterior walls of structures, wall sleeves shall be plain ends and of flush wall design.

3. Where shown on the Contract Drawings, modular wall seals shall be installed in the annular space between the pipe and the sleeve. In all other locations, caulk shall be installed in the annular space between the pipe and the sleeve. Caulking materials shall be in accordance with N.Y. Spec 24-C-38. For flanged pipe, sleeves shall be fabricated large enough to accommodate flanges.

L. Sleeve-Type Couplings:

1. Sleeve-type couplings shall be in accordance with Section 40 05 06 - Couplings, Adapters, and Specials for Process piping

2. Pipe and fittings for use with sleeve-type flexible couplings shall be plain end.

3. Sleeve wall thickness shall be the same as the associated ductile iron process pipe wall thickness.

M. Wall Castings, Connecting Pieces, and Special Fittings:

1. Wall castings and connecting pieces shall be in accordance with AWWA C110, 250 psi pressure rating, unless specified otherwise. Concrete encased wall castings connected to sluice gates and valves shall be cast from alloy iron, Ni-Resist Type 1, International Nickel Co. or approved equal. Wall castings and connecting pieces shall be furnished with ANSI Class 125 flanged ends, bell ends, flare ends and/or spigot ends where shown, specified or required.

2. Wall castings shall be of standard wall pipe dimensions, unless piping layout precludes their use, in which case special castings shall be furnished.

3. Design of Specials: Special fittings where required shall be of an approved design that meet the same specifications and have the same diameters and thicknesses as standard fittings. Any tees, crosses, elbows, laterals, reducers or other fittings of current ANSI or AWWA standard dimensions are not considered specials.

4. Intermediate Collar: Wall castings shall have an integrally cast intermediate collar not less than ½-in. thick and 1½-in. to 2-in. high located at the center of the wall unless otherwise shown.

5. Where space limitations prevent the use of through bolts for assembling flange connections, stud bolts shall be provided on wall casting flanges.

N. Cleanouts:

1. Cleanouts shall be furnished and installed where shown or specified.

2. Size: Cleanout openings shall be not less than 6-in. diameter for pipe 8-in. in diameter or larger. For pipe 6-in. in diameter or smaller, they shall be of the same diameter as the pipe.

3. Cleanout Covers: Cleanout covers which are blind flanges shall be in accordance with AWWA C110, except where conformation is required with the inside curvature of the pipe, in which case the covers shall be flanged plugs of proper shape with American Standard flange drilling.

4. Covers shall be fastened by means of Type 316 stainless steel studs, washers, and nuts, and shall be drilled and tapped for a 1½-in. diameter pipe connection.

5. Flange plugs shall be equipped with a dowel or other suitable means to provide proper setting.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Coatings and Linings:

1. General:

a. Ductile iron process pipe shall be lined and coated in accordance with the piping schedule(s) included in the following Section(s):

1) Section 33 06 01 - Schedule for Buried Piping.

2) Section 40 06 01 - Schedule for Exposed Piping.

b. All bolts, nuts, couplings and the like shall be coated after the joint has been made.

c. Painting shall be in accordance with Section 09 91 00 - Painting.

d. Pipe and fittings that are to be encased in concrete shall not be painted.

2. Cement Lining:

a. All ductile-iron pipe and fittings shall be furnished with a cement-mortar lining not less than twice the standard thickness and seal coating meeting the requirements of AWWA C104.

3. Glass Lining Pipe and Fittings

a. Glass lining, pipe and fittings shall consist of a minimum of two (2) glass lining coats, one bonded or primer coat and one finish or gloss coat.

1) Each coating shall be applied in controlled thickness after the inside surface of the pipe has been prepared as required to assure a continuous and unbroken bond of the coating to the pipe.

2) The combined, finished coatings shall have a thickness from 8 to 12 mils, and a surface hardness of at least 6 on the Mohs scale.

3) The bond of the glass lining to the metal shall be sufficient to withstand a strain of 0.001-in./in. without damage to the glass.

4) Surface of glass shall have a dense, glazed finish nonadherent to grease, scum, wax or other sticky substances found in sludge.

b. Ensure that firing of pipe and applied coating layers shall provide a complete fusion to the pipe wall.

1) The compounding, firing and annealing technique shall assure a lining capable of withstanding thermal shock up to 260 °F without damage to the surface or structure of the coating or to its bond with the pipe material.

c. Finish coating shall be free from craters, porosity, crazing, scaling, or pinholes evident from visual inspection.

1) Pipe need not meet a spark test for continuity, but will be rejected for any faults detectable by visual inspection.

d. Finish coating shall be resistant to attacks from acids equivalent to a weight loss not greater than 3 mg /in^2 as determined by the procedure for testing against citric acid, ASTM C283. The coating shall protect against etching or loss of gloss when subjected to cleaning procedures employing a 200°F water-steam mixture.

e. Glass-lined pipe shall not deviate more than 0.0125-in./ft of length from a centerline perpendicular to the flange face or square end of the pipe.

4. Ceramic Epoxy Lining:

a. Lining applicator:

1) Lining shall be applied by a certified firm or manufacturer with a successful history of applying linings to the interior of ductile iron pipe and fittings.

2) Manufacturer must be independently inspected at least two (2) times per year with certification stating compliance with the requirements specified herein.

b. Lining materials: Amine cured novolac epoxy containing at least 20% by volume of ceramic quartz pigment, and shall have:

1) A permeability rating of 0.00 as per Method A of ASTM E 96, Procedure A (test duration of 30 days).

2) Results equal to 0.0 undercutting after two years as per ASTM B 117.

3) Results to equal no more than 0.5mm undercutting after 30 days as per ASTM G 95 cathodic disbondment 1.5 volts at 77°F.

4) Immersion testing rated using ASTM D 714, with the following results after two years' duration testing of:

a) 20% Sulfuric acid: No effect.

b) 140°F 25% Sodium Hydroxide: No effect.

c) 160°F Distilled Water: No effect.

d) 120°F Tap Water (scribed panel): 0.0 undercutting with no effect.

5) Results of only trace growth using ASTM G 22 at 30°C after 7 days.

6) An abrasion resistance of no more than 3 mils (.075 mm) loss after one million cycles using European Standard EN 598, Section 7.8.

c. Application:

1) Condition of pipe prior to application: Prior to application of the ceramic epoxy lining:

a) Interior: No other coating or lining shall have been applied to the entire interior of the pipe.

b) Exterior: No other coating or lining shall have been applied to the first six inches of the exterior of the spigot ends.

2) Surface preparation:

a) Inspect application area for oil, grease, etc. prior to abrasive blasting. Solvent clean if necessary or required for coating application.

b) Abrasive blast application area using sand or grit abrasive media to remove all rust, loose oxides, etc. Only slight stains and tightly adhering oxide shall remain on application surface. If rust reappears before application, or if more than 12 hours elapses before application, repeat blasting procedure specified herein.

3) Lining:

a) Pipe shall be lined within 12 hours of surface preparation.

b) Apply 40 mils nominal dry film thickness to interior of pipe.

c) Lining shall not take place when the substrate or ambient temperature is below 40°F.

d) Ensure surface is dry and dust free.

e) Do not apply lining to flange faces.

4) Coating of Bell Sockets and Spigot Ends

a) Apply joint compound as per Manufacturer's instructions to the gasket area and spigot end up to 6 in. back from the end of the spigot end.

b) Apply 6 mils nominal, 10 mils maximum even coverage.

c) Manufacturer's joint compound shall be applied by brush to ensure full and complete coverage.

d) Care should be taken that the joint compound is smooth without excess buildup in the gasket seat or on the spigot ends.

e) Coating of the gasket seat and spigot ends shall be done after the application of the lining.

5) Number of Coats

a) The number of coats of lining material applied shall be as recommended by the lining manufacturer.

b) In no case shall lining material be applied above the dry thickness per coat recommended by Manufacturer in printed literature.

c) The maximum or minimum time between coats shall be that time recommended by Manufacturer.

d) To prevent delamination between coats, no material shall be used for lining which is not indefinitely re-coatable with itself without roughening of the surface.

6) Touch-Up and Repair

a) Use Manufacturer's joint compound for touch-up or repair in accordance with Manufacturer instructions

d. Inspection:

1) All ductile iron pipe and fitting linings shall be checked for thickness using a magnetic film thickness gauge as per SSPC PA-2.

2) Test interior of all pipe and fittings for pinholes with a non-destructive 2500-volt test in accordance with ASTM D5162. Any defects found shall be repaired and re-inspected prior to shipment.

e. Mark each pipe joint and fitting with the date of application of the lining system along with its numerical sequence of application on that date. Numerical sequence shall correspond with records maintained by the applicator of the Work.

5. Exterior Primer:

a. Pipe and fittings shall be shop coated on the outside in accordance with Section 09 91 00 - Painting, for use in exposed locations, such as inside buildings where finish painting or insulating is required.

6. Painting:

a. Pipe and fittings shall be painted in accordance with the requirements of Section 09 91 00 - Painting.

7. Asphaltic Coating:

a. Pipe and fittings that will not be exposed to view shall be coated with the standard asphaltic outside coating specified in AWWA C151, at twice the specified thickness.

b. Unlined pipe shall be coated with the standard asphaltic inside coating specified in AWWA C151.

8. Epoxy and Urethane Coatings:

a. Epoxy and urethane coatings shall be applied in accordance with Section 09 91 00 - Painting.

9. Concrete Encased Pipe:

a. Pipe and fittings which are to be encased in concrete where water-tightness is to be obtained shall not be coated or painted on the outside.

10. Labels:

a. In addition to the information required to be cast onto the pipe by AWWA C151, the letters "N.Y.C." shall be painted on the outside of each pipe, fitting, and special casting.

11. Pipe Couplings:

a. Where flexible or rigid couplings are to be used, the exterior coating on the ends of pipe and fittings shall be left off for approximately 8-in., but the interiors shall be lined throughout.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Damaged pipe will be rejected and shall be replaced at the Contractor's expense.

3.02 INSTALLATION

A. Install ductile iron process pipe, fittings, and specials in accordance with the requirements of the following Section(s):

1. Section 33 05 05 - Buried Piping Installation.
2. Section 40 05 05 - Exposed Piping Installation.

3.03 FIELD TESTING / QUALITY CONTROL

A. Perform field testing and quality control of ductile iron process pipe, fittings, and specials in accordance with the requirements of the following Section(s):

1. Section 33 05 05 - Buried Piping Installation.
2. Section 40 05 05 - Exposed Piping Installation.

3.04 STARTUP / DEMONSTRATION

A. All potable water pipe shall be disinfected before they are placed into service, as specified in Section 33 01 10.60 - Disinfection of Piping, Tanks, Structures, and Equipment

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified, and required to furnish, install, and test all thermoplastic process pipe, complete and operational.

B. The following index of this Section is presented for convenience:

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C. Schedules:

1. Refer to the following Section(s) for additional information on the piping that is to be constructed using the pipe materials and methods specified herein:

   a. Section 33 06 01 - Schedule for Buried Piping.

   b. Section 40 06 01 - Schedule for Exposed Piping.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 09 91 00 – Painting.

B. Section 22 07 19 - Plumbing Piping Insulation.

C. Section 33 05 05 – Buried Piping Installation.

D. Section 33 06 01 – Schedule for Buried Piping.

E. Section 40 05 05 – Exposed Piping Installation.

F. Section 40 05 07 – Hangers and Supports for Process Piping.

G. Section 40 06 01 – Schedule for Exposed Piping.

1.04 REFERENCES

A. Reference Standards:

1.	ASME B18.2.1	Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head and Lag Screws (Inch Series).
2.	ASTM A307	Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength.

ASTM D1784 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC)

3.	ASTM D1785	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40,80 and 120.
4.	ASTM D2241	Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
5.	ASTM D2467	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

1.05 DESCRIPTION

A. This Section includes requirements for providing thermoplastic process pipe and accessories in accordance with applicable standards and regulations. In addition:

1. The scope of this Section shall include all thermoplastic process pipe, fittings, and specials.

a. Thermoplastic process pipe includes:

1) PVC process pipe.

2) CPVC process pipe.

2. The extent of thermoplastic process piping is shown on the Contract Drawings. Thermoplastic process pipe service, pipe diameter, pressure rating, joint type, and testing requirements are specified in the following section(s):

a. Section 33 06 01, Schedule for Buried Piping.

b. Section 40 06 01, Schedule for Exposed Piping.

3. Thermoplastic process pipe, fittings, appurtenances, and specials shall be furnished and installed complete with all necessary jointing materials, wall castings, wall sleeves, specials, adapters, and other appurtenances as shown on the Contract Drawings, as specified herein, and/or as necessary and required for a complete installation.

   a. Hangers and support for thermoplastic process pipe shall be provided as specified in Section 40 05 07, Hangers and Supports for Process Piping.

4. Where shown on the Contract Drawings, the Contractor shall provide all labor and materials for making connections between thermoplastic process pipe and existing lines(s) installed under other contracts, including all specials required to connect thermoplastic process pipe to pipe of dissimilar material(s).

1.06 QUALITY ASSURANCE

A. Qualifications of Manufacturer:

1. The manufacturer shall have a minimum of five (5) years of experience in the design and fabrication of thermoplastic process pipe, fittings, appurtenances, and specials of similar size, capacity, and type to those shown on the Contract Drawings and specified in the Contract Documents, and shall show evidence of at least five (5) substantially similar installations in satisfactory operation.

B. Supply and Compatibility:

1. All thermoplastic process pipe, fittings, appurtenances, and specials included in this section shall be provided by the Contractor through a single, qualified thermoplastic process pipe manufacturer.

2. The pipe and fittings shall be designed, fabricated, and installed in accordance with the latest standards referenced herein.

3. The manufacturer shall verify compatibility between the thermoplastic process pipe, fittings, appurtenances, specials, and other Work.

C. Regulatory Requirements:

1. Thermoplastic pipe and fittings shall conform to the New York City Building Code with respect to plumbing and other applications covered by these laws.

2. Use only NSF61-approved materials in potable water lines.

1.07 SUBMITTALS

A. Submittals for all thermoplastic process pipe shall comply with the requirements of Section 33 05 05, Buried Piping Installation, and Section 40 05 05, Exposed Piping Installation.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. PVC process pipe and fittings shall be as manufactured by:

1. IPEX, Inc.
2. Spears Manufacturing Company.
3. Or approved equal.

B. CPVC process pipe and fittings shall be as manufactured by:

1. IPEX, Inc.
2. Spears Manufacturing Company.
3. B. F. Goodrich (now Lubrizol Advanced Materials, Inc.), Cleveland, OH;
4. Lewis Pipe Company, Ardmore, AL;
5. Or approved equal.

C. PVC Solvent cement shall be as manufactured by:

1. Weld-On®, as manufactured by IPS Corp., Compton, CA;
2. Or approved equal.

D. Wall sleeve annular seals as manufactured by:

1. Link-Seal®, as manufactured by Thunderline Corp., Stafford, TX;
2. MetraSeal, as manufactured by the Metraflex Corp., Chicago, IL;
3. The Pipe Seal, as manufactured by Flexicraft Industries, Chicago, IL;
4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. General:

1. Thermoplastic process pipe shall be as uniform as commercially practicable in color, capacity, density and other physical properties.
2. Nominal length of thermoplastic pipe shall be 20 ft.

B. PVC Process Pipe and Fittings:

1. General:
   a. PVC pipe and fittings shall meet the requirements of ASTM D1785, Type I, Grade I.
   b. PVC pipe and fittings shall be Sch. 80, unless otherwise shown or specified.
2. Materials and Construction:
   a. PVC pipe and fittings shall be manufactured from PVC compounds meeting the requirements of ASTM D1784, Class 12454-B.
3. End Connections:
   a. Solvent weld socket type fittings shall conform to ASTM D2467.
   b. Flanges where shown on the Contract Drawings and/or explicitly specified herein.
      1) Bolts and stud bolts shall be of steel, ASTM A307, Grade B, cadmium plated. Bolts and stud bolts shall conform to the dimensional requirements of ASME B18.2.1 with rolled threads conforming to ASME B1.1, Coarse series, Class 2 fit.
      2) Bolts and stud bolts and nuts shall be of American Standard heavy unfinished hexagonal type.
4. PVC Solvent Cement:
   a. PVC solvent cement shall be compatible and suitable for use for the fluid being processed.
   b. Threaded fittings shall conform to ASTM D2464.

C. CPVC Pipe and Fittings:

1. General:
   a. CPVC pipe and fittings shall meet the requirements of ASTM F441.
   b. CPVC pipe and fittings shall be Sch. 80, unless otherwise shown or specified.
2. Materials and Construction:
   a. CPVC pipe and fittings shall be manufactured from CPVC compounds meeting the requirements of ASTM D1784.
3. End Connections:
   a. Socket-type fittings shall conform to ASTM F439.

b. Threaded fittings shall conform to ASTM F437.

c. Flanges

D. Sleeves:

1. Provide steel pipe sleeves at all points where pipes pass through walls or floors of structures.

2. Provide steel sleeves of Schedule 40 minimum thickness, with waterstop. The O.D. of the collar shall be four inches greater than the O.D. of the sleeve, fabricated from steel plate with a minimum thickness equal to the sleeve thickness and double welded to the sleeve.

E. Wall Sleeve Annular Seals:

1. For penetrations through walls, partitions, or floors where fire-rated construction is not required:

a. Provide modular mechanical type seals consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and the wall sleeve to provide an effective hydrostatic seal.

b. Bolts and nuts shall be stainless steel.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Damaged pipe will be rejected and shall be replaced at the Contractor's expense.

3.02 INSTALLATION

A. Install thermoplastic process pipe, fittings, and specials in accordance with the requirements of the following Section(s):

1. Section 33 05 05 - Buried Piping Installation.

2. Section 40 05 05 - Exposed Piping Installation.

3.03 FIELD TESTING / QUALITY CONTROL

A. Perform field testing and quality control of thermoplastic process pipe, fittings, and specials in accordance with the requirements of the following Section(s):

1. Section 33 05 05 - Buried Piping Installation.

2. Section 40 05 05 - Exposed Piping Installation.

3.04 STARTUP / DEMONSTRATION

A. Not Used.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Cleaning:

1. During construction, all piping shall be thoroughly cleaned before placement and the lines kept free from foreign matter of whatever origin. The pipes shall be left thoroughly clean to the satisfaction of the Engineer.

2. Flush all process and potable water piping with clean water.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 40 05 32 – DOUBLE CONTAINMENT CHEMICAL PIPING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified, and required to design, furnish, install, and test all double containment chemical piping, including leak detection systems, complete and operational.

B. The following index of this Section is presented for convenience:

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C. Schedules:

1. Refer to the following Section(s) for additional information on the piping that is to be constructed using the pipe materials and methods specified herein:

   a. Section 33 06 01 - Schedule for Buried Piping.

   b. Section 40 06 01 - Schedule for Exposed Piping.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the

applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 33 06 01 – Schedule for Buried Piping.

B. Section 40 06 01 – Schedule for Exposed Piping.

1.04 REFERENCES

A. ISO 9080 - Determination of the long-term hydrostatic strength of thermoplastic pipe

B. ISO 16770 - Determination of environmental stress cracking (ESC) of PE – Full notch test (FNCT)

C. DVS 2207-5 and -1 - Welding of thermoplastic materials — Testing and assessing welded joints in PE casing pipes

D. EN ISO 265+5 Supplement B - Plastics piping systems for industrial applications - (PE) - Metric series for specifications for components and the system.

E. ASTM D1505 - Standard Test Method for Density of Plastics by the Density-Gradient Technique

F. ASTM D1598 - Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure

G. ASTM D1599 - Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings

H. ASTM D2122 - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

I. ASTM D2657 – Standard Practice For Heat Fusion Joining of Polyolefin Pipe and Fittings

J. ASTM D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

K. ASTM D2839 - Standard Practice for Use of a Melt Index Strand for Determining Density of Polyethylene

L. ASTM D2657 - Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings

M. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

N. ASTM F1473 - Standard Test Method for Notch Tensile Test to measure the resistance to slow crack growth of PE pipes and resins

O. AWS B2.4 - Specification for welding procedure and performance qualification for thermoplastics

P. DVS 2205-1 - Design calculations for containers and apparatus made from thermoplastics; characteristics values

Q. EN 12201 - Plastics piping systems for water supply, and for drainage and sewerage under pressure - polyethylene (PE)

R. ASME NM.1 - Thermoplastic piping systems

S. ASME B31.3 - Process piping code

T. DVS 2210-1 - Industrial piping made of thermoplastics – design and execution – aboveground pipe systems

1.05 DESCRIPTION

A. The extent of double containment chemical piping is shown on the Contract Drawings. Double containment chemical pipe service, pipe diameter, pressure rating, joint type, and testing requirements are specified in the following section(s):

1. Section 33 06 01, Schedule for Buried Piping.

2. Section 40 06 01, Schedule for Exposed Piping.

B. The system design shall meet the requirements of ASME/ANSI B31.3 for design criteria.

C. The system design shall meet the stated minimum requirements of Federal Regulations 40 CFR-280.

1.06 QUALITY ASSURANCE

A. Qualifications of Manufacturer:

1. The manufacturer shall have a minimum of ten (10) years of experience in the design and fabrication of double containment chemical piping, fittings, appurtenances, and specials of similar size, capacity, and type to those shown on the Contract Drawings and specified in the Contract Documents, and shall show evidence of at least five (5) substantially similar installations in satisfactory operation.

B. Obtain components from a single source having responsibility and accountability to answer and resolve problems regarding proper installation, compatibility, performance and acceptance.

C. Supply and Compatibility:

1. All double containment chemical piping, fittings, appurtenances, and specials included in this section shall be provided by the Contractor through a single, qualified thermoplastic process pipe manufacturer.

2. The pipe and fittings shall be designed, fabricated, and installed in accordance with the latest standards referenced herein.

3. The manufacturer shall verify compatibility between the double containment chemical piping, fittings, appurtenances, specials, and other Work.

D. Design, fabricate and install double containment piping to meet ASME/ANSI B31.3 and provide thermal stress analysis demonstrating the ability of the double-containment piping system to handle the stated piping conditions with a restrained or a flexible design in compliance with B31.3.

1.07 SUBMITTALS

A. Submittals for all thermoplastic process pipe shall comply with the requirements of Section 33 05 05, Buried Piping Installation, and Section 40 05 05, Exposed Piping Installation. In addition:

1. Action Submittals:

a. Product data for each type of double containment specified including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

b. Product certificates signed by manufacturer of double-containment product stating compliance with stated requirements.

2. Informational Submittals:

a. Welder certificates certifying that welders comply with the installation procedures as outlined by ASME NM.1 and/or ASTM D2657 and/or AWS B2.4 and/or DVS 2207prior to construction.

b. Qualifications of manufacturer supplying double containment piping. Firms must have the appropriate experience in installation (fusion welding) and operation of a thermoplastic piping system.

c. Manufacturer's Delegated Design Engineer's professional engineering license information, verifying valid licensure in the State of New York, and professional resume, demonstrating the requisite experience for double containment chemical piping systems.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents.

1. Deliver double-containment piping as a factory assembled unit with protective wrapping/coverings.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents.

1. Care shall be taken to prevent damage to the supplied components. Avoid scraping, denting, and gouging the components. Surface damage deeper than 10% of the wall thickness shall be rejected. Pipe shall have adequate support at all times to prevent sagging or distortion.

2. Store products on elevated platforms in a dry location with protection from elements.

3. Lift, support, and transport double containment piping per manufacturer's recommendations.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Turn over to DEP, at end of construction, necessary welding equipment as suggested by manufacturer for repair and maintenance of the double-containment product.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Double Containment Chemical Piping:

1. Asahi/America, Inc., of Lawrence, Massachusetts.

2. No substitution allowed.

B. Electronic Low-Level Leak Detection Systems:

1. LiquidWatch II® Series manufactured by PermAlert.

2. Or approved equal.

C. Continuous Cable Leak Detection Systems:

1. PAL-AT® System as manufactured by PermAlert.

2. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Double Containment Chemical Piping:

1. Pipe and Fittings: Polyethylene (PE) pipe PE100-RC resin 15494 supplement B [Minimum Required Strength of MRS 10] ASTM D3350 minimum cell class PE445586C (1/2" - 12") (20mm - 315mm), advanced polyethylene resin with a slow crack growth resistance of greater than 9,000 hours when conducted with the PENT test ASTM F1473, and greater than 8,760 hours with a full notch creep test (FNCT) according to ISO 16770. SDR 11 Pipe and fittings have been tested and confirmed by the DVGW Test Laboratory Energy of DBI-GTI for permeation and tightness, to be considered H2 Ready.

2. For Sodium Hypochlorite: EDTFE (Halar) shall be used for the carrier pipe (2", 3") and ChemPro Advanced PE RC100 for the containment pipe, For Sodium Bisulfate: both carrier and containment lines are to be ChemPro Advanced PE RC100.

3. Pressure Rating: Both inner and outer pipes shall conform to requirements for establishing a hydrostatic design basis:

   a. Product Pipe The product pipe shall have a standard dimensional ratio of SDR-11 for pipes 1" through 12" and shall be pressure rated to 150 psi at 68° F for all diameter sizes.

   b. Containment Pipe The containment pipe shall have a standard dimensional ratio of SDR-11 for 3"and shall be pressure rated to 150 psi, SDR-33 for all other diameters 4" and larger rated to 45 psi.

B. Double Containment Chemical Piping Fittings:

1. All pressure rated fittings will be per the piping SDR rating, unless specifically identified on drawings or datasheet. Molded fittings shall be central injection gate molded PE100-RC rated to a minimum of the pressure pipe.

2. Drainage pattern fittings including laterals, sanitary tees, wyes, flush reducers, flush reducing tees, cleanouts, p-traps, drains, or any other non-full pressure rated items shall be rated to a minimum of 10 feet of H2O.

3. Unlisted Components: Any special fittings, welded areas, etc. not supplied as part of the normal product offering shall be classified as unlisted components. Products falling into this category shall be pretested to twice the maximum operating pressure for a period of 2 hours minimum.

C. Double Containment Valves:

1. Valving arrangements that are to be double contained shall be supplied preassembled and tested to 150% of the maximum operating pressures. Actuators, stem extensions, and other accessories shall be part of a preassembled package where appropriate.

D. Pipe Supports: Supports, guides, etc. for product pipe shall be provided of same resin as containment pipe. Supports shall be placed in a manner that a maximum of 0.1" deflection is allowed between supports. Supports shall allow axial movement of product pipe within containment pipe. Supports shall maintain a concentric relationship between product pipe and containment pipe. Supports shall supply a minimum of 1.5" wide surface area to prevent point loading of product pipe.

E. Simultaneous Weld Discs: Simultaneous weld discs shall be provided of the same resin group as product pipe and containment pipe. Molded simultaneous weld discs shall supply 4 openings on 90° spacing to allow for drainage and venting of the annular space. Fabricated simultaneous weld discs shall be designed with vent and drain openings. All simultaneous weld discs shall be sized to maintain alignment of product pipe within +/- 10% of wall thickness.

F. Vents/Drains: High-point vents and low-point drains shall provide adequate flows to completely drain annular space. Location of vents/drains shall be coordinated with piping manufacturer. Vents/drains shall be of same resin as product pipe.

G. Leak Detection Systems:

1. General:
   a. The double containment piping manufacturer shall provide the leak detection systems.
   b. Provide electronic low-level leak detection systems as shown on the Contract Drawings.
   c. Provide continuous cable leak detection systems for all buried chemical piping unless otherwise indicated.
2. Low-Level Electronic Leak Detection Systems:
   a. Enclosure: NEMA 4X
   b. Supply Voltage: 115 volt, 1 phase, 60 Hz.

H. Leak detection shall be provided per contract drawings and leak detection manufacturer's requirements. Low Point leak detection stations shall be of same resin as pipe.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Anchorage:
   1. Anchors shall be provided of same resin group as product pipe and containment pipe. Anchors shall be of same wall thickness as product and containment pipe, and be of unitary construction. Anchors shall be fully pressure rated. Anchors shall be dogbone style.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Damaged pipe will be rejected and shall be replaced at the Contractor's expense.

3.02 INSTALLATION

A. Install double-containment piping to comply with manufacturer's recommended procedures.

B. Installers shall be pre-qualified through sufficient training in butt fusion techniques according to ASTM D2657 Section 9.

C. Hot gas welding shall not be allowed for wetted components.

D. Manufacturer/Manufacturer's Representative shall provide on-site training in the assembly, installation, and operation of double containment system.

3.03 FIELD TESTING / QUALITY CONTROL

A. Testing shall be conducted in accordance with manufacturer's recommendations.

B. Prior to pressure testing, the system shall be examined for the following items:

1. Pipe shall be completed per drawing layout with all pipes and valve supports in place.
2. Pipe, valves, and equipment shall be supported as specified, without any concentrated loads on the system.
3. Pipe shall be in good condition void of any cracks, gouges or deformation.
4. Pipe flanges shall be properly aligned. All flange bolts should be checked for correct torques.
5. All diaphragm valve bonnet bolts shall be checked for correct torques.
6. All joints should be reviewed for appropriate welding technique.
    a. Butt fusion welds: to have two beads, 360° around the joint.
7. Verify that all high points are provided with an adequate vent for hydro testing.

C. Field Testing:

1. Pressure Systems: Product Pipe Should be tested hydrostatically to 150% of operating pressure per ASME B31.3 part 345.
2. Containment Pipe: The containment piping shall be tested hydrostatically to 150% of operating pressure per ASME B31.3. The product pipe must be pressurized to the same pressure as the test to prevent collapsing of product pipe.
    a. Alternate to containment pipe hydrostatic test: To avoid moisture in the containment space, an air test can be conducted on the containment pipe. Pressure test is recommended at 5 psi and shall not exceed 10 psi. The inner carrier pipe shall be full of water and under pressure to avoid any possible collapse. When testing with air, the ambient temperature should be above 32 °F and extra safety precautions for personnel shall be put in place during the test.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 40 05 53 – PROCESS VALVES FOUR-INCH DIAMETER AND LARGER
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to furnish, install, and test all process valves four-inch diameter and larger complete and operational.

B. The following index of this Section is presented for convenience:

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C. The following schedule(s), attached after the End of Section designation, are a part of this Section:

1. Schedule 40 05 53-1, Process Valves Four-inch Diameter and Larger.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 05 23.01 – Welding.

B. Section 09 91 00 – Painting.

C. Section 26 05 91 – Low Voltage Electric Motors.

D. Section 33 06 01 – Schedule for Buried Piping.

E. Section 40 05 56- Process Valves Smaller Than Four-Inch Diameter

F. Section 40 05 97 – Identification for Process Equipment.

G. Section 40 06 01 – Schedule for Exposed Piping.

1.04 REFERENCES

A. Abbreviations and Acronyms:

1.	NRS	Non Rising-Stem.
2.	OS&Y	Outside Screw and Yoke.
3.	FS	Federal Specification

B. Definitions:

1.	Non-ferrous metals:	All metal mixtures including copper, tin, zinc, lead, and/or other metals, in which iron does not predominate.

C. Reference Standards:

1.	ASTM A126	Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
2.	ASTM A194	Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
3.	ASTM A380	Standard Specification for Practice for Cleaning, Descaling and Passivation of Stainless Steel Parts, Equipment and Systems.
4.	ASTM A536	Standard Specification for Ductile Iron Castings.
5.	ASTM A743	Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application.
6.	ASTM B62	Standard Specification for Composition Bronze or Ounce Metal Castings.
7.	ASTM B138	Standard Specification for Manganese Bronze Rod, Bar and Shapes.
8.	ASTM B164	Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire.
9.	ASTM B265	Standard Specification for Titanium and Titanium Alloy Strip, Sheet, and Plate.
10.	AWWA C542	Electric Motor Actuators for Valves and Slide Gates.

11.	AWWA C550	Protective Interior Coatings for Valves and Hydrants.
12.	FS TT-C-494B	Coating Compound-Bituminous Solvent Type, Acid Resistant.
13.	AISI 1144	Carbon Steel.

1.05 DESCRIPTION

A. The scope of this Section includes requirements for all process valves, four-inch diameter and larger, in accordance with applicable standards and regulations. In addition:

1. All other valves referenced in Schedule 40 05 53-1, located after the "End of Section" designation, shall be for liquid service.

2. Electric actuators for electrically actuated valves shall be provided by the valve manufacturers. Electric actuator motors shall conform to the requirements of Section 26 05 91 - Low Voltage Electric Motors.

B. All valves larger than four inches that are part of the Work are exposed valves, even though adjoining pipelines may be primarily specified under Section 33 06 01 - Schedule for Buried Piping.

1.06 QUALITY ASSURANCE

A. Quality Assurance Inspections:

1. Quality Assurance inspections may be made by NYC DEP Bureau of Engineering Design and Construction, Quality Assurance Section or its representative at the manufacturer’s facility.

2. Quality Assurance Inspections shall be in accordance with the requirements of the Contract Documents.

3. The Contract shall give ample notice to the Engineer prior to the beginning of any fabrication, so that QA inspection may be made.

4. QA inspections shall include (but no be limited to) the following activities:

a. Obtain representative material samples of main components.

b. Obtain copies of Certified Materials Test Reports (both chemical and physical) and Manufacturer's Certificates of Conformance.

c. Perform visual and dimensional inspection of completed work.

d. Witness surface preparation and coating and lining operations, paint peel tests, and holiday tests.

e. Witness any required hydrostatic, shop leakage and performance tests.

B. Manufacturer's Qualifications:

1. Manufacturer shall have a minimum of 5 years of experience in the production of substantially similar valve equipment, and shall show evidence of satisfactory service in at least 5 installations.

C. Supply and Compatibility:

1. Each type of valve, inclusive of all sizes specified for that type of valve, shall be the product of one (1) manufacturer.

D. Welding Work:

1. All welding work, qualification, and inspections shall conform to the requirements of Section 05 05 23.01 - Welding, and is subject to Quality Assurance inspection.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Quality Assurance Requirements:

1) All information necessary and required to substantiate approval of a valve manufacturer in accordance with the quality assurance requirements of this Section.

b. Shop Drawings:

1) Associated valve tag number(s) as specified in Schedule 40 05 53-1, located after the "End of Section" designation.

2) Complete catalog information, descriptive literature, specifications, and identification of all materials of construction.

3) Product data sheets for make and model. The valve(s) with size(s) and option(s) being submitted for approval are specifically identified in the product data sheet(s).

4) Power and control wiring diagrams, including terminals and numbers.

5) Complete nameplate data of electric actuators.

6) Spare parts list.

7) Special tools list.

c. Calculations:

1) Sizing of electric actuators.

2) Sizing of operating mechanisms with extension stems.

3) Sizing of gear actuators.

4) Sizing of anchor bolts.

d. Operation and Maintenance Data: Submit complete manuals including:

1) Copies of all approved Shop Drawings, test reports, maintenance data and schedules, description of operation, and spare parts information.

2. Information Submittals:

a. Material test reports representing all major components of valves and operators shall be submitted. All such components shall be traceable to the original heat and/or lot numbers unless otherwise approved.

b. Certificates of compliance with AWWA Standards, if applicable.

c. Certificate of chemical composition and compliance with ASTM standard for anchor and miscellaneous mounting bolts.

d. Certificate of suitability of all valve materials for the specified service.

e. Certified copies of shop test results and inspection data.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. Valves and associated appurtenances shall be handled carefully. Valves which are dropped, dented, cracked, and/or otherwise damaged shall not be accepted.

2. Provide full-face protectors of waterproof material fastened to each side of the valve body to protect joints and the valve interior.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Contractor shall provide spare parts and special tools necessary to service, disassemble, repair, and adjust the equipment provided under this Section, and as per the requirements of the Contract Documents. In addition:

1. Provide spare part sets for the following types of valves:

a. Plug Valves: Each spare part set shall consist of the following:

1) One (1) set of gaskets.

2) One (1) set of packing.

3) One (1) set of upper and lower journal bearings.

2. The quantities of spare parts sets to be furnished as part of the Work are given in Table 40 05 53-1, below. Furnish the quantity of spare parts sets

given in the table for each type and each size of valve included in this Section.

TABLE 40 05 53-1
QUANTITIES OF SPARE PARTS SETS TO FURNISH

Number of Valves Installed	Sets of Spare Parts Required
1 - 5	1

B. Tools: Provide standard and special tools and supplies necessary to service, disassemble, repair, and adjust the equipment, products. In addition:

1. The following tools shall be furnished:

a. T-Handle Operating Wrenches: As specified herein.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Plug Valves (Liquid Service):

1. DeZurik, as manufactured by DeZurik APCO Hilton, Inc., Sartell, MN;
2. Or approved equal.

B. Motor-Operators (Open/Close and Modulating):

1. AUMA Actuators, Canonsburg, PA;
2. EIM Controls, Houston, Texas.;
3. Limitorque, Irving, TX;
4. Rotork, Bath, United Kingdom;
5. Or approved equal.

C. Position Indicators:

1. Trumbull Industries, Inc., Youngstown, OH.
2. Or approved equal.

D. Stainless Steel Bracket for Position Indicators:

1. Trumbull Industries, Inc., Youngstown, OH.
2. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. General:

1. Materials of Construction:

a. Compatibility for Service:

1) All materials of construction of the valves shall be confirmed suitable for the application by the valve manufacturer.

b. Wetted parts of the valve shall be protected from galvanic corrosion.

c. Ferrous Metals:

1) Cast iron of the valves, unless otherwise specified, shall conform to ASTM A 126, Class B.

d. Non-Ferrous Metals:

1) Non-ferrous metals shall be provided with standard composition and physical properties conforming to ASTM standards except as otherwise indicated.

2) All non-ferrous metals shall be made from new metals of purest commercial quality. Scrap can be used only when it is the result of the processes of manufacture of articles of similar composition.

3) Bronze items shall have one of the following compositions as specified herein:

a) Composition "A" conforming to ASTM B61 (Alloy UNS No. C92200) or B 62 (Alloy UNS No. C83600).

b) Composition "B" conforming to ASTM B61 (Alloy UNS No. C92200) or an approved standard composition having good wear and corrosion resisting qualities and sufficiently ductile for peening into dove-tail grooves.

c) Composition "C" conforming to ASTM B584, Copper Alloy UNS No. C86500 or C86400; or ASTM B 21, Copper Alloy UNS No. C46400; or ASTM B 124, Copper Alloy UNS No. 37700.

d) Composition "D" conforming to ASTM B584, Copper Alloy UNS No. C86200 or C86700; or B 21, Copper Alloy UNS No. C46400.

e. Metal Castings:

1) Castings shall be true to pattern, sound, smooth, and without injurious cold shuts, swells, lump scabs, scoria, sand holes, and/or other defects and imperfections.

2) Weld repair will not be allowed without the written permission of the Engineer.

   a) Map all defects over ¼-in. wide or ¼-in. deep.

      (1) If such defects add up to ten percent or more of the total open surface area, then the casting will be rejected unless waived by the Engineer.

   b) Map defects smaller than ¼-in. if they are densely concentrated, and report to the Engineer for approval or repair.

   c) Conduct repairs permitted by the Engineer per approved procedures.

      (1) Any acceptable casting defect that affects the paint integrity shall be plugged or filled using approved methods and only with the consent of the Engineer.

3) All castings shall be thoroughly, inside and outside, free from sand and dust.

   a) Use wire brushes, scrapers or other approved mechanical appliances for this purpose.

   b) Do not use acid or other corrosive liquids in cleaning castings.

4) Deviation in casting thickness (for each valve):

   a) For valve body castings having a standard thickness < 0.8-in.:

      (1) Maximum deviation from the standard thickness: < 0.08-in.

   b) For valve body castings having a standard thickness ≥ 0.8-in.:

      (1) Maximum deviation from the standard thickness: ≤ 10% of standard thickness.

   c) Maximum area of casting over which deficiencies in thickness extend: ≤ 50% of surface area.

5) Identification and Pressure Rating:

   a) All valves shall have manufacturer's name and rated pressure cast in raised letters on the valve body.

6) Direction to Open:

   a) All valves shall have permanent markings for direction to open.

2. End Connections:
   a. Unless otherwise explicitly shown or specified, valves shall be furnished with the following end connections:
      1) For exposed valves:
         a) Shall have flanged ends.
         b) Flanges shall conform to:
            (1) For Class 150 valves: ANSI B16.1, Class 125.
            (2) For Class 250 valves: ANSI B16.1, Class 250 and Class 300.
         c) Pressure class of valve flanges shall be based on pressure class of connected piping as specified in Section 40 06 01 - Schedule for Exposed Piping.
      2) For buried valves:
         a) Shall be provided with one of the following:
            (1) Mechanical or push-on joints, based on connected piping specified in Section 33 06 01 - Schedule for Buried Piping.
            (2) Joints shall be restrained or unrestrained, based on connected piping specified in Section 33 06 01 - Schedule for Buried Piping.
3. Operation:
   a. Manual operators shall include hand wheel, chain, crank, lever and a T-handle operating wrench.
   b. Direction: clockwise to close (unless otherwise specified in Schedule 40 05 53-1 - located after the "End of Section" designation).
   c. Force required to open or close manual valves: ≤ 40-lbf.
      1) Applies to all manual valves, with or without extension stems.
      2) Shall apply to open or close against the specified criteria for the adjoining pipeline specified in:
         a) Section 40 06 01 - Schedule for Exposed Piping.
         b) Section 33 06 01 - Schedule for Buried Piping.
   d. Design pull force on manual operator: ≥ 200-lbf.
   e. Design input torque on actuator nut: ≥ 300 ft-lbs.

4. All valves shall be constructed such that operation at the lower range of operating pressures specified shall not result in any leakage.

B. Plug Valves (Liquid Service):

1. General:

a. All plug valves shall be of rectangular port, eccentric type unless otherwise specified.

1) Minimum Port Area: 100% of nominal pipe area.

a) Plug valves shall permit pigging with pigs equal to the interior diameter of the connected piping.

b. Design Working Pressures:

1) For valves ≤ 12-in.: 175 psig.

c. Maximum Fluid Temperature: 180°F.

2. Materials:

a. The materials of construction for the various components of each valve shall be as follows:

1) Body: Ductile-iron, Grade 65-45-12.

a) Shall conform to the requirements of ASTM A 536.

2) Plug Core: Ductile-iron, Grade 65-45-12.

a) Shall conform to the requirements of ASTM A 536,

3) Plug Facing: Neoprene.

a) Hardness: ≥ 70 (Shore A) durometer.

4) Seats:

a) Overlay:

(1) Nickel content: ≥ 90%.

5) Stem Bearings: Type 316 stainless steel, that has been sintered and oil-impregnated.

6) Seal: Neoprene.

7) All internal and external bolting and other hardware including pins, set screws, studs, bolts, nuts and washers: Type 316 stainless steel.

3. Construction:

a. Plug:

1) Shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft.

a) The interface between the plug face and body seat, with the plug in the closed position, shall be externally adjustable in the field with the valve in the line under pressure.

2) Shall be supported to top bearing by the use of spring that is externally adjustable.

3) For valves > 6 in.

a) Plugs with rubber facing shall be furnished, unless fully encapsulated plugs are specified herein.

4) Thickness of rubber lining: ≥ ⅛-in.

5) The rubber to metal bond shall withstand minimum 75 lbf. pull conforming to ASTM D 429, Method B.

b. Seats:

1) Shall have a welded overlay ≥ ⅛-in. thick.

2) Overlay shall cover all surfaces contacting the plug face.

c. Valves shall provide drip-tight bi-directional shutoff at the design working pressure, operating pressures, and test pressures.

d. Stem seal shall be multiple V-Ring type.

e. Stem bearings shall be permanently lubricated.

f. Packing and packing gland:

1) Shall be accessible without disassembly of the valve; and

2) Shall be externally adjustable; and

3) Shall be accessible for adjustment without requiring the removal of actuator from the valve.

4. Appurtenances:

a. Valves shall be tagged or marked by the manufacturer to indicate the proper mounting position as specified herein.

b. Gear Actuators for Manual Valves:

1) Each valve shall be provided with gear actuators as specified herein, except:

a) 4-in. valves located < 6 ft. above the operating floor.

2) The gear actuators shall be sized for the following differential pressures:

a) For valves ≤ 8-in.: 175 psig.

b) For valves > 8-in.: 100 psig, unless a greater pressure differential is specified in Schedule 40 05 53-1, located after the "End of Section" designation.

C. Gear Actuators for Manual Valves:

1. General:

a. Gear actuators shall be designed to hold the valve in any intermediate position without creeping or vibrating.

2. Materials:

a. Housing: Cast Iron, ASTM A126, Class B.

b. Gear Sector: Ductile Iron, ASTM A536.

c. Worm Gear: Steel, AISI 1144, hardened and tempered to an average Rc 40 and within range of Rc 35-45.

d. All Bearings: Bronze oil impregnated.

e. All Hardware including Bolts, Nuts, Washers, Set Screws and Pins: Type 316 stainless steel.

3. Construction:

a. Each actuator shall have all gearing totally enclosed.

b. The operator shaft and the gear sector shall be supported on permanently lubricated bronze bearings.

c. Metal encased spring loaded seals shall be provided in top and bottom covers of the gear housing.

d. Diameter ratio of the handwheel or the chainwheel and the gear sector: < 2.

e. For buried or submerged valves, the gear actuator shall be grease-packed and designed to withstand submersion and be droptight in water to 20 ft. head.

4. Appurtenances:

a. A valve position indicator shall be provided on each actuator. Stop-limiting devices shall be provided for open and closed position.

b. An adjustable stop shall be provided to adjust the seating pressure.

D. Electric Actuators (Open/Close):

1. General:

a. Electric actuators for open/close service shall conform to the requirements of AWWA C542.

b. Application Criteria:

1) Ambient Temperature Rating: -20°F to +150°F.

2) Ambient Humidity: 100%.

3) Maximum design differential pressures and forward/reverse flows applicable to the valves:

a) Refer top Schedule 40 05 53-1, located after the "End of Section" designation.

b) For the service conditions of buried piping on which the actuated valve is installed, refer to Section 33 06 01 – Schedule for Buried Piping.

c) For the service conditions of exposed piping on which the actuated valve is installed, refer to Section 40 06 01.

4) Opening and Closing Speeds: 11 sec.

5) Power Supply: 120 volts, single phase, 60 Hz.

6) Control Voltage: 120 volts, single phase, 60 Hz.

7) Torques: Per valve manufacturer.

8) Duty Cycle: ≥ 6 starts / hr.

9) Each electric actuator shall be equipped with a handwheel for manual operation.

a) The handwheel shall be connected such that operation by the motor will not cause the handwheel to rotate.

b) Should power be returned to the motor while the handwheel is in use, design of the unit shall prevent transmission of the motor torque to the handwheel.

10) The actuator shall be operable with handwheel or chainwheel even after the electric motor has been disengaged and removed for repairs.

c. Remote Control Panels:

1) Provide separate remote control panels for all valves with electric actuators located ≥ 6.00 ft. above the operating floor.

2) The separate remote control panels shall be provided with separate push-button stations.

3) The separate remote control panels shall be installed approximately 5 ft. above the operating floor at an approved location.

4) Electrical wiring shall be modified as required for the remote location of the control panels.

d. Sizing of each electric actuator shall be coordinated with the valve manufacturer who shall furnish the valve and the electric actuator as a unit.

e. The electric actuators shall be suitable for the valve orientation as shown on the Contract Drawings.

f. All electrical components shall conform to the area classification shown on the Contract Drawings.

2. Materials and Construction:

a. Electric Motor:

1) Motor shall be in accordance with the requirements of Section 26 05 91 - Low Voltage Electric Motors.

2) Motor shall be specifically designed for valve actuator service. It shall have high torque characteristics and shall have a maximum continuous total temperature rating of 70°C.

3) The motor shall be sized for at least 1.5 times the actuator torque requirement.

b. Actuator Gearing:

1) Housing: Die-cast aluminum.

2) Close coupled to electric motor.

3) Input Shaft Gearing: Spur or bevel gear assembly.

4) Output Shaft Gearing: Self-locking worm gears with minimum gear backlash to prevent valve disc chatter or vibration. The gearing shall be rated for twice the required actuator torque.

5) All gearing shall be of hardened alloy steel or a combination of hardened alloy steel and alloy bronze, accurately cut by hobbing machine.

6) Lubrication: Oil bath or grease.

7) Bearings: Ball or roller with a minimum B-10 life of 100,000 hrs.

8) Input Shaft: Hardened alloy steel.

9) Provide mechanical stops adjustable from 0° to 90° at each end of travel.

c. Limit Switches:

1) Each actuator shall be provided with "end of travel" limit switches to allow control of desired end position for each direction of travel.

2) Travel stops shall be threaded and of Type 316 stainless steel to allow adjustment at each end of actuator stroke.

3) Open and close limit switches shall be geared to the drive mechanism and in step at all times, whether the unit is operated electrically or manually and whether or not the

actuator is powered by the 3-phase power supply. Friction devices or set-screw arrangements shall not be used to maintain the setting.

4) Limit switch gearing shall be appropriately lubricated.

5) The driven mechanism shall be totally enclosed to prevent entrance of foreign matter or loss of lubricant.

6) Each actuator shall be provided with four auxiliary contacts. Two contacts shall close and two contacts shall open at a desired end position for each direction of travel.

7) Switches shall be rated 5A or 10A at 120V, as applicable for the specified equipment.

d. Torque Switches:

1) Adjustable torque switches shall be provided with each valve actuator.

a) The torque switches shall operate during the complete valve cycle without the use of auxiliary relays, linkages, latches or other devices.

2) Torque switches shall be wired to de-energize the valve actuator motor in the event excessive torque is developed during either direction of travel.

3) It shall be possible to select the torque switches to control the open and close limit positions in either direction of valve travel.

4) Dry contacts, 5A or 10A, 120V, as applicable for the specified equipment, shall be provided for remote high torque alarm for automatically controlled valves.

3. Appurtenances:

a. Handwheel:

1) Provide each electric actuator with a handwheel.

2) Maximum Effort on Rim of Handwheel:

a) For seating or unseating Load: ≤ 80 lbf.

b) For Running Load: ≤ 60 lbf..

3) The handwheel shall have an arrow and the word "OPEN" or "CLOSE" indicating required rotation.

4) The handwheel shall operate in the clockwise direction to close.

5) Handwheels shall conform to the requirements specified separately herein.

b. All fasteners shall be Type 316 stainless steel.

4. Controls:

a. Provide each electric actuator with controls:

1) Provide controls in a separate compartment integral with the actuator.

2) Enclosure: NEMA 4X, unless NEMA 7 is required for duty in the actuator location.

3) Starter:

a) Provide a combination reversing magnetic starter with circuit breaker and disconnect switch.

b) Housing:

(1) For nonhazardous areas: NEMA 4X, Type 316 SS enclosure.

(2) For hazardous areas: Class 1 Division 2 cast aluminum housing.

4) Control Power Transformer:

a) Provide a transformer to transform the rated three phase, 60 Hz power to 120V, single phase.

b) The transformer shall be complete with a grounded and fused secondary and dual primary fuses.

5) Provide LOCAL/OFF/REMOTE Selector Switch. "LOCAL" position provides operation from open/close/stop push buttons.

a) "OFF" position disables local and remote operation.

b) "REMOTE" position enables open/close/stop control from a remote source.

6) Provide OPEN/CLOSE/STOP push buttons with a hold-to-run or momentary contact selection.

7) Provide OPEN/CLOSE/STOP indicating lights.

8) Provide thermal overload and single phasing protection of the motor.

9) Provide a set of dry contacts to remotely indicate that the actuator is available for remote operation.

10) The actuator circuit boards shall be rated for high temperature service, minimum 55°C.

11) Provide electrical interlocks as shown on the Contract Drawings.

12) For monitoring of the actuator, provide a set of SPDT dry contacts. The monitor relay shall indicate that the actuator is available for remote operation.

b. Remote Mounted Control Panels:

1) Remote mounted controls for the electric actuators will be incorporated into the respective chemical fill station.

E. Appurtenances for Exposed Metallic Valves

1. Provide appurtenances for all exposed valves of metallic construction, unless otherwise specified.

2. Provide handwheels for all valves located < 6 ft. above the operating floor.

a. All handwheels shall conform to the applicable AWWA Standards.

b. Material of Construction: Ductile iron or cast aluminum.

c. Arrow indicating direction of opening and word “OPEN” shall be cast on the trim of the handwheel.

d. Maximum Handwheel Diameter: 30 inches.

F. Appurtenances for Buried Metallic Valves

1. Wrench Nuts:

a. Wrench nuts shall be provided on all buried valves and shall be of nominal 2-in. size conforming to AWWA C500.

b. Arrow indicating direction of opening the valve shall be cast on the nut along with the word "OPEN".

c. Material: Ductile iron.

d. The nut shall be secured to the stem by mechanical means.

2. T-Handle Operating Wrenches:

a. Contractor to provide from valve manufacturer.

b. Provide T-Handle operating wrenches in lengths to permit operation of all valves by operators.

c. Furnish one (1) wrench per type and size of each buried metallic valve installed.

3. Valve Boxes:

a. Valve boxes shall be as indicated and as required.

b. Type: Heavy duty, suitable for highway loading, telescopic, and adjustable.

c. Material: Cast or ductile iron.

d. Coating: Two coats of asphalt varnish conforming to FS TT-C494B.

e. Marking: As required for service.

G. Anchor and Miscellaneous Mounting Bolts

1. All bolts, nuts and washers furnished for connection of the valve appurtenances to the concrete structure or other structural members shall be furnished by the valve equipment manufacturer, and shall be of ample size and strength for the purpose intended.

2. Anchor bolts shall be hooked or adhesive type.

3. All bolts and washers shall be of Type 316 stainless steel and nuts shall be UNS S21800 alloy stainless steel and shall conform to the requirements of ASTM A194 Grade 8SA.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. General:

1. Stainless Steel:

a. Fabricated stainless steel items shall be cleaned and descaled in accordance with ASTM A380, and shall be as follows:

1) All stainless steel welded fabricated items shall be passivated after manufacture by immersion in a pickling solution of 6% nitric acid and 3% hydrofluoric acid.

a) Temperature and detention time shall be sufficient for removal of oxidation and ferrous contamination without etching of surface.

b) Perform a complete neutralizing operation by immersion in a trisodium phosphate rinse followed by clean water wash.

2) The welds shall be scrubbed with the same pickling solution or pickling paste and stainless steel wire brushes after fabrication to remove weld discoloration, and then shall be neutralized and washed clean.

b. Anti-seize Compound:

1) For all stainless steel bolting, anti-seize compound, graphite free, shall be used to prevent galling.

2) Strength of bolting shall not be affected by anti-seize compound.

2. Painting of Exposed Valves and Appurtenances:

a. Exterior steel, cast-iron, and ductile iron surfaces except machined or bearing surfaces of all exposed valves and appurtenances shall be finish painted in the shop.

b. The surface preparation, priming, finish painting, and field touch-up painting shall conform to Section 09 91 00 - Painting.

3. Painting of Buried Valves:

a. Exterior steel, cast-iron, and ductile iron surfaces except machined or bearing surfaces of all buried valves shall be shop-painted with two coats of asphalt varnish conforming to FS TT-C 494B.

4. Nameplates:

a. All valves shall be provided with Type 316 stainless steel nameplates attached with Type 316 stainless steel screws.

b. The nameplates shall have engraved letters and shall include the following information as a minimum:

1) Valve size.

2) Pressure and temperature ratings.

3) Date of manufacture.

4) Manufacturer's name and address.

5. Identification:

a. The valves shall be provided with identification conforming to the requirements of Section 40 05 97 - Identification for Process Equipment.

B. Plug Valves (Liquid Service):

1. Interior Coating:

a. All plug valves shall be coated inside.

b. If the pipe connecting to the plug valve, as specified in Section 33 06 01 - Schedule for Buried Piping, and/or Section 40 06 01 - Schedule for Exposed Piping, shall not have glass lining, the interior of the plug valve shall be coated as follows:

1) The steel, cast-iron, and ductile iron surfaces, except machined surfaces, shall be epoxy coated in accordance with AWWA C550.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Plug Valves (Liquid Service):

1. Perform shop tests on all plug valves for liquid service.

2. Open/Close Test:

a. Each plug valve (with the actuator mounted directly on the valve) shall be shop operated three (3) times from the fully closed to the fully opened position and the reverse under a no-flow condition.

3. Leakage Tests:

a. Plug valves shall be given a leakage test at the design working and operating pressures.

b. During the test, the plug valves shall be drip-tight.

c. Duration:

1) For plug valves < 20-in.: 5 min.

d. The tests shall be repeated with pressure in the opposite direction.

4. Hydrostatic Test:

a. All plug valve bodies shall be subjected to an internal hydrostatic pressure equivalent to twice the rated pressure.

b. During the hydrostatic test, there shall be no leakage through the metal, end joints, or shaft seal, nor shall any part be permanently deformed.

c. The duration of the hydrostatic test shall be sufficient to allow visual examination for leakage.

d. Duration:

1) For plug valves ≤ 8-in.: 1 min.

2) For plug valves 8-in. through 20 in.: 3 min.

B. Electric Actuators (Open/Close):

1. Shop test each actuator in accordance with the requirements of AWWA C542.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Install valves in complete accordance with the manufacturer's printed instructions and the approved Shop Drawings.

B. All valves shall be installed plumb and level. The valves shall be free from distortion and strain caused by misaligned piping, equipment or other causes.

C. All valves shall be installed so that operating handwheels or levers may be conveniently turned from operating floor without interfering with access, and shall be as approved by the Engineer. Chain operators shall be oriented out of the way from the walking areas.

D. For motor-operated valves located less than 6.00 ft. above the operating floor, the orientation of the motor actuator shall permit easy access to the push buttons and the handwheel.

E. For buried valves:

1. The valve boxes shall be set plumb and centered.

2. Carefully tamp to a lateral distance of 4 ft. on all sides of the valve box.

3. If the undisturbed trench face is less than 4 ft. from the valve box in any direction, carefully tamp to the undisturbed trench face.

F. Provide identification accordance with the requirements of Section 40 05 97 - Identification for Process Equipment.

3.03 FIELD TESTING / QUALITY CONTROL

A. All parts and components shall be adjusted as required to provide correct operation.

B. A functional field test of each valve shall be conducted in the presence of the Engineer to demonstrate that each part and all components function together correctly.

3.04 STARTUP / DEMONSTRATION

A. Where specified herein, the Contractor shall provide the services of qualified factory-trained service technicians to check and approve the installation.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Provide field touch up painting in accordance with the requirements of Section 09 91 00 - Painting.

END OF SECTION

NO TEXT ON THIS PAGE

SCHEDULE 40 05 53-1
VALVE SCHEDULE, VALVES 4 INCH AND LARGER[(1)(2)]

Valve Tag (No.):	Service:	Size: (in.)	Type:	Material:	Actuator:	End Type:	Remarks:
--	DR	12	PV	DI	Elec(O/C)	Flg	TI-010 Chlorination fill station valve pit
--	DR	12	PV	DI	MAN	Flg	TI-010 Dechlorination fill station valve pit
--	DR	12	PV	DI	MAN	Flg	TI-011 Chlorination fill station valve pit
--	DR	12	PV	DI	MAN	Flg	TI-011 Dechlorination fill station valve pit

Notes:
(1) Only valves to be permanently provided as part of the Work are included in Schedule 40 05 53-1.

(2) See Section 40 05 56 - Process Valves Smaller Than Four-Inch Diameter for thermoplastic valves up to 6-inch in diameter.

A. The following service abbreviations are used in Schedule 40 05 53-1:

Service:	**Abbrev:**	**Service:**	**Abbrev:**
Drain	DR	--	--

B. The following valve type abbreviations are used in Schedule 40 05 53-1:

Valve Type:	**Abbrev:**
Plug Valve, Liquid Service	PV

C. The following actuator type abbreviations are used in Schedule 40 05 53-1:

Actuator Type:	**Abbrev:**
Manual	Manual
Electric Actuators (Open/Close)	Elec(O/C)

D. The following valve material abbreviations are used in Schedule 40 05 53-1:

Pipe Material:	**Abbrev:**	**Pipe Material:**	**Abbrev:**
304L Stainless Steel	304L SS	Cast Iron	CI
316L Stainless Steel	316L SS	Chlorinated PVC	CPVC
Brass	Brass	Ductile Iron	DI
Carbon Steel	CS	Polyvinyl Chloride	PVC

E. The following valve end type abbreviations are used in Schedule 40 05 53-1:

Joint Type:	**Abbrev:**	**Joint Type:**	**Abbrev:**
Flanged	Flg	Shouldered End Coupling	SEC
Grooved End Coupling	GEC	Split-sleeve Coupling	SSC
Grooved / Shouldered End Coupling	GSEC	Solvent Weld	SW
Mechanical Joint	MJ	Restrained Mechanical Joint	RMJ
Push-on Joint	POJ	Restrained Push-on Joint	RPOJ

SECTION 40 05 54 – RUPTURE DISCS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to furnish, install, and test all rupture discs, complete and operational.

B. The following index of this Section is presented for convenience:

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3.03	Field Testing / Quality Control	4
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3.05	Adjusting / Protection / Cleanup	4

C. The following schedule, after the End of Section designation, is a part of this Section:

1. Schedule 40 05 54-1, Rupture Disc Schedule.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

1. Rupture Discs shall fit between two points in the tank pressure relief system and rupture when a predetermined pressure level is reached. They shall eliminate over-pressurization and help prevent system damage, resulting in improved safety and efficiency.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Manufacturer shall have a minimum of 5 years of experience in the production of substantially similar rupture disc equipment and shall show evidence of satisfactory service in at least 5 installations.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Shop Drawings:

1) Complete catalog information, descriptive literature, specifications, and identification of all materials of construction.

2) Product data sheets for make and model.

3) Spare parts list.

4) Special tools list.

b. Operation and Maintenance Data: Submit complete manuals including:

1) Copies of all approved Shop Drawings, test reports, maintenance data and schedules, description of operation, and spare parts information.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Contractor shall provide spare parts and special tools necessary to service, disassemble, repair, and adjust the equipment provided under this Section, and as per the requirements of the Contract Documents

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fike Corp., Blue Springs, CO

B. Mersen, Salem, VA

C. Zool Chagrin Falls, OH

D. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Rupture Disc:

1. The rupture discs used shall be suitable for the specified chemical and rupture when a predetermined pressure level is reached.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Install rupture discs in complete accordance with the manufacturer's printed instructions and the approved Shop Drawings.

B. Manufacturer's Representative:

1. The Contractor shall furnish the services of accredited representatives of the rupture disc manufacturer to supervise the installation, adjustment, and field tests of the equipment and to provide training for DEP operating personnel.

2. The services of the manufacturer's representative shall be furnished for installation supervision for at least the following number of days:

Visit:	Purpose:	Number of Visits:	Person-days per visit
No. 1	Installation Supervision	3	1

3. Should additional days of service be necessary for a successful installation, such services shall be provided by the Contractor at no additional cost to the City

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SCHEDULE 40 05 54-1
RUPTURE DISC SCHEDULE

Location	TI-010 Chlorination Facility	TI-010 Dechlorination Facility	TI-011 Disinfection Facility (Chlorination)	TI-011 Disinfection Facility (Dechlorination)
Quantity:	6 (three installed plus three spares)	2 (one disc installed + one spare}	2 (one disc installed + one spare}	2 (one disc installed + one spare}
Size (diameter):	3”	6”	6”	6”
Burst Pressure (psig):	1	1.0	X1.0	1.0
Chemical:	15% Sodium Hypochlorite	38% Sodium Bisulfite	15% Sodium Hypochlorite	38% Sodium Bisulfite

NO TEXT ON THIS PAGE

SECTION 40 05 56 – PROCESS VALVES SMALLER THAN FOUR-INCH DIAMETER
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to furnish, install, and test all process valves smaller than four-inch diameter complete and operational.

B. The following index of this Section is included for convenience.

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C. The following schedule(s), attached after the End of Section designation, are a part of this Section:

1. Schedule 40 05 56-1, Process Valves Smaller than Four-inch Diameter.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 09 91 00 – Painting.

B. Section 33 06 01 – Schedule for Buried Piping.

C. Section 40 05 97 – Identification for Process Equipment.

D. Section 40 05 53 – Process Valves Four-inch Diameter and Larger.

E. Section 40 06 01 – Schedule for Exposed Piping.

F. Section 40 78 90 – PMCS Panel Mounted Instruments and Devices

1.04 REFERENCES

A. Definitions:

1. Non-ferrous Metals: Materials consisting of mixtures of copper, tin, zinc, lead, or other metals in which iron does not predominate.

B. Reference Standards:

1. ANSI B16.1 Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250
2. ASTM A126 Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings
3. ASTM A193 Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications
4. ASTM A307 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength
5. ASTM A536 Standard Specification for Ductile Iron Castings.
6. AWWA C500 Metal-Seated Gate Valves for Water Supply Service
7. AWWA C508 Swing-Check Valves for Waterworks Service, 2 in. through 24 in.
8. AWWA C509 Resilient-Seated Gate Valves for Water Supply Service
9. AWWA C542 Electric Motor Actuators for Valves and Slide Gates
10. Naval Publications and Form Center (NPFC) A-A-59326D General Specification for Coupling Halves, Quick-Disconnect, Cam-Locking Type.

1.05 DESCRIPTION

A. The scope of this Section includes requirements for all process valves smaller than four-inches, in accordance with applicable standards and regulations. In addition:

1. All other valves referenced in Schedule 40 05 56-1, located after the "End of Section" designation, shall be for liquid service, unless otherwise explicitly indicated for air or digester gas service.
2. Electric actuators for electrically actuated valves shall be provided by the valve manufacturers.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Manufacturer shall have a minimum of 5 years of experience in the production of substantially similar valve equipment, and shall show evidence of satisfactory service in at least 5 installations.

B. Supply and Compatibility:

1. Each type of valve, inclusive of all sizes specified for that type of valve, shall be the product of one (1) manufacturer.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Quality Assurance Requirements:

1) All information necessary and required to substantiate approval of a valve manufacturer in accordance with the quality assurance requirements of this Section.

b. Shop Drawings:

1) Associated valve tag number(s) as specified in Schedule 40 05 56-1, located after the "End of Section" designation.

2) Complete catalog information, descriptive literature, specifications, and identification of all materials of construction.

3) Product data sheets for make and model. The valve(s) with size(s) and option(s) being submitted for approval are specifically identified in the product data sheet(s).

4) Power and control wiring diagrams, including terminals and numbers.

5) Complete nameplate data of electric actuators.

6) Spare parts list.

7) Special tools list.

c. Calculations:

1) Sizing of electric actuators, if applicable.

d. Operation and Maintenance Data: Submit complete manuals including:

1) Copies of all approved Shop Drawings, test reports, maintenance data and schedules, description of operation, and spare parts information.

e. Samples:

1) 1 ft. of chain for chain wheel operated valves.

2. Information Submittals:

a. Material test reports representing all major components of valves and operators shall be submitted. All such components shall be traceable to the original heat and/or lot numbers unless otherwise approved.

b. Certificates of compliance with AWWA Standards, if applicable.

c. Certificate of suitability of all valve materials for the specified service.

d. Certified copies of shop test results and inspection data.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. Valves and associated appurtenances shall be handled carefully. Valves which are dropped, dented, cracked, and/or otherwise damaged shall not be accepted.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Contractor shall provide spare parts and special tools necessary to service, disassemble, repair, and adjust the equipment provided under this Section, and as per the requirements of the Contract Documents. In addition:

1. The quantities of spare parts sets to be furnished are given in Table 40 05 56-1, below. Furnish the quantity of spare parts sets given in the table for each type and each size of valve included in this Section.

TABLE 40 05 56-1
QUANTITIES OF SPARE PARTS SETS TO FURNISH

Number of Valves Installed	Sets of Spare Valves Required
1-5	1
6-10	2
11-15	3
16-30	5
Greater than 30	5 + (1 for every 10 additional valves)

B. Tools: Provide standard and special tools and supplies necessary to service, disassemble, repair, and adjust the equipment, products.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solenoid Valves:

1. Automatic Switch Company, Florham Park, NJ;
2. Automatic Valve Corporation, Novi, MI;
3. Or approved equal.

B. Ball Valves:

1. Stockham Valves and Fitting Company, Cullman, AL;
2. CVC Valves, former Lunkenheimer Company, Cincinnati, OH;
3. Or approved equal.

C. Pressure Reducing Valves:

1. Cla-Val Company, Milford, CT;
2. Watts Water Technologies, Inc., North Andover, MA;
3. Or approved equal.

D. Thermoplastic Ball Valves:

1. Asahi/America, Lawrence, MA;

2. Hayward Industries, Inc., Elizabeth, NJ;
3. NIBCO, Inc., Elkhart, IN;
4. Or approved equal.

E. Thermoplastic Check Valves:
1. Asahi/America, Lawrence, MA;
2. Hayward Industries, Inc., Elizabeth, NJ;
3. Or approved equal.

F. Quick Connect Couplings - Chemical Service:
1. Banjo Corporation, Crawfordsville, IN;
2. Bee Valve, Inc., Elyria, OH;
3. Or approved equal.

G. Electric Motor Actuators:
1. To be provided by valve manufacturer.

H. Pressure Relief Valves:
1. Asahi/America, Lawrence, MA;
2. Chemline Inc., St. Louis, MO
3. Or approved equal.

I. Backpressure Valves:
1. Model RVDT by Plast-O-Matic
2. Or approved equal.

J. Pulsation Dampener:
1. Blacoh Fluid Control
2. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. General:
1. Materials of Construction:
a. Compatibility for Service:
1) All materials of construction of the valves shall be confirmed suitable for the application by the valve manufacturer.
b. Wetted parts of the valve shall be protected from galvanic corrosion.

c. Ferrous Metals:

1) Cast iron of the valves, unless otherwise specified, shall conform to ASTM A126, Class A.

d. Non-ferrous Metals:

1) Non-ferrous Metals shall have standard composition and physical properties conforming to ASTM standards except as otherwise indicated.

e. Metal Castings:

1) All valves shall have manufacturer's name and rated pressure cast in raised letters on the valve body.

2) All valves shall have permanent markings for direction to open.

2. End Connections:

a. Shall be (at a minimum) suitable for the test pressure of the piping connected to the valve in question, as specified in:

1) For buried valves: Section 33 06 01 - Schedule for Buried Piping.

2) For exposed valves: Section 40 06 01 - Schedule for Exposed Piping.

3. Operation:

a. Direction: Clockwise to close (unless otherwise specified in Schedule 40 05 56-1, located after the "End of Section" designation).

4. All valves shall be constructed such that operation at the lower range of operating pressures specified shall not result in any leakage.

5. All valves shall be blowout proof.

B. Metallic Valves:

1. Solenoid Valves:

a. Type: Packless construction with screwed end connections and threaded conduit connection.

b. Materials: Bronze body and wetted parts with type 304 stainless steel hardware.

c. Coil: Continuous duty, epoxy encapsulated.

d. Failure Mode: Fail open, energize to close.

e. Electrical Power: 120 volt, 60 Hz, single phase.

f. Each solenoid valve shall be protected with a strainer upstream.

2. Ball Valves:

a. Body: Bronze, semi-steel or316 Stainless Steel. as specified herein.

b. Ball, Stem Handle and Hardware: Type 316 stainless steel.

c. Seat, Packing and Gasket: Polytetrafluoroethylene.

d. End Connections: Screwed.

e. Rating: 150 psig Water, Oil or Gas (W.O.G.).

f. All ball valves shall be full port.

3. Needle Valves:

a. Type: Long tapered plug for fine flow regulation.

b. Body and Wetted Parts: Bronze.

c. Handwheel: Malleable iron.

d. Hardware: Type 316 stainless steel.

e. End Connections: Screwed.

f. Rating: 150 psig.

4. Pressure Reducing Valves:

a. Type: Balanced, soft closing, single seat. Constant downstream pressure regardless of upstream pressure or flowrate. Drop tight shutoff when downstream pressure greater than spring setting.

b. Strainer: Integral with the valve, Type 316 stainless steel.

c. Body and Cover: Bronze with pressure gauge taps.

d. Trim: Type 316 stainless steel.

e. End Connections: Screwed.

f. Diaphragm: Ethylene propylene diene monomer rubber, fully guided at top and bottom.

g. Pressures and Flows: As specified in this section.

C. Valves for Thermoplastic Piping

1. Ball Valves:

a. Type: True union, full port.

1) Vented ball valve shall be provided for sodium hypochlorite services.

b. Body and Ball: Poly (Vinyl Chloride) (PVC) Compounds, ASTM D1784, Cell Classification 12454A.

1) A pre-drilled and de-burred 1/8-inch vent hole shall be provided to prevent pressurization when the valve is in the closed position for sodium hypochlorite services.

c. Stem: Type 316 stainless steel.

d. Seats: Polytetrafluoroethylene.

e. Seals:

1) Material: Fluoropolymer elastomer synthetic rubber.

2) Provide double seals.

f. O-Rings: Ethylene propylene diene monomer rubber.

g. End Connections: See Schedule 40 05 56-1.

1) Valves shall be provided with butt ends chemically compatible with chemical process piping.

h. Rating: 150 psig at 70°F.

2. Check Valves:

a. Type: True union, ball.

b. Body and Ball: PVC Compounds, ASTM D1784, Cell Classification 12454.

c. Seats: Polytetrafluoroethylene.

d. Seals: Fluoropolymer elastomer synthetic rubber.

e. O-rings: Ethylene propylene diene monomer rubber.

f. End Connections: See Schedule 40 05 56-1.

g. Rating:

1) Valves ≤ 2 inches: 150 psig at 70°F.

2) Valves > 2inches : 100 psig at 70°F.

D. Electric Motor Actuators:

1. General:

a. Electric motor actuators shall be provided by the valve manufacturer.

b. Electric motor actuators shall conform to the requirements of AWWA C542.

c. Type: Open-Close, reversing.

d. Open-Close Time for Ball Valves: 10 sec.

2. Materials and Construction:
   a. Housing: NEMA 4X with corrosion resistant epoxy coating.
   b. Power: 120 vac, 60 Hz, single phase.
   c. SPDT switches shall be provided for remote valve position indication.
   d. Space heater and thermostat shall be provided in the housing.
   e. Integral thermal overload protection shall be provided with automatic reset.
   f. Limit switches shall be in accordance with the requirements for electric motor actuators specified in Section 40 05 53 - Process Valves Four-inch Diameter and Larger.

E. Appurtenances and Miscellaneous Items
1. Corporation Stops:
   a. Type: AWWA standard tapered thread, ball valve.
   b. Material: Bronze.
   c. End Connection:
      1) Copper Pipe: Threaded flare.
      2) Thermoplastic Pipe: Compression with Type 304 stainless steel stiffener rings.
2. Strainers:
   a. Type: Y-pattern.
   b. Body:
      1) Metallic Piping: Bronze, screwed ends.
      2) Thermoplastic Piping: CPVC Compounds, true union ends.
   c. Screens: Monel, No. 20 mesh, 2.5 times the inlet area.
   d. Rating: 125 psig.
3. Quick Connect Couplings - Water Service:
   a. Type: Dual cam and groove, male end dimensionally meeting the requirements of A-A-59326D, with dust cap, Type 304 stainless steel chain and lock.
   b. Body: Cast iron.
   c. Cam Arms: Type 304 stainless steel.
   d. Gaskets: Acrylonitrile butadiene synthetic rubber.
4. Quick Connect Couplings - Chemical Service:

a. Type: Dual cam and groove, male end dimensionally meeting the requirements of A-A-59326D, with dust cap, Type 316 stainless steel chain and lock.

b. Body: Polypropylene.

c. Cam Arms: Type 316 stainless steel.

d. Gaskets: Ethylene propylene diene monomer rubber.

e. End Connections: Solvent socket welded.

5. Dielectric Pipe Couplings:

a. Provide at every location where copper pipe connects to steel, stainless steel or ductile iron pipe or equipment.

b. Body: Steel with non-conducting bushings on each end.

c. End Connections: Screwed.

d. Rating: 200 psig at 225°F.

6. Valve Boxes, Floor Boxes and Operating Wrenches:

a. Provide in accordance with Section 40 05 53 – Process Valves Four-inch Diameter and Larger.

7. Valve Chain Operators:

a. All ball, butterfly and diaphragm valves 1½-in. and larger located more than 6 ft.-0 in. above the operating floor level shall be equipped with a manual gear operator mounting assembly and a chain operator adapted to fit the gear operator, chain guide and sprocket wheel bolted directly to the valve operating wheel.

b. Aluminum or type 316 stainless steel chain shall be provided to hang three feet above the operating floor. All operators shall be equipped with a ½-in. hook bolt located to keep chain out of walking areas or to permit access to equipment.

c. Chain shall be of welded link type with smooth finish. Chain that is crimped and has links type with exposed ends that may scratch or cut the operator shall not be acceptable.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. General:

1. Painting of Exposed Valves and Appurtenances:

a. Exterior steel, cast-iron, and ductile iron surfaces except machined or bearing surfaces of all exposed valves and appurtenances shall be finish painted in the shop.

b. The surface preparation, priming, finish painting, and field touch-up painting shall conform to the requirements of Section 09 91 00 – Painting.

2. Nameplates:

a. All valves shall be provided with Type 316 stainless steel nameplates attached with Type 316 stainless steel screws.

b. The nameplates shall have engraved letters and shall include the following information as a minimum:

1) Valve size.

2) Pressure and temperature ratings.

3) Date of manufacture.

4) Manufacturer's name and address.

3. Identification:

a. The valves shall be provided with identification conforming to the requirements of Section 40 05 97 – Identification for Process Equipment.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Shop test all valves in accordance with the manufacturer’s standard test procedures.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Install valves in complete accordance with the manufacturer's printed instructions and the approved Shop Drawings.

B. All valves shall be installed plumb and level. The valves shall be free from distortion and strain caused by misaligned piping, equipment or other causes.

C. All valves shall be installed so that operating handwheels or levers may be conveniently turned from operating floor without interfering with access, and shall be as approved by the Engineer. Chain operators shall be oriented out of the way from the walking areas.

D. For motor-operated valves located less than 6.00 ft. above the operating floor, the orientation of the motor actuator shall permit easy access to the push buttons and the handwheel.

E. For buried valves:

1. The valve boxes shall be set plumb and centered.
2. Carefully tamp to a lateral distance of 4 ft. on all sides of the valve box.
3. If the undisturbed trench face is less than 4 ft. from the valve box in any direction, carefully tamp to the undisturbed trench face.

F. Provide identification accordance with the requirements of Section 40 05 97 – Identification for Process Equipment.

3.03 FIELD TESTING / QUALITY CONTROL

A. All parts and components shall be adjusted as required to provide correct operation.

B. A functional field test of each valve shall be conducted in the presence of the Engineer to demonstrate that each part and all components function together correctly.

3.04 STARTUP / DEMONSTRATION

A. Where specified herein, the Contractor shall provide the services of qualified factory-trained service technicians to check and approve the installation.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Provide field touch up painting in accordance with the requirements of Section 09 91 00 – Painting.

END OF SECTION

SCHEDULE 40 05 56-1
VALVE SCHEDULE, SMALLER THAN 4-INCHES[(1)]

TI-010 CHLORINATION FACILITY							
Valve Tag (No.):	**Service:**	**Size: (in.)**	**Type:**	**Material:**	**Actuator:**	**End Type:**	**Remarks:**
	HYPO-F	2”	BVP	PVC	MAN		Truck Loadout to HYPO-T-1 Tank
	HYPO-F	2”	BVP	PVC	MAN		Truck Loadout to HYPO-T-2 Tank
	HYPO-F	2”	BVP	PVC	MAN		Truck Loadout to HYPO-T-3 Tank
	HYPO	2”	BVP	PVC	ELEC(O/C)		HYPO-T-1 Tank Suction Isolation
	HYPO	2”	BVP	PVC	ELEC(O/C)		HYPO-T-2 Tank Suction Isolation
	HYPO	2”	BVP	PVC	ELEC(O/C)		HYPO-T-3 Tank Suction Isolation
	HYPO	2”	BVP	PVC	MAN		HYPO-T-1 Drain
	HYPO	2”	BVP	PVC	MAN		HYPO-T-2 Drain
	HYPO	2”	BVP	PVC	MAN		HYPO-T-3 Drain
	HYPO	4"	BVP	PVC	MAN		HYPO Tank Common Drain Isolation
	SW	2”	BVP	PVC	ELEC(O/C)		Service Water Connection
	HYPO	3”	BVP	PVC	MAN		HYPO-MP-1A/1B Suction Header
	HYPO	3”	BVP	PVC	ELEC(O/C)		HYPO-MP-1A Suction
	HYPO	2"	PR	PVC	--		HYPO-MP-1A Pressure Relief Valve

TI-010 CHLORINATION FACILITY							
Valve Tag (No.):	**Service:**	**Size: (in.)**	**Type:**	**Material:**	**Actuator:**	**End Type:**	**Remarks:**
	HYPO	2”	CVP	PVC	--		HYPO-MP-1A Discharge
	HYPO	2”	BVP	PVC	MAN		HYPO-MP-1A Discharge
	HYPO	2”	BVP	PVC	MAN		HYPO-MP-1A Drain Connection
	HYPO	3”	BVP	PVC	ELEC(O/C)		HYPO-MP-1B Suction
	HYPO	2"	PR	PVC	--		HYPO-MP-1B Pressure Relief Valve
	HYPO	2”	CVP	PVC	--		HYPO-MP-1B Discharge
	HYPO	2”	BVP	PVC	MAN		HYPO-MP-1B Discharge
	HYPO	2”	BVP	PVC	MAN		HYPO-MP-1B Drain Connection
	HYPO	2”	CVP	PVC	--		Upstream Channel No. 1 diffuser
	HYPO	2”	BVP	PVC	MAN		Upstream Channel No. 1 diffuser
	HYPO	2”	CVP	PVC	--		Upstream Channel No. 2 diffuser
	HYPO	2”	BVP	PVC	MAN		Upstream Channel No. 2 diffuser
	HYPO-TF	2"	BVP	PVC	MAN		HYPO-MP-TP-1/TP-2 Suction Header
	HYPO-TF	2"	BVP	PVC	ELEC(O/C)		HYPO-MP-TP-1 Suction
	HYPO-TF	2"	PR	PVC	--		HYPO-MP-TP-1 Pressure Relief Valve

TI-010 CHLORINATION FACILITY							
Valve Tag (No.):	**Service:**	**Size: (in.)**	**Type:**	**Material:**	**Actuator:**	**End Type:**	**Remarks:**
	HYPO-TF	2”	CVP	PVC	--		HYPO-MP-TP-1 Discharge
	HYPO-TF	2”	BVP	PVC	MAN		HYPO-MP-TP-1 Discharge
	HYPO-DR	2”	BVP	PVC	MAN		HYPO-MP-TP-1 Drain Connection
	HYPO-TF	2”	BVP	PVC	ELEC(O/C)		HYPO-MP-TP-2 Suction
	HYPO-TF	2"	PR	PVC	--		HYPO-MP-TP-2 Pressure Relief Valve
	HYPO-TF	2”	CVP	PVC	--		HYPO-MP-TP-2 Discharge
	HYPO-TF	2”	BVP	PVC	MAN		HYPO-MP-TP-2 Discharge
	HYPO-DR	2”	BVP	PVC	MAN		HYPO-MP-TP-2 Drain Connection
	HYPO-TF	2”	BVP	PVC	ELEC(O/C)		Transfer Pump Discharge To HYPO-T-1
	HYPO-TF	2”	BVP	PVC	ELEC(O/C)		Transfer Pump Discharge To HYPO-T-2
	HYPO-TF	2”	BVP	PVC	ELEC(O/C)		Transfer Pump Discharge To HYPO-T-3
	HYPO	3"	BVP	PVC	MAN		HYPO-MP-2A/2B Suction Header
	HYPO	3"	BVP	PVC	ELEC(O/C)		HYPO-MP-2A Suction
	HYPO	3"	PR	PVC	--		HYPO-MP-2A Pressure Relief Valve
	HYPO	3”	CVP	PVC	--		HYPO-MP-2A Discharge

TI-010 CHLORINATION FACILITY							
Valve Tag (No.):	**Service:**	**Size: (in.)**	**Type:**	**Material:**	**Actuator:**	**End Type:**	**Remarks:**
	HYPO	3”	BVP	PVC	MAN		HYPO-MP-2A Discharge
	HYPO	3”	BVP	PVC	MAN		HYPO-MP-2A Drain Connection
	HYPO	3"	BVP	PVC	ELEC(O/C)		HYPO-MP-2B Suction
	HYPO	3"	PR	PVC	--		HYPO-MP-2B Relief
	HYPO	3”	CVP	PVC	--		HYPO-MP-2B Discharge
	HYPO	3”	BVP	PVC	MAN		HYPO-MP-2B Discharge
	HYPO	3”	BVP	PVC	MAN		HYPO-MP-2B Drain Connection
	HYPO	2”	CVP	PVC	--		Upstream diffuser Barrel 1
	HYPO	2”	BVP	PVC	MAN		Upstream diffuser Barrel 1
	HYPO	2”	CVP	PVC	--		Upstream diffuser Barrel 2
	HYPO	2”	BVP	PVC	MAN		Upstream diffuser Barrel 2
	HYPO	2”	CVP	PVC	--		Upstream diffuser Barrel 3
	HYPO	2”	BVP	PVC	MAN		Upstream diffuser Barrel 3
	SPD	3”	CVP	PVC	--		HYPO-CSP-1 Discharge Check 1
	SPD	3”	CVP	PVC	--		HYPO-CSP-1 Discharge Check 2

TI-010 CHLORINATION FACILITY							
Valve Tag (No.):	**Service:**	**Size: (in.)**	**Type:**	**Material:**	**Actuator:**	**End Type:**	**Remarks:**
	SPD	3”	BVP	PVC	MAN		HYPO-CSP-1 Discharge
	SPD	3”	CVP	PVC	--		HYPO-CSP-2 Discharge Check 1
	SPD	3”	CVP	PVC	--		HYPO-CSP-2 Discharge Check 2
	SPD	3”	BVP	PVC	MAN		HYPO-CSP-2 Discharge
	SPD	3”	BVP	PVC	MAN		HYPO-CSP-1/2 Discharge Hose Connection
	SMP	2"	BVP	PVC	MAN		FBCSO-SMP-1 Suction
	SMP	2"	PR	PVC	--		FBCSO-SMP-1 Pressure Relief Valve
	SMP	2"	PSV	PVC	--		FBCSO-SMP-1 Pressure Sustaining Valve
	SMP	2"	BVP	PVC	MAN		FBCSO-SMP-1 Drain Connection
	SMP	2"	CVP	PVC	--		FBCSO-SMP-1 Discharge Check
	SMP	2"	BVP	PVC	MAN		FBCSO-SMP-1 Discharge
	SMP	2"	3WV	PVC	ELEC(O/C)		FBCSO-SMP-1 Drain
	SMP	2"	BVP	PVC	MAN		FBCSO-SMP-1 Drain
	SMP	2"	NV	PVC	MAN		FBCSO-SMP-1 Drain
	SMP	2"	BVP	PVC	MAN		FBCSO-SMP-2 Suction

TI-010 CHLORINATION FACILITY							
Valve Tag (No.):	**Service:**	**Size: (in.)**	**Type:**	**Material:**	**Actuator:**	**End Type:**	**Remarks:**
	SMP	2"	PR	PVC	--		FBCSO-SMP-2 Relief
	SMP	2"	PSV	PVC	--		FBCSO-SMP-2 Pressure Sustaining
	SMP	2"	BVP	PVC	MAN		FBCSO-SMP-2 Drain to Sump
	SMP	2"	BVP	PVC	MAN		FBCSO-SMP-2 Discharge to PSH-115
	SMP	2"	CVP	PVC	--		FBCSO-SMP-2 Discharge to FBCSO-STR-1
	SMP	2"	BVP	PVC	MAN		FBCSO-SMP-2 Discharge to FBCSO-STR-1
	SMP	2"	3WV	PVC	ELEC(O/C)		FBCSO-SMP-2 Drain
	SMP	2"	BVP	PVC	MAN		FBCSO-SMP-2 Drain
	SMP	2"	NV	PVC	MAN		FBCSO-SMP-2 Drain
	SL	Varies	BV		MAN		HYPO-CSP Seal Water System; See Contract Drawings for sizes and quantities
	SL	Varies	PRV		MAN		HYPO-CSP Seal Water System; See Contract Drawings for sizes and quantities
	SL	Varies	NV		MAN		HYPO-CSP Seal Water System; See Contract Drawings for sizes and quantities

Notes:
(1) Only valves to be permanently provided as part of the Work are included in Schedule 40 05 56-1.

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A. The following service abbreviations are used in Schedule 40 05 56-1:

Service:	**Abbrev:**	**Service:**	**Abbrev:**
Sodium Hypochlorite	HYPO	Sodium Bisulfite	SBS
Sump Pump Discharge	SPD	Service Water	SW
		Seal Water	SL

B. The following valve type abbreviations are used in Schedule 40 05 56-1:

Valve Type:	**Abbrev:**
Solenoid Valve	Sol
Ball Valve	BV
Pressure Reducing Valve	PRV
Pressure Relief Valve	PR
Pressure Sustaining Valve	PSV
Needle Valve	NV
Thermoplastic Ball Valve	BVP
Thermoplastic Check Valve	CVP

C. The following actuator type abbreviations are used in Schedule 40 05 56-1:

Actuator Type:	**Abbrev:**
Manual	MAN
Electric Actuators (Open/Close)	ELEC(O/C)

D. The following valve material abbreviations are used in Schedule 40 05 56-1:

Pipe Material:	**Abbrev:**	**Pipe Material:**	**Abbrev:**
304L Stainless Steel	304L SS	Cast Iron	CI
316L Stainless Steel	316L SS	Chlorinated PVC	CPVC
Brass	Brass	Ductile Iron	DI
Carbon Steel	CS	Polyvinyl Chloride	PVC
Double Containment Pipe	DC		

E. The following valve end type abbreviations are used in Schedule 40 05 56-1:

Joint Type:	**Abbrev:**	**Joint Type:**	**Abbrev:**
Flanged	Flg	Soldered	Sld
Grooved End Coupling	GEC	Solvent Weld	SW

Grooved / Shouldered End Coupling	GSEC	Threaded	Thd
Shouldered End Coupling	SEC	Polyethylene Coupling	PEC

SECTION 40 05 89 – AUTOMATIC SELF-CLEANING STRAINERS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to furnish, install, and test all automatic self-cleaning strainers, complete and operational.

B. The following index of this Section is presented for convenience:

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C. The following schedule, attached after the End of Section designation, is a part of this Section:

1. Schedule 40 05 89-1, Automatic Self-Cleaning Strainer Schedule.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Automatic self-cleaning strainers shall be electrically driven with a self-cleaning process that initiates either when the pressure differential across the screen reaches a pre-set value or after an adjustable pre-determined lapse or time.

B. Design Requirements:

1. Type of Fluid: Combined sewer.
2. Maximum Flow Rate: 110 gpm.
3. Minimum Working Pressure: 22 psi.
4. Maximum Working Pressure: 120 psi.
5. Maximum Working Temperature: 140 degrees F.
6. Flushing Requirements: 25 gpm at 22 psi.
7. Refer to Schedule 40 05 89-1, Automatic Self-Cleaning Strainer Schedule, located after the "End of Section" designation for specific requirements for each strainer.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Manufacturer shall have a minimum of 5 years of experience in the production of substantially similar automatic self-cleaning strainer equipment and shall show evidence of satisfactory service in at least 5 installations.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Shop Drawings:

1) Complete catalog information, descriptive literature, specifications, and identification of all materials of construction.

2) Product data sheets for make and model. The valve(s) with size(s) and option(s) being submitted for approval are specifically identified in the product data sheet(s).

3) Power and control wiring diagrams, including terminals and numbers.

4) Spare parts list.

5) Special tools list.

b. Operation and Maintenance Data: Submit complete manuals including:

1) Copies of all approved Shop Drawings, test reports, maintenance data and schedules, description of operation, and spare parts information.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Contractor shall provide spare parts and special tools necessary to service, disassemble, repair, and adjust the equipment provided under this Section, and as per the requirements of the Contract Documents. In addition:

1. Two (2) screen o-rings.

2. One (1) spare screen per size.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. TAF Series as manufactured by Amiad Water Systems, Mooresville, NC.

B. No alternate manufacturer or product will be accepted.

2.02 MATERIALS / EQUIPMENT

A. Automatic Self-Cleaning Strainer:

1. General:

a. Strainer shall operate under a positive pipeline pressure on the discharge side or downstream from the pump. Pipeline pressure and water shall efficiently backwash strainer media. A valve on the backwash discharge pipe shall control pressure drop and amount of water wasted in back flushing.

2. Materials and Construction:

a. Filter Housing and Lid: Nylon.

b. End Connection Type: NPT.

c. Screen: Type 316 stainless steel with polypropylene construction.

d. Exhaust Valve: Plastic, natural rubber.

e. Seals: NBR.

B. Controller:

1. General:

a. Integral controllers shall be provided by the automatic self-cleaning strainer manufacturer. Battery-powered controllers will not be accepted.

b. Backflushing:

1) Backflushing shall initiate based on a user-adjustable value for differential pressure, user-adjustable time interval, and manual operation.

2. Materials and Construction:

a. Power: 120 vac, 60 Hz, single phase.

b. Control Voltage: 24 VAC.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Install automatic self-cleaning strainers in complete accordance with the manufacturer's printed instructions and the approved Shop Drawings.

B. Manufacturer's Representative:

1. The Contractor shall furnish the services of accredited representatives of the automatic self-cleaning strainer manufacturer to supervise the installation, adjustment, and field tests of the equipment and to provide training for DEP operating personnel.

2. The services of the manufacturer's representative shall be furnished for installation supervision for at least the following number of days:

Visit:	Purpose:	Number of Visits:	Person-days per Visit:
No. 1	Installation Supervision	3	1

3. Should additional days of service be necessary for a successful installation, such services shall be provided by the Contractor at no additional cost to the City.

C. Provide identification accordance with the requirements of Section 40 05 97 – Identification for Process Equipment.

3.03 FIELD TESTING / QUALITY CONTROL

A. All parts and components shall be adjusted as required to provide correct operation.

B. Perform the following functional tests:

1. Dry Flushing Cycle Operation – Operate a “dry” flushing cycle based on to verify proper operation of the controller, motor, and solenoid valve.

2. Wet Flushing Cycle Operation – Operate a “wet” flushing cycle based on to verify proper operation of the controller, motor, and solenoid valve. During this test, the service water connection shall be opened and the strainer outlet valve shall be closed.

C. The Contractor shall provide the services of the automatic self-cleaning manufacturer's representative at such times and for such durations of time as are needed to perform the field testing tasks required of the representative.

1. The services of a manufacturer's representative shall be furnished for field testing for at least the following number of days:

Visit	Purpose:	Number of Visits:	Person-days per Visit:
No. 2	Field Testing	3	1

3.04 STARTUP / DEMONSTRATION

A. Where specified herein, the Contractor shall provide the services of qualified factory-trained service technicians to check and approve the installation.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SCHEDULE 40 05 89-1
AUTOMATIC SELF-CLEANING STRAINERS SCHEDULE

Location:	TI-010 Chlorination Facility	TI-010 Dechlorination Facility	TI-011 Disinfection Facility
Tag No(s):	FBCSO-STR-1 and FBCSO-STR-	TI-010-STR-1 and TI-010-STR-2	TI-011-STR-1 and TI-011-STR-2
Quantity:	2	2	2
Inlet and Outlet Diameter:	2-inch	2-inch	2-inch
Screen Size:	80 micron	80 micron	80 micron
Operating Flow:	20 gpm	20 gpm	20 gpm
Operating Pressure:	25 psi	1 psi	1 psi

SECTION 40 05 97– IDENTIFICATION FOR PROCESS EQUIPMENT
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to furnish and install all components of the system for identification of exposed piping and equipment.

B. The following index of this Section is presented for convenience:

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C. The following schedules, attached after the "End of Section" designation, are a part of this Section:

1. Schedule 40 05 97-1, Dimensions of Identification Signs and Nameplates.
2. Schedule 40 05 97-2, Table of Standard Colors.
3. Schedule 40 05 97-3, General Color Code.
4. Schedule 40 05 97-4, Pipe Identification Signs.
5. Schedule 40 05 97-5, Nameplates.
6. Schedule 40 05 97-6, Pipeline and Equipment Identification.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 09 91 00 – Painting

1.04 REFERENCES

A. ASTM D523 Standard Test Method for Specular Gloss

B. ASTM D543 Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents

C. ASTM D638 Standard Test Method for Tensile Properties of Plastics

D. ASTM D646 Standard Test Method for Grammage of Paper and Paperboard (Mass per Unit Area)

E. ASTM D709 Standard Specification for Laminated Thermosetting Materials

F. ASTM D790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

G. ASTM D792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

H. ASTM D5420 Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact)

I. SAE AMSSTD595 Colors Used in Government Procurement.

J. New York City Local Law 30

1.05 DESCRIPTION

A. This Section describes the system for the identification of piping and equipment. This includes the placing of identification signs and direction-of-flow arrows on all visible, exposed plant piping, the placing of nameplates on plant equipment and structures, and painting in color of all equipment and pipe (except stainless steel or aluminum surfaces) as shown on the Contractor's Shop Drawings submitted under other Section(s) for equipment, piping, and valves, and as required.

1.06 QUALITY ASSURANCE

A. Provide the specified items from firms regularly engaged in the manufacture of identification devices of types and sizes required, with at least five (5) years' experience in manufacturing signs.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Submit samples of the lettering to be used for fiberglass reinforced plastic signs to the Engineer for approval before manufacturing begins.

1) Such samples must show the height, width and spacing of letters and numbers for any three (3) legends of ten or more letters and spaces as specified herein.

b. Submit sample direction-of-flow arrows for both sizes of pipe identification signs to the Engineer for approval before installation.

c. Submit details of the method of fastening nameplates to the Engineer.

1) Since it is impractical to detail each means of attachment in the Contract Drawings, each means of attachment shall receive approval only on its own merits – submit for approval sketches of each type of attachment proposed.

2. Information Submittals:

a. Submit certification on acid resistance to the Engineer prior to installation.

b. Submit manufacturer's guarantee and warranty, in writing.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Contractor shall provide spare parts and special tools necessary to service, disassemble, repair, and adjust the materials provided under this Section, and as per the requirements of the Contract Documents.

B. In addition, provide the following spare parts for identification of piping and equipment:

1. For every twenty (20) pipe identification signs installed:

a. One (1) pair stainless steel mounting screws

b. One (1) pair stainless steel threaded brackets

c. One (1) pair fiber or plastic washers

d. One (1) pair stainless steel banding seals

2. One (1) set banding tools and banding accessories

3. One (1) stainless steel banding strap, approximately 1000 ft.

4. One (1) complete nameplate mounting assembly for every twenty (20) nameplates installed

5. One (1) stainless steel cable and splice for every twenty (20) valve identification tags

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mounting assembly "Steelbinder" strapping units:

1. A.J. Gerrard & Co., Lake City, FL;

2. Independent Metal Strap, Roslyn, NY;

3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Construction:

1. Construct fiberglass reinforced plastic identification signs and nameplates of 100 mils thick fiberglass reinforced plastic conforming to ASTM D709.

2. Provide fiberglass reinforced plastic process with a blemish free, low gloss surface of superior permanence and durability in the colors selected.

3. Construct all signs and nameplates in conformity with ASTM D523, D638, D646, D790, D792, and D5420.

4. Make direction-of-flow arrows for attachment to pipe identification signs from No. 16 U.S. gauge Type 304 stainless steel, the full width of the sign.

5. Chemical Resistance:

a. Provide fiberglass reinforced plastic signs resistant to abrasion, impact, corrosion, and the following acids, alkalis, salts, and solvents in accordance with ASTM D543:

1) 10% citric acid

2) 5% acetic acid

3) 3-30% sulfuric acid

4) 10% ammonium hydroxide

5) 10% sodium chloride
6) turpentine
7) mineral spirits
8) heptane
9) kerosene
10) ethyl alcohol
11) ethyl acetate
12) transformer oil
13) heavy duty detergents
14) water
15) 15% sodium hypochlorite
16) 22% sodium bisulfite

B. Lettering:

1. Provide lettering made by silk screening or other permanent embedment of subsurface printed graphics in the material so as to produce a clear, legible sign.

C. Grommets and Holes:

1. Provide signs for piping and valve identification with two ⅜-in. diameter grommet-protected holes located on the long side center line, the center of the hole to be ½-in. from the edge.
2. Provide nameplates for equipment and structures with four ⅜-in. diameter grommet-protected holes, the center of the hole located ½-in. away from the edges.
3. Provide all holes with suitable brass or stainless steel grommets.
4. Shall be of Type 304 stainless steel construction.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Dimensions of Signs and Tags:

1. Provide identification signs and nameplates rectangular in shape and of the dimensions specified in Schedule 40 05 97-1, Dimensions of Identification Signs and Nameplates, located after the "End of Section" designation.
   a. A dimensioned tolerance of $\pm 1/16$- in. is permissible.

B. Lettering of Signs:

1. Perform all lettering and numbering on identification signs and nameplates in block style in size and spacing to suit the size of sign, as approved by the Engineer.

2. Unless otherwise approved by the Engineer, the following limits shall apply:
   a. Limit the legend on pipe identification signs to one (1) line and to a total of 12 letters and spaces
   b. Limit the legend on equipment nameplates to two (2) lines and a maximum of 35 letters and spaces.
3. Do not place lettering, symbols or markings containing the name of the manufacturer on the signs.
   a. The contract number and the year of the contract as given on the Contract Drawings may be placed in small lettering on the front of the sign, if approved by the Engineer.

C. Colors:
1. Provide each identification sign and nameplate in two colors and with the legend specified.
   a. Provide the backside of the sign in black or some other uniform color.
2. Code pipeline signs and equipment nameplates and finish coats of paint for pipe lines and equipment in basic colors.
3. Provide brilliant colors, distinctive shades matching as closely as possible (without custom color blending) the basic colors as specified by the Munsell Color System (MN) in Schedule 40 05 97-2, Table of Standard Colors, located after the "End of Section" designation:
4. Provide identification signs for pipelines of all sizes, mechanical equipment, sluice gates, and valves in the color combinations specified in Schedule 40 05 97-3, General Color Code, located after the "End of Section" designation.
5. Provide vents and drains of the same color combination as the contents of tanks and equipment vented and drained.
6. Identification signs for services not included in the Schedule 40 05 97-3 shall be black letters on a white background.

D. Legend for Pipe Identification Signs:
1. Provide identification signs, to identify the pipe line service, with the words or abbreviations in color combinations shown in Schedule 40 05 97-4, Pipe Identification Signs, located after the "End of Section" designation.
2. Number sluice gates and valves in conformity with the Basic Code as specified by the Operation and Maintenance Manual for the plant. Perform color combinations for such lines and valves in the same color combinations as the medium serviced and as specified in Schedule 40 05 97-3.

3. In addition to the identification requirements listed above, for all gas piping at pressures above ½ psig, show the maximum pressure level within the piping as required by New York City Local Law 30.

E. Valve Identification Tags:

1. Furnish and attach valve identification tags to all valves, gates, and controls.

2. Provide round fiberglass reinforced plastic tags, in sizes per Schedule 40 05 97-1, made in conformity with the requirements specified herein. Provide tags with one ⅛-in. grommet protected hole at the top for fastening to the valve body using $^{1}/_{16}$-in. diameter cable and splices or pins as approved. Provide grommets, cable splices and pins of stainless steel or other approved corrosion resistant material.

3. Provide numbering code for the identification tags in conformity with the Basic Code as specified by the Operation and Maintenance Manual for the plant. Assign identification numbers subject to the approval of the Engineer and in conformity with the entire piping and equipment identification system. Provide identification code for each valve and control without duplication. Provide lettering on identification tags not less than $^{5}/_{16}$-in. high and limited to two lines. Silk-screen lettering in correct color combination; stenciled or painted numbers and lettering will not be accepted.

4. In addition to the tagging requirements listed above, provide tags at all gas valves at pressures above ½ psig with the operating pressure within the valve shown as required by New York City Local Law 30.

F. Arrows:

1. Make the arrow head with a tapered point, about 90° at the apex, extending one half of the sign width from the sign edge and one half of the sign width extending under the sign.

   a. Make point with a radius of ¼-in. for the 3½-in. wide sign and a radius of $^{3}/_{16}$-in. for the 1½ in. wide sign.

2. Finish all edges of the arrow.

3. Punch detents on the arrows to prevent twisting of the point.

4. Drill one hole in the arrow in alignment with the hole in the pipe identification sign so that both sign and arrow can be mounted with the same screw and bracket.

G. Nameplates:

1. Provide nameplates for equipment and structures in the same color combination as the medium they service. Legends for nameplates must follow the terminology shown. Provide numbering system as described in the Operation and Maintenance Manual.

2. Schedule 40 05 97-5, Nameplates, located after the "End of Section" designation, is a representative list (and not necessarily complete) of nameplate legends with appropriate color combinations to which the equipment identification number(s) shall be added.

H. Additional Signs and Nameplates:

1. In addition to the legends specified above, the Engineer may order the Contractor to furnish and install additional identification signs, arrows and nameplates at no additional cost to the City.

2. Such additional signs may be requested near completion of the work and will be limited to no more than five (5) signs for each of the five (5) types listed in Schedule 40 05 97-1.

3. Conform legends and color combinations for additional signs to the requirements specified.

I. Color of Pipelines and Equipment:

1. Paint all pipelines and equipment in conformity with the requirements of Section 09 91 00 - Painting.

a. Color code the color of the final coats of paint.

2. Match the color of the final coats as closely as possible, without custom blending, to the colors presented in Schedule 40 05 97-6, Pipeline and Equipment Identification, located after the "End of Section" designation.

a. The colors in Schedule 40 05 97-6 and Schedule 40 05 97-7 are identified by a name and their SAE AMSSTD595 color identification number and shall match this standard; the names of the colors in Schedules 40 05 99-6 and 40 05 97-7 are for convenience only.

3. Do not paint aluminum or stainless steel ductwork or jackets on insulated pipelines. Should the Contract Documents state that flanges, flexible couplings, valves, and/or fittings for such jacketed lines not be covered, paint only the flanges, flexible couplings, valves, and/or fittings in accordance with the piping color code.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Location:

1. Locate identification signs for piping along straight line runs at intervals of not more than 30 ft, near valves, branches and junction points and where pipes pass through walls or ceilings.

2. Place direction-of-flow arrows as shown or required.

3. Locate signs on large valves on or adjacent to the valve itself.

4. Place all piping identification signs so as to be easily visible from operating locations.

5. Locate nameplates on equipment bases and on structures at readily visible levels in such positions relative to the equipment and structures so as to prevent damage to the nameplate.

3.02 INSTALLATION

A. Mounting:

1. Mount identification signs and arrows on piping parallel and tangent to the pipe and valves by fastening with screws, plastic or fiber washers, threaded brackets, and banding straps and seals.

2. Provide screws and brackets of stainless steel with 5/16 - 18 American Standard Coarse Threads; provide No. 25 U.S. gauge stainless steel, /4 inch wide bands.

3. Where pipe is insulated, use care in mounting the signs so to prevent the banding straps from crushing the insulation.

4. Provide mounting assembly "Steelbinder" strapping units.

5. Mount nameplates in the manner specifically approved by the Engineer, after the installation of equipment or the construction of structures is complete.

6. Mount valve identification signs with approved stainless steel brackets or approved stainless steel strapping in such a fashion that sharp corners or edges on signs, brackets, bolts, chain or strapping will not constitute a hazard to personnel operating the valves.

7. Do not attach identification tags or signs to handwheels.

8. Use of flange bolts or bonnet bolts as a means of attachment of brackets shall receive consideration by the Engineer.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SCHEDULE 40 05 97-1
DIMENSIONS OF IDENTIFICATION SIGNS AND NAMEPLATES

Type of Sign:	**Sign Dimensions: (Width × Length)**
PIPE IDENTIFICATION -	
1. Outside diameter of pipe (including pipe insulation):	
a. 4-in. and larger:	3½-in. × 12-in.
b. Less than 4-in.:	1½-in. × 7-in.
VALVE IDENTIFICATION -	
1. Valve tags:	2-in. diameter
2. Operating stands for valves and sluice gates:	1½-in. × 7-in.
NAMEPLATES -	
1. Equipment and structures	3½-in. x 12 in.

SCHEDULE 40 05 97-2
TABLE OF STANDARD COLORS

Color:	**Munsell Number:**
White	MN - N8.8/
Yellow	MN - 4Y7.5/12.8
Orange	MN - 0.5 YR 4.6/12.2
Red	MN - 7R 3.6/12.7
Brown	MN - 2.5 YR 4.2/4.3
Gray	MN - 2.5PB 5.8/1.7
*Charcoal	MN - 6B 5/0.4
Black	MN - N1/
Blue	MN - 3PB 3.3/7.4
Green	MN - 8G 4.4/6.2
* Provide color "Charcoal" for paints equivalent to MN - N 3.75.	

SCHEDULE 40 05 97-3
GENERAL COLOR CODE

Service Line:	**Colors:**	
	Letters:	**Background:**
1. FIRE AND STANDPIPE	White	Red
2. CHEMICALS		
a. Sodium Bisulfite	Orange	Black
b. Sodium Hydroxide	Black	Yellow
c. Sodium Hypochlorite	Blue	Yellow
3. LIQUIDS WEAK IN SOLIDS a. Sump Drains	Black	Gray
4. NON-POTABLE WATER a. Service Water b. Seal water	Yellow	Blue
5. CITY WATER	White	Blue
6. HEATING, VENTILATING AND CONDITIONING AIR (Equipment And Ductwork)	Green	Charcoal

SCHEDULE 40 05 97-4
PIPE IDENTIFICATION SIGNS

Legend:	**Service:**	**Color Code:**	
		Lettering:	**Background:**
CAUSTIC	Caustic soda (Sodium hydroxide)	Black	Yellow
CHILL SUPPLY	Chilled water supply	Yellow	Blue
CHILL RETURN	Chilled water return	Yellow	Blue
DRAIN - *	Drain - *	*	*
FIRE	Fire line	White	Red
H.W. RETURN	Hot water return	Blue	Orange
H.W. SUPPLY	Hot water supply	Blue	Orange
HYPO	Sodium hypochlorite	Blue	Yellow
METER - *	Metering - *	*	*
O'FLOW - *	Overflow - *	*	*
PLANT DRAIN	Plant drain	Black	Gray
SBS	Sodium bisulfite	Orange	Black
SEAL WATER	Seal water	Yellow	Blue
SW	Service Water	Yellow	Blue
SEWAGE	Sewage	Black	Gray
SEW. SAMPLE	Sewage sampling	Black	Gray
SUMP - *	Sump pump line - *	*	*
VENT - *	Vent - *	*	*
WATER	City water	White	Blue
* Where shown, specified or required, the legend for blowoff, drain, metering, sump, vent and similar lines shall also include the equipment, structure or identification number to which the service applies.			

SCHEDULE 40 05 97-5
NAMEPLATES

Legend:		**Color Code:**	
First Line(1):	**Second Line(2):**	**Lettering:**	**Background:**
EMERGENCY EYEWASH SHOWER		White	Black
EXHAUST FAN	**	White	Charcoal
HOT WATER HEATER	ELECTRIC **	Blue	Orange
SEAL WATER	PUMP **	Yellow	Blue
SERVICE WATER	BFP**	Yellow	Blue
SEWAGE EJECTOR	**	Black	Gray
SEWAGE FLOW	METER **	Black	Gray
SODIUM HYPOCHLORITE	METERING PUMP**	White	Black
SODIUM HYPOCHLORITE	TRANSFER PUMP**	White	Black
SODIUM BISFULITE	METERING PUMP**	White	Black
SODIUM BISULFITE	TRANSFER PUMP**	White	Black
SUMP PUMP	**	Black	Gray
SUPPLY FAN	**	White	Charcoal

(1) Nominal limit of 18 letters, numerals and spaces.
(2) Nominal limit of 17 letters, numerals and spaces.

*Where equipment is mounted on roofs or where exposed to the public view, such as in lobby or office areas, the color will be selected by the Architect.

**The legend on these nameplates also includes the appropriate six-digit numeral and letter designation for such equipment and structures as specified by the Operation and Maintenance Manual.

SCHEDULE 40 05 97-6
PIPELINE AND EQUIPMENT IDENTIFICATION

Abbr.:	**Process/Service Line:**	**Fed. Std. 595B Color:**
CSTC	Caustic (Sodium Hydroxide)	Orange 22544
CW	City Water	Blue 15200
C	Condensate	Gray 16357
FRS	Fire and Standpipe	Red 11350
HVACEX	HVAC Exhaust	Gray 14158
HVACS	HVAC Supply	Gray 14056
SMP	Sampling Line	(Match to Service)
SLW	Seal Water	Blue 15182
SW	Service Water	Blue 15102
SBS	Sodium Bisulfite	Black 14084
HYPO	Sodium Hypochlorite	Yellow 13591
SD	Sump Drain	Gray 16376

NO TEXT ON THIS PAGE

SECTION 40 05 98 – SEAL WATER SYSTEM
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to furnish, install, and test all seal water systems complete and operational

B. The following index of this Section is presented for convenience:

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3.04	Startup / Demonstration	5
3.05	Adjusting / Protection / Cleanup	5

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 22 07 19 – Plumbing Piping Insulation

B. Section 22 11 16 – Domestic Water Piping

C. Section 40 05 56 – Process Valves Smaller Than Four-inch Diameter

D. Section 40 70 71 – Measurement

1.04 REFERENCES

A. Not Used.

1.05 DESCRIPTION

A. Seal water systems shall be provided for each set of duplex chemical sump pumps as shown on the Contract Drawings.

B. The seal water system components include, not is not limited to the following:

1. Seal water feeder line, including piping and hoses.

2. Seal water valves, flow indicators, gages, and appurtenances.

3. Seal water monitoring and control units.

C. Seal water systems shall utilize service water piping. It shall be designed, constructed and installed for the service intended.

1. Each seal water system shall provide a flush to the column bearings of each chemical sump pump.

2. Each seal water system shall be designed to provide 6 gpm to each chemical sump pump at a pressure range of 30 to 60 psi.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Manufacturer shall have a minimum of five years experience producing substantially similar equipment and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.

B. Component Supply and Compatibility

1. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall seal water assembly.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Shop Drawings:

1) Drawings Showing: Fabrication, assembly, installation and wiring diagrams.

2) Manufacturer's literature, illustrations, specifications and engineering data including; materials, dimensions, weights, performance data, part lists for all components furnished, and test reports

b. Operation and Maintenance Data: Submit complete manuals including:

1) Copies of all approved Shop Drawings, test reports, maintenance data and schedules, description of operation, and spare parts information.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Contractor shall provide spare parts and special tools necessary to service, disassemble, repair, and adjust the equipment provided under this Section, and as per the requirements of the Contract Documents. In addition, provide the following spare parts for each seal water system provided:

1. One pressure reducing valve.
2. Gaskets for all valves, gages, and meters.
3. One Seal Water Control and Monitoring Unit of each type supplied.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Seal Water Control and Monitoring Unit:

1. Safematic Safeunit, as manufactured by John Crane Company.
2. Seal Water Control System, as manufactured by Flexaseal.
3. Seal Water Flow Meter, as manufactured by Kytola Instruments.
4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Seal Water Control and Monitoring Unit:

1. General:

a. Each Seal Water Control and Monitoring Unit shall include the following components:

1) Flow rate indicator.

2) Pressure gage.

3) Flow regulating valve.

4) Push-to-clean feature.

5) Low-flow alarm feature, with 120 volt output.

6) Mounting bracket and hardware.

b. Maximum Temperature: 170 degrees F.

c. Maximum Pressure: 145 psi.

2. Construction:

a. Connections: 3/8-inch barbed hose fitting connectors with industrial braided tubing for connection to pump.

B. Seal Water Feeder Piping: Provide copper in accordance with Section 22 11 16 – Domestic Water Piping. Provide insulation in accordance with Section 22 07 19 – Plumbing Piping Insulation.

C. Solenoid Valves: Provide in accordance with Section 40 05 56 – Process Valves Smaller Than Four-inch Diameter.

D. Ball Valves: Provide in accordance with Section 40 05 56 – Process Valves Smaller Than Four-inch Diameter.

E. Needle Valves: Provide in accordance with Section 40 05 56 – Process Valves Smaller Than Four-inch Diameter

F. Pressure Reducing Valves: Provide in accordance with Section 40 05 56 – Process Valves Smaller Than Four-inch Diameter.

G. Pressure Gages: Provide in accordance with Section 40 70 71 – Measurement.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Mounting bracket and hardware for the Seal Water Control and Monitoring Units shall be provided by the manufacturer.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Contractor shall verify that structures, pipes, and equipment are compatible.

3.02 INSTALLATION

A. Install seal water system in complete accordance with the manufacturer's printed instructions and the approved Shop Drawings.

B. Support piping independent of seal water unit.

C. Seal water piping located underneath ductwork shall be insulated.

3.03 FIELD TESTING / QUALITY CONTROL

A. A functional field test of each seal water system shall be conducted in the presence of the Engineer to demonstrate that each part and all components function together correctly. All parts and components shall be adjusted as required to provide correct operation.

B. The Contractor shall provide the services of the seal water system manufacturer's representative at such times and for such durations of time as are needed to approve the installation and perform the field testing tasks required of the representative.

1. The services of a manufacturer's representative shall be furnished for field testing for at least the following number of days:

Visit	Purpose:	Number of Visits:	Person-days per Visit:
No. 1	Field Testing	3	1

3.04 STARTUP / DEMONSTRATION

A. Not Used.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 40 06 01 – SCHEDULE FOR EXPOSED PIPING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to furnish, install, and test all exposed piping as indicated in the exposed piping schedule, complete and operational.

B. The following index of this Section is presented for convenience:

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C. The following schedule(s), attached after the End of Section designation, are a part of this Section:

1. Schedule 40 06 01-1, Exposed Piping Schedule.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. Not Used

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SCHEDULE 40 06 01-1
EXPOSED PIPING SCHEDULE

Service	Material	Wall Thickness/ Schedule/ Class	Type of Joint	Working Pressure (psig)	Test Type	Test Pressure (psig)	Interior Coating	Exterior Coatings, Treatments	Remarks
HYPO-F	SPE	Schedule 80	SW	10	hyd	15	-	P	Refer to Contract Drawings for extents of single-wall piping
HYPO-F	DC	See Note 1	BW	10	hyd	15	-	-	Refer to Contract Drawings for extents of double containment piping
HYPO	SPE	schedule 80	SW	65	hyd	98	-	P	Refer to Contract Drawings for extents of single-wall piping
HYPO	DC	See Note 1	BW	65	hyd	98	-	-	Refer to Contract Drawings for extents of double containment piping
HYPO-TF	SPE	schedule 80	SW	10	hyd	15	--	P	Refer to Contract Drawings for extents of single-wall piping
HYPO-TF	DC	See Note 1	BW	10	hyd	15	-	-	Refer to Contract Drawings for extents of double containment piping
HYPO-OF	DC	See Note 1	BW	5	hyd	10	-	-	TI-010 Chlorination Facility
HYPO-OF	SPE	schedule 80	SW	5	hyd	10	-	P	
HYPO-VT	PSPE	Schedule 80	SW	--	--	--	--	P	
SBS-F	SPE	schedule 80	SW	10	hyd		-	P	Refer to Contract Drawings for extents of single-wall piping
SBS-F	DC	See Note 1	BW	10	hyd	15	-	-	Refer to Contract Drawings for extents of double containment piping
SBS	SPE	schedule 80	SW	40	hyd	60	-	P	Refer to Contract Drawings for extents of single-wall piping
SBS	PDC	See Note 1	SW	40	hyd	60	-	-	Refer to Contract Drawings for extents of double containment piping
SBS-TF	SPE	Schedule 80	SW	10	hyd	60	-	P	Refer to Contract Drawings for extents of single-wall piping
SBS-TF	DC	See Note 1	BW	10	hyd	15	-	-	Refer to Contract Drawings for extents of double containment piping
SBS-OF	SPE	Schedule 80	SW	5	hyd	10	-	P	

SECTION 40 06 01 – SCHEDULE FOR EXPOSED PIPING
CONTRACT CSO-FC-DF

Service	Material	Wall Thickness/ Schedule/ Class	Type of Joint	Working Pressure (psig)	Test Type	Test Pressure (psig)	Interior Coating	Exterior Coatings, Treatments	Remarks
SBS-VT	PVC	Schedule 80	SW	--	--	-	--	P	
SMP	PVC	Schedule 80	SW	30 psi	HYD	45 psi	--	P	
SPD	PVC	Schedule 80	SW	20	HYD	30 psi	--	P	
SW	PVC	Schedule 80	SW	60	HYD	90 psi	--	P, I	
SL	Cu	Type L	Sld	20	HYD	30	--	I	Insulate seal water piping located under ductwork

Notes:

(1) See Section 40 05 32 - Double Containment Chemical Piping

B. The following service abbreviations are used in Schedule 40 06 01-1:

Service:	Abbrev:	Service:	Abbrev:
Sodium Hypochlorite	HYPO	Sodium Bisulfite	SBS
Sodium Hypochlorite (fill)	HYPO-F	Sodium Bisulfite (fill)	SBS-F
Sodium Hypochlorite (transfer)	HYPO-TF	Sodium Bisulfite (transfer)	SBS-TF
Sodium Hypochlorite (overflow)	HYPO-OF	Sodium Bisulfite (overflow)	SBS-OF
Sodium Hypochlorite (vent)	HYPO-VT	Sodium Bisulfite (vent)	SBS-VT
Sump Pump Discharge	SPD	Service Water	SW
		Seal water	SL

C. The following pipe material abbreviations are used in Schedule 40 06 01-1:

Pipe Material:	Abbrev:	Pipe Material:	Abbrev:
Double-Contained Polyethylene	PE(D)	Polyvinyl Chloride	PVC
Single-Contained Advanced Polyethylene or Fluoropolymer (note 1)	SPE	Copper	Cu

Note 1: Material to be similar to carrier pipe in Double Containment piping; depending of use: SBS or Hypo. Refer to Section 40 05 32 – Double Containment Piping

D. The following joint type abbreviations are used in Schedule 40 06 01-1:

Joint Type:	Abbrev:	Joint Type:	Abbrev:
Bell and Spigot	BS	Push-on Joint	POJ
Brazed	Brz	Shouldered End Coupling	SEC
Butt Weld	BW	Split-sleeve Coupling	SSC
Flanged	Flg	Soldered	Sld
Flexible Tube Connector	Flex	Solvent Weld	SW
Grooved End Coupling	GEC	Restrained Mechanical Joint	RMJ
Grooved / Shouldered End Coupling	GSEC	Restrained Push-on Joint	RPOJ
Lap Welded	LW	Threaded	Thd
Mechanical Joint	MJ	Welded	Wld

E. The following interior coating abbreviations are used in Schedule 40 06 01-1:

Interior Coating	Abbrev:	Interior Coating:	Abbrev:

Asphalt Coated	AC	Cement Lined	CL
Basalt Coated	BC	EPDM (M-class) Rubber	EPDM
Ceramic Epoxy Coated	CEC	Glass Lined	GL
Ceramic Epoxy Lined	CEL	Polyethelene Lined	PEL

F. The following exterior coating and treatment abbreviations are used in Schedule 40 06 01-1:

Exterior Coating, Treat.:	**Abbrev:**	**Exterior Coating, Treat.:**	**Abbrev:**
Asphalt Coated	AC	Galvanized	Galv
Epoxy	Epx	Insulate	I
Heat Trace	HT	Paint	P

G. The following testing abbreviations are used in Schedule 40 06 01-1:

Test Type:	**Abbrev:**	**Exterior Coating, Treat.:**	**Abbrev:**
Hydrostatic	Hyd	--	--

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install, calibrate, test, start-up, commission, and place in operation a complete Process Monitoring Control System (PMCS). The PMCS shall be as specified in this Section, the Sections listed in the Related Sections of this Section, and as shown on the Contract Drawings.

B. PMCS shall be designed to control, monitor, store, display and log process and equipment operating information and alarms and to perform various control functions and generate various alarms.

C. The unit processes which the PMCS shall control and monitor are shown on the Contract Drawings and described herein.

D. Contractor shall coordinate with all PMCS equipment manufacturers to ensure that all control and instrumentation signals are incorporated properly.

E. P&IDs, Specifications of Division 40 and the Related Sections of this Section illustrate and describe the overall PMCS functional and operational requirements.

F. The System includes, but is not limited to the following:

1. New Main Control Panel (MCP-10) at the Flushing Bay Combined Sewer Overflow (CSO) Facility associated with TI-010, including interface and coordination with new field instruments, chlorination systems, and other auxiliary systems shall be provided as shown on the drawings and as specified in the Control Strategies.

2. New DC-5 Control Panel (DC5-CP-10) at the Lawrence & Peck Pump Station including interface with new non-contact flow meters shall be provided as shown on the drawings and as specified in the Control Strategies.

3. New Sodium Bisulfite Control Panel (SBS-CP-10) at the TI-010 Dechlorination Facility including interface and coordination with new Dechlorination systems, and other auxiliary systems shall be provided as shown on the drawings and as specified in the Control Strategies.

4. New Main Control Panel at the TI-011 Disinfection Facility (MCP-11), including interface and coordination with new field instruments, Chlorination systems, Dechlorination systems, and other auxiliary systems shall be provided as shown on the drawings and as specified in the Control Strategies.

5. Interface of new field instruments to an existing Regulator TI-09 Control Panel for the TI-011 facility which will be provided by a different contractor under the Floatables Removal Contract. Work with the Other Contractor to coordinate the placement of new flow

transmitters and associated intrinsic safety barriers in this existing panel which is being provided under the separate contract.

6. New Fill Station Panels at the Flushing Bay CSO Facility, TI-010 Dechlorination Facility, and the TI-011 Disinfection Facility.

7. Configuration of Programmable Logic Controllers (PLCs), Operator Interface Terminals (OITs) and CCFISS HMI displays.

8. Configuration of new cellular modems and coordination with City to effect communication with the DEP CCFISS Network, and to connect the different control panels to the overall CCFISS Network, as indicated on the drawings.

9. Coordination with the Process Monitoring Camera Systems Integrator under Section 28 00 00, for proper interface of CCTV control panels at the TI-010 and TI-011 facilities, with the respective process control panels via ethernet communication.

10. Provide interfacing with all systems as indicated on the P&IDs and as specified.

11. Field instruments specified herein.

12. All other appurtenances as listed in the various sections within Division 40.

G. The following index of this Section is presented for convenience:

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3.05 Adjusting / Protection / Cleanup.....29

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 05 27 - Grounding
B. Section 26 05 53 - Identification for Electrical Systems
C. Section 26 29 13 - Enclosed Controllers
D. Section 28 00 00 - Closed Circuit Television Surveillance System
E. Section 40 61 26 - PMCS Training
F. Section 40 61 93 - PMCS Input Output List
G. Section 40 61 94 - PMCS Instrument Index
H. Section 40 61 95 - PMCS Monitoring and Control Criteria
I. Section 40 61 96 - PMCS Control Strategies
J. Section 40 63 43 - PMCS Programmable Logic Controllers
K. Section 40 63 53 - PMCS Network Equipment
L. Section 40 67 16 - PMCS Panels and Enclosures
M. Section 40 70 01 - Measurement
N. Section 40 78 90 - PMCS Panel Mounted Instruments and Devices
O. Section 40 79 91 - PMCS Field Instruments
P. Section 40 80 81 - PMCS Factory Test
Q. Section 40 80 82 - PMCS Startup and Field Testing

1.04 REFERENCES

A. Definitions

1. AI - Analog Input
2. AO - Analog Output
3. Area Process - A number of unit processes grouped either because of their similar equipment operation or similar function in a Plant. Area Process also comprise groupings of dissimilar unit

processes designated a single group function.

4. CPU - Central Processing Unit
5. CS - Control Strategy
6. CSO - Combined Sewer Overflow
7. DEP BIT - DEP Bureau of Business Information Technology.
8. DI - Digital Input
9. Distributed I/O - Hardware specifically designed to function as Remote I/O.
10. Distributed
11. Control System Area - A control system comprising Unit and Process connected by a communication network which facilitates control and monitoring of the entire system from a central point such as a Plant control room.
12. DO - Digital Output
13. Fixed PLC - PLC whose hardware configuration comprises a fixed number of I/O, a CPU and power supply all in one enclosure.
14. HMI - Human Machine Interface are electronic displays and windows providing operator access to monitor access, and set parameters of a Unit Process control system.
15. I/O - Input/Output
16. Modular - A style of PLC assembly where I/O, CPU and power supply are each mounted in cards which are insertable to a mounting chassis or backplane.
17. OAD - Operational Availability Demonstration
18. OIT - Operator Interface Terminal; another name for HMI.
19. Control Panel - Control Panel includes any enclosure provided to house electrical equipment, instrumentation, controls wiring terminations, network hardware or connections, indicators, displays, computer hardware, panels of

packaged systems etc. provided under any Section of this Contract.

20. P&ID - Process and Instrumentation Diagrams included in the Contract Documents.
21. Plant - Combined Sewer Overflow (CSO) Facility
22. PLC - Programmable Logic Controller
23. PMCS - Process Monitoring and Control System
24. Remote I/O - Any I/O that functions physical remote from its location of the CPU and I/O located on backplane.
25. SCADA - Supervisory Control and Data Acquisition
26. SFT - Start-up and Field Testing
27. Unit Process - Any standalone equipment or process operation such as a pump in which all the logic for control of the equipment or process resides in the local installation.
28. URT - Upset and Recovery Testing
29. WFAT - Witnessed Factory Acceptance Tests

B. Reference Standards

The following organizations have generated standards that are to be used as guides in assuring quality and reliability of components and systems; govern nomenclature; define parameters of configuration and construction, in addition to specific details in this Section and the Contract Drawings:

1. BWT PDS - BWT Design Guideline, Program Development Standards.
2. BWT PLC - BWT Design Guideline, Programmable Logic Controllers.
3. BWT SCADA Software. - BWT Design Guideline, SCADA
4. ISA 5.1 Identification - Instrumentation Symbols and
5. ISA 5.2 Operations - Binary Logic Diagrams for Process
6. ISA 5.3 Control/Shared Logic and Computer - Graphic Symbols for Distributed Display Instrumentation, Systems.

7.	ISA 5.4	-	Instrument Loop Diagrams.
8.	ISA 5.5	-	Graphic Symbols for Process Displays.
9.	ISA 18.1 Specifications.	-	Annunciator Sequences and
10.	ISA 18.2 Process	-	Management of Alarm Systems for Industries.
11.	ISA TR20.00.01 Measurement General	-	Specification Forms for Process and Control Instruments Part1: Considerations.
12.	ISA 51.1	-	Process Instrumentation Terminology.
13.	ISA RP60.3	-	Human Engineering for Control Centers.
14.	ISA 101	-	Human Machine Interfaces for Process Automation Systems.
15.	NEMA 250	-	Enclosures for Electrical Equipment (1000 Volts Minimum).
16.	NEMA ICS 1	-	Industrial Control and Systems General Requirements.
17.	NEMA ICS 2	-	Industrial Control and System Controllers, Contactors and Overload Relays Rated 600V.
18.	NEMA ICS 4	-	Terminal Blocks.
19.	NFPA 79	-	Electrical Standard for Industrial Machinery.
20.	NYCEC	-	New York City Electrical Code.
21.	MIL-STD -1916	-	DOD Preferred Methods for Acceptance of Product.
22.	NYCEC	-	New York City Electrical Code.
23.	UL 508	-	Industrial Control Equipment.
24.	UL 1059	-	Terminal Blocks.

1.05 DESCRIPTION

A. The PMCS shall be a Distributed Control System (PLC and SCADA).

B. The system shall comprise unit processes organized into major process areas and a central monitoring and control point.

C. Unit processes shall be fully capable of accomplishing control, monitoring, storing and logging equipment operation at local point.

D. Unit Processes shall have the ability to transfer control to remote Area Control points or a remote Central Control point.

E. The system includes the following major equipment and all other appurtenances listed in the various Division 40 Sections:

F. Environmental Conditions:

1. The PMCS shall be designed and constructed for continuous operation under the following temperature and humidity conditions:

a. Control Rooms:

1) Ambient Temperature

a) Normal Range 60-degree F to 80-degree F.

b) Extremes 40-degree F to 105-degree F.

2) Relative Humidity

a) Normal 80 percent

b) Maximum 95 percent

b. Indoor locations for digital processing equipment hardware, control panels and instruments:

1) Ambient Temperature 40-degree F to 120-degree F.

2) Relative Humidity 98 percent maximum.

c. Outdoor locations

1) Ambient Temperature -10-degree F to 120-degree F.

2) Relative Humidity 100 percent maximum.

1.06 QUALITY ASSURANCE

A. Criteria

1. The PMCS facilities outlined in the Contract Documents and included herein have been designed to meet stringent quality standards. The criteria for selection of this system include, but are not limited to the following:

a. The use of standard, "non-custom" equipment and application software.

b. The ability of City's personnel to make modifications and adjustments in the field to react to actual field conditions.

c. The ability of City to obtain training of City's personnel in a well-established equipment manufacturer training program.

d. The availability of factory service and a well-stocked spare parts inventory, which could be drawn upon by the City in emergency situations.

B. PMCS Supplier

1. The PMCS shall be furnished by a single Supplier who shall assume responsibility for providing a complete and integrated system.

2. The system is to contain products of a single manufacturer, when possible, and to consist of equipment models, which are currently in production.

3. The Supplier shall identify those system components, which are not of his manufacture.

4. The Supplier shall supply his company's quality assurance plan, and for components which are not of his manufacture, the component manufacturer's quality assurance plan. The plans shall include but not necessarily be limited to:

   a. Method of testing, raw material criteria, methods of documentation, station control, "Burn-In", final tests and serialization coding and packaging.

   b. Plans should be in accordance with M.I.L.-STD-1916.

C. Supplier's Qualifications

1. Shall be a financially sound firm having at least five (5) years continuous experience in designing, implementing, supplying and supporting instrumentation and control systems, which are comparable to the PMCS in terms of hardware, software, cost and complexity.

2. Shall have manufactured and supported standard lines of digital processing and control equipment and application software continuously for the last five (5) years.

3. Shall have in existence at the time of bid advertisement, an experienced Engineering and Technical staff capable of designing, implementing, supplying and supporting the PMCS and handling the PMCS submittal and training requirements.

4. Shall provide system hardware components and software packages of fully developed, field proven standardized designs and therefore shall furnish a system which is not a highly unique, custom one-of-a-kind system.

5. Shall have a minimum of five (5) years' experience in operator interface software configuration and hardware application and programming of distributed microprocessor based controllers and data highway systems.

6. Shall provide standard course offerings in general process control applications and in operation, programming and maintenance of the control system and equipment at a facility specifically utilized for training purposes. The facility shall have been in operation continuously for the last five (5) years.

7. Shall have a thorough working knowledge of Plant operation and control philosophy in accordance with standard practices of the industry.
8. Shall have a system of traceability of the manufactured units and purchased components through production, assembly and testing.
9. Shall have a system of "Burn-In" for all components and available supportive documentation.
10. Shall have a demonstrated record of prompt response to field failures.
11. Shall have a documented program of failure analysis.
12. Shall have a UL approved panel shop.
13. Shall have a record of prompt shipments in accordance with Contract obligations required for previous projects.

D. Technical Proposal Requirements

1. The Contractor shall submit a copy of a Technical Proposal from the Supplier which he has selected to provide the PMCS.
2. The Technical Proposal shall be complete and at a minimum contain all information as specified below:
   a. Financial Statement
      1) Shall include the value of distributed microprocessor based control systems delivered during the last five (5) fiscal years.
      2) Shall include the value of other process instrumentation and controls shipped during the period.
   b. Experience
      1) Shall provide evidence of compliance with the specific experience requirements under the Supplier Qualification listed in this Section in the form of an experience certification signed by an officer of the company.
      2) Shall furnish list of last five (5) projects completed.
      3) Shall describe at least three (3) completed municipal projects utilizing instrumentation and control equipment identical to or similar to (indicate which) that specified in this Section.
      4) Shall indicate project name, value, completion date, names and phone numbers of representatives familiar with each project.
      5) Letters of recommendation submitted does not relieve the Contractor from complying the requirements in this Section
   c. Personnel

1) Shall provide a listing of those personnel committed to be assigned to the Contract.
2) List shall include Project Manager, Project Engineer, Field Representative, Local Service Representative, and Sales Representative.
3) Shall identify addresses of personnel not based at supplier's main office.
4) Shall provide documentation including resumes of personnel demonstrating experience in Plant operations.

d. Exceptions
1) Shall list all exceptions and deviations from the requirements of the Contract.
2) Shall reference the Drawing Number, Section number, article, and paragraph of proposed variance and provide an explanation of why the proposed exception or deviation meets (or exceeds) the functional or equipment requirements specified.

e. Shipment Records
1) Shall provide evidence of timely delivery of equipment on past projects.

f. PMCS Hardware and Software:
1) Shall provide a general system configuration drawing and include designations for model numbers and types of the proposed distributed control system components and all other proposed system components.
2) Shall provide descriptive literature and manufacturer's catalog information covering all aspects of the hardware design and software functions and capabilities of the specific distributed control system and data highway system proposed for the PMCS.
3) Shall provide descriptive literature and catalog information covering the features and capabilities of all proposed hardware components.
4) Shall describe standard software packages proposed, including any customized software required to meet the functional intent of the system Specifications.
5) Descriptions shall address the following:
a) Overview of system software including the functions, organization and interrelationship of the major software modules provided.

b) Estimated memory requirements to accomplish the specified graphic display, logging, reporting and alarming functional requirements.

c) Examples of graphic displays, methods of display access and procedures for display definition and generation, including use of the standard symbols library and capabilities for generating and storing user defined symbols in the symbol library.

d) Real-time data logging and reporting software features and capabilities including examples of logs and reports, procedures for automatic reporting and logging file setups, limitations on sampling and computing frequency for data acquisition and logging, and utilities for log file and report modifications and file maintenance.

e) Alarm handling software features and capabilities including an alarm display example, methods of defining alarms and alarm files, automatic printing of alarms, acknowledgements and return to normal conditions, chronological sorting and time-tagging of alarms, and alarm file maintenance utilities.

f) Distributed system programming and documentation software features and capabilities, including screen display and printout examples for a fully annotated and cross-referenced ladder diagram and the ladder diagram elements.

g) Use of system level diagnostics for monitoring the performance of and detecting and reporting faults associated with the distributed communications data highway.

g. Instrumentation and Panel Mounted Devices

1) The Contractor shall provide descriptive literature and catalog cuts for each type of sensor, transmitter, indicator, and other such devices required by the Contract.

h. Training

1) The Contractor shall provide information and literature as to the organization proposed and the factory facilities to be utilized for the training specified.

2) Indicate the qualifications of the factory training staff.

i. Availability Demonstration

1) The Contractor shall indicate how the Availability Demonstration will be accomplished.

j. Maintenance

1) The Contractor shall provide the following information:

a) Location of service facility along with minimum and maximum response time.

b) Location of parts facility with delivery time and method.

E. Supplier's Responsibility

1. The Contractor shall retain the PMCS supplier to assume the responsibilities specified below. However, execution of these specified duties by the System Supplier shall not relieve the Contractor of the ultimate responsibility for the PMCS.

a. Design, fabrication, implementation and applications programming of the PMCS and all subsystems in accordance with the Contract Documents and all referenced standards and codes.

b. Preparation, assembly and correction of all PMCS submittals in accordance with the Contract Documents.

c. Proper interfacing of the PMCS hardware, software, field devices and panels, including required interfacing with packaged control systems furnished by other equipment suppliers, and with the Facility's PMCS.

d. Supervision of the installation of PMCS, instruments, panels, consoles, cabinets, wiring and other components required.

e. Calibration, testing and start-up of the PMCS.

f. Training of the City personnel in operation and maintenance of the PMCS.

g. Handling of all warranty obligations for the control system components.

h. Maintenance of two (2) reproducible copies of the complete PMCS system and running software at the supplier's facility for the duration of the warranty period.

1) Software copies shall be maintained on the bulk storage medium used by the supplier for system program development and shall be directly loadable on the supplied system.

F. Coordination and Progress Meetings:

1. The Contractor shall be responsible for the scheduling and coordinating the system installation with regard to all other work on

the site and in accordance with the provisions of the General Conditions. Said coordination shall be documented on the project schedule.

2. Routine progress and coordination meetings will be scheduled by Engineer. The Contractor and a representative of the System Supplier shall be required to attend a minimum of one meeting per month for the length of Contract.

3. The purpose of the meetings shall be to review the progress of the work involving the PMCS and provide coordination for installation of the equipment to ensure construction schedules are met.

4. Representatives at the meetings shall have the competence and authority to make any and all necessary decisions. Decisions and statements made at the meetings shall commit the Contractor and the System Supplier to agreed procedures and schedules.

1)

G. System Supplier Project Personnel

1. The Contractor shall require the System Supplier to provide the following project personnel:

a. Project Manager

1) The System Supplier shall appoint a Project Manager who shall coordinate and schedule all work and assure that the Contract schedule is met.

2) The Project Manager shall have a minimum of five (5) years' experience in coordination, scheduling and delivery of instrumentation and control contracts under similar Plant Facilities as this Contract along with thorough working knowledge of contract administration as both a prime and sub-prime Vendor/Contractor.

3) The Project Manager shall act as the liaison with the Contractor for the installation of the PMCS and shall assist in all matters required for proper coordination and interfacing of the equipment and processes.

b. Field Engineer

1) The System Supplier shall appoint a Field Engineer with responsibilities as follows:

a) Provide advice and technical consultation relative to installation techniques and procedures for equipment furnished.

b) Installed system checkout, calibration, adjustment and start-up including tuning of every control loop.

c) Maintenance services during availability demonstration.

d) Involvement in the on-site system training of pumping station personnel.

e) Resolving of control problems encountered during initial start-up and testing of all PMCS monitoring equipment.

2) The Field Engineer shall have a minimum of five (5) years' experience in systems engineering and start-up and shall have a thorough working knowledge of both the hardware and software supplied for the PMCS.

c. Training Personnel:

1) Comply with requirements of Section 40 61 26 - PMCS Training.

1.07 SUBMITTALS

A. Shop Drawings General

1. The Contractor shall submit Shop Drawing and material specifications for the approval of the Engineer.

2. Shop Drawing preparation shall not commence until after the pre-submittal conference specified below.

3. Manufacture of the PMCS shall not commence until related and interfacing equipment submittals have been approved by the Engineer.

4. Shop Drawings shall be submitted in complete packages grouped to permit review of related items as generally outlined in this Section under Submittal Requirements.

5. Review of Shop Drawings will be for conformance with Contract Documents and with regard to functions specified to be provided.

B. Pre-Submittal Conference

1. The Contractor shall arrange and conduct a pre-submittal conference on the PMCS within thirty (30) days of notification of preliminary acceptance of the proposed PMCS and Supplier by the City and the Engineer.

2. The Pre-submittal conference shall be attended by representatives of Contractor, the PMCS Supplier, the Engineer, and the City. The Contractor shall allocate one (1) full working day for the conference and that time shall be included in the price of this Contract. The

meeting shall be held at the job site or location approved by the Engineer.

3. The purpose of the pre-submittal conference shall be to review informally and approve the manner in which the control system supplier intends to respond to the Contract requirements before any submittals are prepared.

4. Contractor shall prepare the items listed below for presentation at the pre-submittal conference. The information shall be submitted to Engineer three (3) working weeks prior to the date of the conference.

   a. List of equipment and materials required for the PMCS and the brand and model which Contractor proposes to use for each item or component of the proposed system.

   b. List of proposed exceptions to the plans and specifications along with a brief explanation of each.

      1) Approval of exceptions and substitution shall be subject to a formal submittal according to the Contract procedure.

   c. Sample of each type of submittal specified herein. These may be submittals prepared for other projects.

   d. A flow chart showing the steps to be taken in preparing and coordinating each control system submittal to the Engineer, and a list of proposed submittals.

   e. Schedule for all PMCS related activities from the pre-submittal conference through start-up and training.

      1) Particular emphasis shall be given to dates relative to submittal, design, fabrication, programming, factory testing, delivery, installation and field testing.

      2) The schedule shall be subdivided to show activities relative to each major item or group of items when everything in a given group is on the same schedule.

      3) Schedule shall conform to requirements for Contract schedules.

   f. General outline of the type of tests to be performed to verify that the PMCS and all its components including sensors/transducers, instruments and digital processing equipment are functioning properly.

C. Sensors/Transducers and Panel Instruments.

1. Submit product information for all sensors/transducers and panel instruments. Include the following:

   a. Manufacturer's product name and model number.

   b. Instrument tag number from Contract Documents.

c. Manufacturers' standard catalog product data.

d. Description of construction features.

e. Performance and operation data.

f. Installation and mounting details, instructions and recommendations.

g. Service requirements.

h. Dimensions.

D. PMCS Information:

1. System Description

a. Detailed block diagram showing system hardware configuration and identifying model numbers of system components.

b. Software language and organization:

1) Format, protocol and procedures for data highway communications and local communications with Input/Output modules and peripheral devices.

2. HMI details:

a. Control and failure modes.

b. On line and off line capabilities for programming, system utilities and diagnostics.

c. Input/Output point listing with I/O module cross reference identification for each distributed controller.

d. Data base listing including all Input/Output points.

e. Suggested detailed format and configuration of all log reports, alarm summaries, printer outputs, displays and graphics.

f. List of spare parts and test equipment.

3. Equipment Hardware

a. Layout drawings showing front, rear, end and plan views to scale of all processing equipment, I/O components, power supplies and peripheral devices.

b. Construction details, features and procedures.

c. Interconnection diagrams including termination details, cable identification list and cable length.

d. Plans showing equipment layout in control panels.

e. Installation requirements, instructions and/or recommendations

4. Software Description

a. Standard technical documentation covering all aspects of the PMCS software functions and capabilities, including instruction set description and programming procedures related to control, monitoring, display, logging, reporting and alarming functions

b. Standard technical and instructional documentation covering software for utility, system support, system documentation, display, communications, data logging and storage and diagnostic functions.

c. Functional Description:

1) Detailed functional descriptions of application programs explaining control, display, logging and alarming features to be provided and functions to be performed.

2) Operational descriptions covering the procedures for programming, operation, startup, shutdown and calibration of the control system equipment and explaining how the various control functions are performed.

3) Provide complete narratives of the Control Strategies, including initial setpoints, and methods of programming.

4) Verbatim cut and paste of the specifications will not be acceptable.

d. Documentation describing memory type, size and structure and listing size of system memory, I/O and data table memory and size of memory available for control programs. Also define estimated control program memory requirements and processor execution times and program scan times.

e. Documentation describing central monitoring station main and secondary memory type size and requirements to perform the display, logging, reporting and alarming functions required.

5. Panels, Consoles and Cabinets Information:

a. Layout Drawings shall include the following:

1) Front, rear, side, end and plan views to scale.

2) Dimensional information

3) Tag number and functional name of components mounted in and on panel, console or cabinet.

4) Product information on all panel components.

5) Nameplate location and legend including text, letter-size and colors to be used.

6) Location of anchoring connections and holes.

7) Location of external wiring and/or piping connections.

8) Mounting and installation details.

9) Proposed layouts and sizes of graphic display panels.
10) Calculations for heating and cooling.

b. Wiring and/or piping diagrams shall include the following:
1) Name of panel, console or cabinet.
2) Wiring sizes and types.
3) Piping sizes and types.
4) Terminal strip numbers.
5) Color coding.
6) Functional name and manufacturer's designation for components to which wiring and piping are connected.

c. Provide System Architecture Diagram including detailed physical layout of the PLC Panels, arrangement of the PLC, power supplies, I/O Modules, terminal blocks, and other components with dimensions, mounting arrangements, cable routing, and with annotations. Include detailed product numbers and actual connections based on the equipment that is actually provided.

d. Electrical control schematics in accordance with NFPA 79.

e. Plan showing equipment layout in each area.

6. Field piping diagrams shall include the following:
a. Piping sizes and types.
b. Location, functional name and manufacturer's designation of items to which piping is connected.

7. Instrument loop diagrams for all analog display, control and I/O loops prepared using ISA standard symbols in accordance with ISA 5.4 shall include the following:
a. Instrument tag numbers from Contract Documents.
b. Functional name of each item.
c. Manufacturer's model, product, or catalog number for each item.
d. Location of each item.
e. Showing loop diagrams as part of the Control Panel layout will not be accepted as a substitution.

8. Logic Diagrams such as function block diagrams that illustrate the logic and sequencing of control functions programmed into the PLC. Show relationship between input signals, output actions, timers, and other control elements. Showing logic diagrams as part of the Control Panel layout will not be accepted as a substitution.

9. ISA Data Sheets:

a. ISA Data Sheets shall comply with ISA–TR20.00.01–2001 requirements and shall be computer generated.

b. All field and panel instruments ISA Data Sheets shall contain the following information, as a minimum.

1) Tag number in accordance with Section 40 96 20 – Pump Monitor and Control System Instrument Index and Contract Drawings.

2) Product (item) name used herein and on the Contract Drawings.

3) Name of manufacturer or supplier.

4) Manufacturer's complete model number.

5) Location of the device.

6) Input-output characteristics.

7) Range, size, and graduations.

8) Physical size with dimensions, NEMA enclosure classification and mounting details.

9) Materials of construction of all components.

10) Instrument or control device sizing calculations, where applicable.

11) Certified calibration data on all flow metering devices, where applicable.

12) Environmental requirements during storage and operation.

10. PMCS I/O Loop Wiring Diagrams

a. Contractor shall prepare drawings on a module-by-module basis and include the following information:

1) Rack numbers, slot number, module type and module terminal point numbers. Also, include location and identification of all intermediate panel terminal block and strip numbers to which I/O wiring and power supply wiring is connected. Identify all power supply circuit numbers and ratings.

2) Wiring sizes, types, wire numbers and color-coding.

3) Location, functional name, tag numbers and manufacturer model numbers of panel and field devices and instruments to which I/O wiring is connected. For discrete I/O devices, use JIC electrical symbols tagged with designation shown on P&IDs.

11. System Software Documentation: Prepare and submit two copies of preliminary software documentation at least four (4) weeks prior to expected initiation of factory testing as specified in Section 40 80 81, PMCS Factory Testing. Submittal shall be for information only and

shall not be subject to formal approval. Software documentation shall be available as physical and digital format with all required software and licenses provided and shall include the following as a minimum:

a. Complete hard copies of all ladder diagram programming. Documentation shall include complete external and internal I/O coil, contact and signal cross-referencing, addressing and rung numbering. Documentation shall clearly distinguish between internal and real I/O and shall also incorporate extensive English language to identify contact, coil and signal functions and for labeling and description of program, sub-program and rung purpose and action.

b. Complete listing of external and internal I/O address assignments, register assignments and preset constant values along with unused/undefined I/O and data table registers available.

c. Complete hard copies of all program documentation for all types of programs.

d. Detailed system memory map defining memory segments used and spare memory segments available for system memory, I/O tables, Data Tables, and control program.

e. Complete database listing including listings for log, report, and alarm file setups.

f. Hard copies of all system graphic displays for formats for all logs, reports, and the alarm summary.

g. User's manuals describing procedures and providing examples for use of operator's consoles, workstations and programming terminal, accessories, and system utility routines to perform control, display and logging program generation, program modification, program verification, diagnostics, program documentation, loading and backup and other required system support functions.

h. Graphic displays: Submit samples of each type of display.

E. The Contractor shall include a submittal of related PMCS record drawings, the furnishings of licenses for plant personnel to allow changes of software, settings, and include the furnishing of Operations and Maintenance Manuals.

F. Spare Parts and Test Equipment:

1. General:

a. Furnish the spare parts and test equipment in accordance with the Contract Documents, identical to and interchangeable with similar

materials and equipment provided for the Process Control System under the Contract.

b. Provide source quality control for spare parts as part of factory testing prior to shipment of process control system equipment.

c. For process sensors and other analog instruments, the Supplier shall submit a separate quotation for recommended list of spare parts and test equipment. Separately list and price each item recommended. Upon request, Supplier shall submit documentation that stock of spare parts and test equipment is obtainable within 48 hours of receipt of City's order.

2. Furnish the following spare parts:

a. Ten (10) of each type of Input/Output relay for each quantity of forty or fraction thereof provided under the Contract.

b. Two (2) of each type of PLC Input/Output module or card used.

c. Two (2) spare processor for each type of PLC used.

d. Two (2) replacement power supply for each type and size provided under the Contract.

e. Two-year supply of all expendable or consumable materials.

f. Two (2) per quantity of five (5) or fraction thereof of gauges, indicators, and switches provided, complete with diaphragm seals, filled and ready to use.

g. Two (2) per quantity of ten (10) or fraction thereof provided, per range of field instruments. No spares are required for inline instruments such as magnetic flow meters through which flow is conveyed.

h. Twelve (12) of each type and size of fuse used in instruments.

3. Furnish the following test equipment:

a. Four (4) Fluke, Hewlett-Packard, or approved equal (latest in series) digital multimeter plus amp probe, high-voltage probe, test leads, case, and other recommended spares and accessories.

b. Two (2) of each set of special tools required to insert, extract, and connect internal or external connectors, including edge connectors.

c. Two (2) sets of special calibration equipment required for system calibration.

d. Two (2) signal simulators (4 to 20 mADC; 1 to 5 VDC), including case. One simulator shall be battery-powered and shall include charger.

e. Two (2) portable flow meter calibrator, for magnetic flow meter use only.

G. PMCS Operation and Maintenance (O&M) Manuals

1. The Contractor shall furnish O&M manuals for the PMCS in accordance with the Section 01 78 25 – Operation and Maintenance Manuals, this Section and the following minimum requirements:

a. Name, address and telephone number of the PMCS Supplier's local service representative.

b. Complete list of supplied system hardware parts with full model numbers referred to system part designations, including spare parts and test equipment provided.

c. Copy of all approved submittal information and system shop drawings as specified herein with corrections made to reflect actual system as tested and delivered to the site for installation.

d. Half-size black line reproductions shall be provided for all shop drawings larger than 11 by 17 inches.

e. All drawings shall be 11 by 17 inches minimum size.

1) Drawings 8-1/2 by 11 inches are not acceptable.

f. Manufacturer's Original Copies of Hardware, Software and Installation, Assembly and Operations Manuals for the PMCS central monitoring station and peripheral devices, and all other control system components.

g. Manuals shall include the following information:

1) General descriptive information covering the basic features of the equipment

2) Physical description covering layout and installation requirements and all environmental constraints.

3) Functional and operational descriptions covering the procedures for programming, operation, start-up, shutdown, and calibration of the distributed control system equipment and explaining how the various control functions are performed.

4) Principles of operation explaining the logic of operation; provide information covering operation to a component level.

5) Maintenance procedures covering checkout, troubleshooting, and servicing.

a) Checkout procedures shall provide the means to verify the satisfactory operation of equipment,

b) Troubleshooting procedures shall serve as a guide in determining faulty components and

c) Servicing procedure shall cover requirements and recommended time schedule for calibration, cleaning, lubrication and other housekeeping and preventive maintenance procedures.

6) As-Built wiring, schematic and logic diagrams.

7) Safety considerations relating to operation and maintenance procedures.

H. Record Drawings and Documentation

1. The Contractor shall require the System supplier to revise all system shop drawings, submittals and software documentation to reflect as-built conditions in accordance with the requirements of the Contract Documents and the supplemental requirements.

2. All revised shop drawings and documentation shall be submitted to the Engineer per Section 01 78 40 – Final Record Documents to replace outdated drawings and documentation contained in the system O&M Manuals.

3. Half-size black line sets shall be provided for all drawings larger than 11 x 17. Specific instructions for outdated drawing removal and replacement shall be provided with the record drawing submittal.

4. Half-size black line prints of wiring diagrams applicable to each control panel shall be provided inside a clear plastic envelope and stored in a suitable print pocket or container inside each control panel.

I. Reports:

1. The following report shall be submitted shall be submitted to the Engineer:

a. Factory Test Reports as specified in Section 40 80 81 - PMCS Factory Testing.

b. Installation Inspection, Field Calibration, and Field Testing. Reports, as specified in Section 40 80 82 - PMCS Factory Testing.

c. Training as specified in Section 40 61 26 – PMCS Training.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The PMCS equipment shall be delivered, stored and handled in accordance with the Sections listed under Related Specification of this Section, the Specifications, the manufacturer’s recommendations and the following:

1. PMCS equipment shall be packaged at the factory prior to shipment to site, to protect each item from damage during shipment and storage.
2. Containers shall be protected against impact, abrasion, corrosion, discoloration and/or other damages.
3. Clearly label contents of each container and provide information on the required storage conditions necessary for the equipment.
4. PMCS equipment shall be inspected for shipping damage or loose parts when received.
5. Evidence of water which may have entered equipment during transit shall be checked.
6. PMCS equipment shall be lifted, rolled or jacked into locations shown on the Contract Drawings.
7. PMCS equipment shall be stored in a clean, dry location in which a uniform temperature is maintained.
8. PMCS equipment shall be protected in storage with suitable covering and air circulation maintained to ensure the equipment is kept dry and free from condensation.
9. Where dampness or condensation may be encountered, heaters shall be provided for equipment to prevent moisture damage.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall furnish and deliver to the Engineer, at that part of the site and at such time as the Engineer may direct, spare parts for the PMCS in accordance with the Sections listed under Related Specifications of this Section.

B. The spare parts shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the manufacturer's part number with complete information for use and reordering.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. PMCS/s shall be as manufactured by:

1. Optimum Controls Corp, Reading, PA;
2. PCS Systems Integrators, Fairfield, NJ.

3. A.K. De Rama Industrial Control System Inc., Mountainside, NJ.
4. Avantech, Inc., Columbia, SC.
5. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Design Criteria

1. Power Supplies:

a. All electrically powered equipment and devices shall be suitable for operation on 115-volt +/- 10 percent, 60 Hz. If a different voltage or closer regulation is required, a suitable regulator or transformer shall be provided.

b. Appropriate power supplies shall be furnished by the Contractor for all two (2) wire transmitters, loops for monitoring discrete inputs and all necessary outputs.

c. Power supplies shall be mounted in enclosures and installed in the appropriate indoor or field panel.

d. Power supplies shall be sized adequately for signal converter and repeater loads.

e. Design all power supplies for a minimum of 130 percent of the maximum simultaneous current draw.

f. A power on-off switch or an air circuit breaker shall be furnished for each item requiring electrical power.

g. Provide isolation transformers, line voltage regulators and power distribution panels for the distributed digital portions of the PMCS to eliminate electrical noise and/or transients entering on the primary power line.

2. Signal Requirements

a. The control system shall be designed to use 4 to 20 mA DC analog signals, unless otherwise specified.

b. Signal converters and repeaters shall be provided where required and in addition analog inputs to the distributed control system shall be through appropriate repeaters to provide signal isolation where series looped with other devices and to allow the loop to maintain integrity even if the distributed control system is out of service.

c. Signals shall be isolated from ground.

d. Signals shall not have a transient dc voltage exceeding 300 volts over one millisecond nor a dc component over 300 volts.

e. Equipment ranges, scales and set-point values specified in Division 40 and as shown on the P&IDs are for initial setting and

configuration. Contractor shall coordinate these values with actual equipment furnished to implement proper and stable process action as systems are placed in operation.

f. For any items where ranges, scales and set-points may not have been specified, Contractor shall submit a recommendation to the Engineer for review and approval.

g. Design all logic and control loops for fail-safe operation.

h. Surge protection shall be provided for all PMCS and all other control system components which could be damaged by electrical surges.

i. The system and associated Input/Output wiring will be used in a Plant environment where there can be high energy ac fields, dc control pulses, and varying ground potentials between the sensors/transducers or input contact locations and the system components. The system design shall be adequate to provide proper protection against interference from all such possible situations.

B. Miscellaneous:

1. All PMCS components shall be heavy-duty types, designed for continuous service in a Combined Sewage Overflow Plant environment.

2. All equipment provided are to be of Modular construction and to be capable of field expansion through the installation of plug-in circuit cards and additional cabinets as necessary.

3. All instrumentation and PMCS components shall be designed to return automatically to accurate measurement within 15 seconds upon restoration of power after a power failure or when transferred to standby power supply.

4. All field-mounted instruments and system components shall be designed for installation in humid and corrosive service conditions.

5. All field mounted cabinets, instrument enclosures, junction boxes and appurtenances shall conform to NEMA 4X requirements and be made of 12 gage 316 stainless steel, unless otherwise specified. For Class 1 Division 1 or Division 2 locations, provide NEMA 7. Unless otherwise stated, all transmitters installed outdoors shall be mounted in thermostatically heated enclosures.

6. All relays with interconnections to field devices shall be wired through terminal blocks. Terminals as part of the relay base are not an acceptable alternate.

7. All panel mounted instruments, switches, and other devices shall be selected and arranged to present a pleasing coordinated appearance. All panel door mounted devices shall be of the same manufacturer and model line.

8. Ranges and scales specified herein shall be coordinated to suit equipment actually furnished.

9. All components furnished, including field and rear of panel instruments, shall be tagged with the item number and nomenclature indicated on the Contract Documents and/or approved Shop Drawings.

10. All instruments and devices shall be tagged with the associated tag number from the Instrument List and/or Instrument Data Sheets.

11. All I/O shall be tagged with the associated tag number from the I/O List.

12. All PLCs, I/O racks, and all networking equipment shall be tagged with a unique identification tag number which will be provided to the Contractor as a numbering range system for the affected equipment.

13. Tag numbers for sensors and field instruments shall be as listed on the Contract Drawings and Instrument List/Instrument Data Sheets. The prefix shall be included with ISA Tag Number.

14. The identifying tag number shall be permanently etched or embossed onto a stainless-steel tag which shall be fastened to the device housing with stainless-steel rivets or self-tapping screws of appropriate size.

15. Where neither of the above fastenings can be accomplished, tags shall be permanently attached to the device by a circlet of 1/16-inch diameter stainless-steel wire rope.

16. All sensors and field instruments mounted on or within panels shall have the stainless-steel identification tag installed so that the numbers are easily visible to the service personnel.

17. Field-mounted devices shall be treated with an anti-fungus spray.

18. Field-mounted devices shall be protected from exposure to freezing temperatures.

C. System Designs:

1. Range, scale, and setpoint values specified in other Division 40 Sections are for initial setting and configuration. The Contractor shall coordinate these values with actual equipment furnished to implement proper and stable process action as systems are placed in operation.

2. For any items where ranges, scales, and setpoints may not have been specified, the Contractor shall submit a recommendation for review and approval.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Control Strategies

1. Functional descriptions of all monitoring and control sequences for the PMCS shall be as specified in Section 40 61 96 - PMCS Control Strategies.

2. The general guidance on how the control strategies shall be implemented in the PMCS shall be as specified in Section 40 61 95 – PMCS Monitoring and Control Criteria.

B. PLCs and HMIs

1. Programmable Logic Controllers and HMIs for the PMCS shall be as specified in Section 40 63 43 - PMCS Programmable Logic Controllers.

C. Network Equipment

1. Networking Equipment including ethernet switches and cellular modems shall be as specified in Section 40 63 53 – PMCS Network Equipment.

D. Panels and Enclosures

1. Panels and Enclosure for the PMCS shall be as specified in Section 40 67 16 - PMCS Panels and Enclosures.

E. Panel Mounted and Field Instruments

1. Instruments and Devices installed on panels and in the field for the PMCS shall be as specified in Section 40 78 90 - PMCS Panel Mounted Instruments and Devices.

2. Standalone instruments and devices for the PMCS shall be as specified in Section 40 79 91 - PMCS Field Instruments.

F. Lists and Index

1. PMCS I/O shall be as specified in Section 40 61 93 – PMCS Input Output List.

2. The list of instruments, their ranges, Tag Numbers, and P&ID shall be as specified in Section 40 61 94 – PMCS Instrument Index.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Factory Tests

1. Factory testing for the PMCS shall be as specified in Section 40 80 81 – PMCS Factory Testing.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Testing

1. Field Testing for the PMCS shall be as specified in Section 40 80 82 – PMCS Startup and Field Testing

B. Training

1. Training on the operation and Maintenance of the PMCS shall be as specified in Section 40 61 26 – PMCS Training.

3.04 STARTUP / DEMONSTRATION

A. Operational Availability

1. The system test and Operational availability of the PMCS shall be as specified in Section 40 80 82 – PMCS Startup and Field Testing.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and coordinate all required training at times acceptable to the City and the Engineer.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 75 10 - Preliminary and Final Field Test

B. Section 01 79 05 - Equipment Startup and Training

C. Section 28 00 00 - Closed Circuit Television Surveillance System

D. Section 40 61 13 - PMCS General Requirements

E. Section 40 61 93 - PMCS Input Output List
F. Section 40 61 94 - PMCS Instrument Index
G. Section 40 61 95 - PMCS Monitoring and Control Criteria
H. Section 40 61 96 - PMCS Control Strategies
I. Section 40 63 43 - PMCS Programmable Logic Controllers
J. Section 40 63 53 - PMCS Network Equipment
K. Section 40 67 16 - PMCS Panels and Enclosures
L. Section 40 70 01 - Measurement
M. Section 40 78 90 - PMCS Panel Mounted Instruments and Devices
N. Section 40 79 91 - PMCS Field Instruments
O. Section 40 80 81 - PMCS Factory Testing
P. Section 40 80 82 - PMCS Startup and Field Testing

1.04 REFERENCES

A. Definitions

1. Section 40 61 13 – PMCS General Requirements defines the terms abbreviations used in this Section and the PMCS.

B. Reference Standards

1. Section 40 61 13 – PMCS General Requirements lists the standards applicable to the PMCS.

1.05 DESCRIPTION

A. General

1. The Contractor shall retain the services of the PMCS Supplier to provide and perform standardized, structured training courses on site and off site, as specified in this Section, and the Specifications covering both operation and maintenance of the PMCS equipment.

2. For equipment items not manufactured by the Supplier(s), Supplier shall provide on-site training by an authorized representative of the equipment manufacturer as part of their services. The manufacturer's representative shall be fully knowledgeable in the operation and maintenance of the equipment.

3. The Contractor shall be responsible for all costs associated with training and shall provide all required materials including training facility rental, computers, simulators, texts and required supplies.

4. On-Site Training

a. On-site training shall be within the building where the PMCS will be installed.

b. On-site training shall make extensive use of the installed PMCS to ensure Plant personnel develop an enhanced understanding and level of comfort with the PMCS.

c. On-site training submittals which in the opinion of the Engineer does not meet the objectives stated in this Section and the Specifications shall be rejected.

5. Off-site Training

a. Off-site training shall be conducted at an approved facility within a 10-mile radius of the Contract site.

b. The training facility shall be staffed with regular full-time training instructors.

c. If a the PMCS Supplier does not have a training facility with a ten-mile radius of the Contract Site a suitable facility shall be rented.

d. Off-site training submittals which in the opinion of the Engineer does not meet the objectives stated in this Section and the Specifications shall be rejected.

6. All training, except Follow-up Training specified in this Section, shall be scheduled so that it is completed prior to Acceptance of the PMCS by the City.

7. The City will send the following personnel to attend training courses:

a. Operations Training – 4 persons min

b. Maintenance Training - 4 persons

c. Supervisor Training - 4 persons

d. Engineer Training - 4 persons

8. All training shall be conducted during the hours of 8:00 AM to 12:00 PM until the conclusion of the training course.

9. All training sessions shall be provided twice and shall be scheduled by the City to accommodate their shift schedule.

1.06 QUALITY ASSURANCE

A. General:

1. For equipment items not manufactured by the PMCS Supplier, the PMCS Supplier shall provide for training by an authorized representative of the equipment manufacturer as part of PMCS Supplier services.

2. The manufacturer’s representative shall be fully knowledgeable in the operation and maintenance of the equipment.

B. PMCS Supplier's Training Qualifications

1. Section 40 61 13 – PMCS General Requirements specifies the PMCS Supplier’s training qualifications.

C. PMCS Supplier's Training Responsibility:

1. Section 40 61 13 – PMCS General Requirements specifies the PMCS Supplier's training responsibility.

D. PMCS Supplier Training Personnel

1. The Contractor shall require the System Supplier to provide the following training personnel:

a. Lead Trainer

1) The System Supplier shall appoint a Lead Trainer who shall coordinate, schedule and conduct all work and assure that the Training schedule is met.

2) The Lead Trainer shall have a minimum of five (5) years' experience in coordination, scheduling and delivery of instrumentation and control training at/under similar Plant Facilities as this Contract including a thorough working knowledge of training administration as both a prime and sub-prime Vendor/Contractor.

3) The Lead Trainer shall be the PMCS Supplier's liaison with the Contractor for all PMCS training requirements and shall assist in all matters required for proper coordination and interfacing of the training with the City.

1.07 SUBMITTALS

A. Shop Drawings General

1. Once all submittals of the proposed systems and equipment have been approved, including Functional Descriptions, Control Panels, Field Instruments, and all related Equipment, the Contractor shall submit for approval of the Engineer, Shop Drawings detailing the proposed plan for training, including but not limited to all course outlines and schedules.

2. Shop Drawing preparation shall not commence until after the pre-submittal specified in Section 40 61 13 – PMCS General Requirements.

3. Shop Drawings shall be submitted in complete packages grouped to permit review of related items as generally outlined in this Section.

B. Reports:

1. Training reports shall be submitted to the Engineer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The PMCS training equipment and materials shall be delivered, stored and handled in accordance with this Section, the Specifications, the PMCS Supplier's recommendations and the following:

1. PMCS training equipment and material shall be packaged to protect each item from damage during shipment and storage.

2. Containers shall be protected against impact, abrasion, corrosion, discoloration and/or other damages.
3. Clearly label contents of each container and provide information on the required storage conditions necessary for the equipment and materials.
4. PMCS training equipment and materials shall be inspected for shipping damage or loose parts when received.
5. Evidence of water which may have entered equipment during transit shall be checked.
6. PMCS training equipment and materials shall be stored in a clean dry location in which a uniform temperature is maintained.
7. PMCS training equipment and materials shall be protected in storage with suitable covering and air circulation maintained to ensure the equipment and materials are kept dry and free from condensation.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. PMCS Training shall be as delivered by the approved PMCS Supplier.

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 APPLICATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Training of Plant Personnel

1. Operator Training

a. Provide an 8 hour (2 days, 4 hours per day) course covering the structure and the functions of the PMCS, its components and devices.

b. The course shall familiarize the Operator with the procedures for applying the PMCS to process control situations or scenarios and develop operator issue resolution capability.

c. The Contractor shall rent and install a computer projector for the training sessions. The projector shall be suitable for HDTV sources utilizing HDMI for connectivity.

d. As a minimum, the course shall cover the following topics:

1) Overview of PMCS functional capabilities.

2) Equipment overview including PMCS component functions, operating principles and proper use.

3) Loading and start-up of the digital system hardware components.

4) Use of PMCS commands.

5) Development of programs and control schemes.

6) Development and use of system displays.

7) Programming concepts and techniques.

8) Use of bulk storage device for system backup.

9) The training shall familiarize staff with HMI, overlays, navigation, alarm pages, trend displays, startup/shutdown procedures, emergency responses to faults/malfunctions/upsets and process events.

2. Maintenance Training Course:

a. Provide 8 hours (2 days, 4 hours) course covering preventive and troubleshooting maintenance for the PMCS components.

b. The course shall familiarize the maintenance personnel with diagnostic capabilities of the system, both software and hardware, and also the routine maintenance procedures on the system and the common peripheral devices.

c. As a minimum the course shall cover the following topics:

1) PMCS overview description including the power subsystems and logic components of the processor bus.

2) Description of the maintenance and troubleshooting aids of the system including software diagnostic programs.

3) Description of all bus operations.

4) Description of peripheral and process interface devices.

5) The use of hardware diagnostic routines, test equipment and test procedures as required to enable the City's personnel to detect and isolate system faults to the circuit board or module level and to implement repairs by replacing failed circuit boards or modules.

6) Instruction for PLC hardware maintenance, troubleshooting, and maintenance planning.

3. Supervisor/Engineer Training

a. Provide an 8-hour (2 days, 4 hours) manufacturer's standard training in the use and configuration of the PMCS HMI software.

b. An instructor certified by the software manufacturer to furnish such training shall perform this training.

c. The course shall be structured as follows:

1) Fundamentals

a) One two-day course (minimum) shall be provided which shall serve as a PMCS familiarization course for project management personnel, engineers, and key operating/maintenance personnel.

b) This course shall be a prerequisite for the advanced course.

2) Advanced

a) One three-day (minimum) PMCS configuration and operating course shall be provided.

b) The level of training shall be sufficient to familiarize the City personnel with the configuration and application of all PMCS programs.

c) All essential system operating procedures shall be described as required to enable the City personnel to operate and configure the PMCS via all interfaces such as Work Stations, Large Display Screens and local control panels.

d. Upon completion of the training the City personnel shall be able to make modification to Control Strategies and have them run in the PMCS.

e. Training shall be provided in the following subjects:

1) At a minimum, include:

a) System overview and capabilities

b) Database configuration

c) Graphic display configuration, including linking of data to displays

d) Historical data configuration (collection, manipulation, and display)

e) Real-time and historical trending

f) Report configuration, generation, printing, and customization

g) System security

h) I/O driver and configuration

i) System back-up and recovery

j) Dynamic Data Exchange (DDE) linking, where applicable

k) System command language

l) Trouble-shooting

m) System optimization

n) System start-up and shutdown procedures

o) LAN and WAN communications, as appropriate

p) Cellular Communications

B. On-Site Training

1. Primary Sensors/Transducers and Field Instruments: Provide on-site operation and maintenance training by Supplier(s) and the equipment manufacturer representatives prior to placing the equipment in continuous operation. The services of the equipment manufacturer's representatives shall be provided for a minimum of one (1) hour for each type of instrument provided.

2. Training shall accomplish the following:

a. Provide instruction covering the use and operation of the equipment to perform the intended functions.

b. Provide instruction covering procedures for routine, preventative, and troubleshooting maintenance including equipment calibration.

c. Explain procedures for placing the equipment in and out of operation and explain necessary actions and precautions to be taken regarding the overall plant monitoring and control system.

3. Training Covering Control Equipment:

a. The Supplier(s) shall provide a two (2) day, eight (8) hours per day of operations sessions training covering all system components.

b. Training session shall accomplish the following:

1) Operators:

a) Provide all instructions necessary to operate and utilize all system components.

b) Provide all instruction necessary to monitor and control the system processes from the designated control panel for each panel.

c) Explain procedures for control of the system during scheduled or rescheduled shutdown and the subsequent startup.

d) Provide instructions for regular care-taking operations.

2) Maintenance:

a) Same training as specified above for Operators.

b) Hands on Repair Instruction.

c) Use of test equipment to troubleshoot.

C. Follow-up Training

1. The PMCS Supplier shall provide operation and maintenance training covering all PMCS equipment provided.

2. The Follow-up Training shall take place after Acceptance of the PMCS by the City but prior to Substantial Completion.

3. The Follow-up Training shall repeat the On-Site Training specified in this Section.

4. The Follow-up Training shall in addition, target those areas of PMCS equipment where Plant personnel have highlighted either operational or maintenance issues.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 40 61 93 – INPUT/OUTPUT LIST
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the I/O point list and requirements for configuring the PMCS databases.

B. The following index of this Section is presented for convenience:

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3.06	INPUT/OUTPUT LIST TABLE	7

C. The I/O List is given in a table after the "End of Section" and is available from the Engineer on electronic media. Allow 30 days from request to delivery of media.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 40 61 13 - PMCS General Requirements

B. Section 40 61 26 - PMCS Training

C. Section 40 61 94 - PMCS Instrument Index

D. Section 40 61 95 - PMCS Monitoring and Control Criteria
E. Section 40 61 96 - PMCS Control Strategies
F. Section 40 63 43 - PMCS Programmable Logic Controllers
G. Section 40 63 53 - PMCS Network Equipment
H. Section 40 67 16 - PMCS Panels and Enclosures
I. Section 40 70 01 - Measurement
J. Section 40 78 90 - PMCS Panel Mounted Instruments and Devices
K. Section 40 79 91 - PMCS Field Instruments
L. Section 40 80 81 - PMCS Factory Testing
M. Section 40 80 82 - PMCS Startup and Field Testing

1.04 REFERENCES

A. Definitions

1. I/O – Input/Output
2. SFT – Start-up and Field Testing.
3. OAD – Operational Availability Demonstration.
4. URT – Upset and Recovery Testing.
5. WFAT - Witnessed Factory Acceptance Tests.
6. Section 40 61 13 – PMCS General Requirements defines the terms and abbreviations used in this Section and the PMCS.

B. Reference Standards

1. Section 40 61 13 – PMCS General Requirements lists the standards applicable to this Section and the PMCS.

1.05 DESCRIPTION

A. General

1. The I/O point list shall be used to configure the I/O interface hardware of all controllers of the PMCS.
2. The listing includes information on signal functions, signal ranges and range conversions.
3. As a minimum, the Contractor shall provide all hardware [and software] to provide the I/O points listed in the accompanying I/O List as indicated in the Contract documents and as required.
4. The Contractor shall furnish and install as spares, twenty-five (25) percent of each type of I/O of the listed I/O point hardware.

5. The Contractor shall furnish and install spare hardware and fully configure all spare points into the PMCS databases, displays, trends, alarms and controllers.

6. All I/O points designated as spares shall be completely prewired to equipment and panel terminal blocks such that only field connections need to be complete when the I/O is activated.

B. I/O List Column Headings

1. NO or Ref NO or Item NO – is a sequential number starting with a discrete number used to order the entries in the I/O List and permitting the list to sorted and resorted to its original order.

2. TAG NUMBER – is an alpha numeric character string used to identify the I/O point and laid out as follows ISA_###_Y where:

   a. ISA – is the functional identifier of the I/O and follows ISA 5.1.

      1) ISA identifiers will be provided with the I/O Lists.

   b. ### - is a 3-digit number identifying the loop or field device.

   c. Y – is a digit or letter identifying duplicate instruments or devices on the same loop.

3. I/O Type is a two letter describing the I/O as follows:

   a. AI designates an analog input (4 to 20 mA DC).

   b. AO designates an analog output (4 to 20 mA DC).

   c. DI designates a discrete input.

   d. DO designates a momentary, maintained or latched discrete output.

   e. ETH designates ethernet communication.

4. DESCRIPTION – is an alphanumeric string that describes the I/O Point such as:

   a. Sodium Hypochlorite Transfer Pump No. 1 Running

   b. Sodium Bisulfite Storage Tank No. 2 Level

5. SIGNAL FROM – is an alphanumeric string that describes the equipment where the signal originates from.

6. SIGNAL TO – is the listing of the physical location of the instrument or device generating the I/O Point.

7. P&ID NUMBER – is the listing of the P&ID Drawing where the I/O point can be found.

8. REMARKS – can be used for supplementary information or to cross-reference information.

1.06 QUALITY ASSURANCE

A. The Contractor shall comply with the Quality Assurance requirements listed in Section 40 61 13 – PMCS General Requirements, this Section and the Specifications.

B. The Contractor shall not commence production of database until the configuration of all I/O points has been approved by the Engineer.

C. For each I/O attribute listed in the I/O list which cannot be used exactly as listed, submit an explanation of the reason for the deviation and propose a method to modify the I/O list information.

D. I/O information specific to all controllers shall in addition be submitted with the submittal covering that controller.

E. I/O Lists shall be kept current, updated regularly and shall be available for inspection by the City at the project site.

1.07 SUBMITTALS

A. The Contractor shall comply with submittal requirements listed in Section 40 61 13 – PMCS General Requirements, this Section and the Specifications.

B. Contractor shall submit all I/O lists and schedules for the approval of the Engineer.

C. The Contractor is solely responsible for the timing of I/O listing submittal to enable approval by the Engineer and subsequent use by the PMCS Supplier.

D. The Contractor shall create, maintain and submit for review, an updated I/O Listing of all device, instruments and I/O points.

E. Submittal shall be made at least 90 days in advance of any proposed use by the PMCS Supplier.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall comply with delivery, storage and handling requirements listed in Section 40 61 13 – PMCS General Requirements.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. PMCS I/O Lists shall be implemented by the PMCS Supplier.

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. PMCS Factory Test shall conform to the requirements of Section 40 80 81 – PMCS Factory Tests.

B. Section 40 80 81 details how the configuration of I/O specified under this Section shall be verified against approved submittals.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 APPLICATION

A. I/O Configuration

1. Implement the control system database fields in a consistent manner by using the following procedures:

a. Use abbreviations and acronyms already established in the Contract Documents.

b. In particular use the information in the I/O List.

c. Use only abbreviation or acronym for a word or group of words respectively.

d. Use the same subject and word order within data fields.

e. Use the same term (either phrase, word or acronym) to denote the same meaning.

f. Do not use multiple terms for a single meaning.

g. Use the point names, descriptions, logic state descriptions, ranges and units of measurement exactly wherever the point is referenced.

h. Show point names and descriptions for all point references on documentation.

i. Spell correctly.

j. Maintain lists of acronyms and abbreviations used.

B. I/O Hardware Configuration

1. Partition the I/O among cards within an I/O enclosure to provide control loop integrity.

a. Put all inputs of the same I/O type associated with a device (e.g. pump, blower, clarifier or other piece of equipment) on the same card.

b. Put all inputs of the same I/O type for devices arranged in process trains (e.g. a pump, its inlet valve and its outlet valve, or a pump and its associated macerator) on the same card or cards if more than one card is needed to accommodate the points.

c. Put all outputs of the same I/O type associated with a device or group of devices in a process train on the same card.

d. Where the preceding requirements specified in this subparagraph would cause more than 20 percent spare points on a card, points for a device or process train may be split between two consecutive cards.

e. Make unused terminals resulting from partitioning the I/O into pre-wired spares.

f. Provide pre-wired spare points with all cabling and termination internal to controllers as done for other I/O points.

C. Spares Utilization

1. If I/O is added by change order, incorporate pre-wired spare points into the active point data base at no increase in Contract price.

a. Include changing point names, descriptions, ranges, or statuses from spare to the new point.

b. Include adding points to group displays and summary displays.

c. Include related documentation changes.

2. Spares utilization will be subject to the following limitations:

a. The incorporation will not alter the control software configuration except to make the point accessible to displays, reports and future control software configuration.

b. The incorporation will not alter the local area panels or field wiring to the device.

c. Additions will not increase the size of reports or number of displays beyond that specified.

d. The change will not be made subsequent to the controller shop drawing approval for a given process area.

3. Treat changing of active points to spare points in the same manner as incorporation of spares.

D. Point Data Fields

1. I/O point data fields will be subject to review and modification by the Engineer during the shop drawing review phase.

2. Incorporate changes directed by the Engineer completely into the entire system at no increase in Contract price subject to the following limitations:

3. Limit the total number of modifications to 20 percent of the total number of I/O points.

4. Each unique change will count as one modification. For example, modifying the description, range, and engineering unit on an analog input count as 3 modifications.

5. Analog input alarm limit definition will not be counted as a modification.

3.03 FIELD TESTING / QUALITY CONTROL

A. PMCS Field Testing shall conform to the requirements of Section 40 80 82 – PMCS Startup and Field Testing.

B. Section 40 80 82 details how the configuration of I/O specified under this Section shall be verified during Field Testing.

3.04 STARTUP / DEMONSTRATION

A. Section 40 80 82 – PMCS Startup and Field Testing details the requirements for OAD and PMCS Upset and Recovery Testing.

B. The OAD and the PMCS Upset and Recovery Testing shall serve as the final verification of the configuration of all PMCS I/O.

C. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

INPUT/OUTPUT LIST TABLE
Input/Output List Table is included as an attachment to this Section following the "End of Section".

END OF SECTION

NO.	TAG NUMBER	I/O TYPE	DESCRIPTION	HARD WIRED I/O		P&ID NUMBER	REMARKS
				SIGNAL FROM	SIGNAL TO		
1	FI-101	AI	CHANNEL NO. 1 MASTER FLOW	FIT-101	MCP-10	I-101.00	
2	LI-101A	AI	CHANNEL NO. 1 LEVEL	FIT-101	MCP-10	I-101.00	
3	VI-101A	AI	CHANNEL NO. 1 VELOCITY	FIT-101	MCP-10	I-101.00	
4	LI-101B	AI	CHANNEL NO. 1 SURCHARGE LEVEL	FIT-101	MCP-10	I-101.00	
5	VI-101B	AI	CHANNEL NO. 1 SURCHARGE VELOCITY	FIT-101	MCP-10	I-101.00	
6	FI-103	AI	CHANNEL NO. 2 MASTER FLOW	FIT-103	MCP-10	I-101.00	
7	LI-103A	AI	CHANNEL NO. 2 LEVEL	FIT-103	MCP-10	I-101.00	
8	VI-103A	AI	CHANNEL NO. 2 VELOCITY	FIT-103	MCP-10	I-101.00	
9	LI-103B	AI	CHANNEL NO. 2 SURCHARGE LEVEL	FIT-103	MCP-10	I-101.00	
10	VI-103B	AI	CHANNEL NO. 2 SURCHARGE VELOCITY	FIT-103	MCP-10	I-101.00	
11	LI-105	AI	STORAGE CELL NO. 7 LEVEL	PIT-105	MCP-10	I-101.00	
12	LI-106	AI	STORAGE CELL NO. 15 LEVEL	PIT-106	MCP-10	I-101.00	
13	YIL-110	DI	FBCSO-SMP-1 RUNNING	FBCSO-SMP-1 MCC	MCP-10	I-101.00	
14	ZIL-110	DI	FBCSO-SMP-1 NOT IN REMOTE	FBCSO-SMP-1 MCC	MCP-10	I-101.00	
15	PAH-110	DI	FBCSO-SMP-1 DISCHARGE PRESSURE HIGH	FBCSO-SMP-1 MCC	MCP-10	I-101.00	
16	HS-110	DO	FBCSO-SMP-1 START/STOP COMMAND	MCP-10	FBCSO-SMP-1 MCC	I-101.00	
17	UA-110A	DI	FBCSO-SMP-1 FAULT	FBCSO-SMP-1 MCC	MCP-10	I-101.00	
18	UA-110B	DI	FBCSO-SMP-1 EMERGENCY STOP	FBCSO-SMP-1 MCC	MCP-10	I-101.00	
19	YIL-111	DI	FBCSO-STR-1 BACKWASH RUNNING	FBCSO-STR-1	MCP-10	I-101.00	
20	UA-111	DI	FBCSO-STR-1 STRAINER FAULT	FBCSO-STR-1	MCP-10	I-101.00	
21	FAL-112	DI	FBCSO-SMP-1 DISCHARGE NO FLOW DETECTED	FSL-112	MCP-10	I-101.00	
22	HSC-113	DO	FBCSO-SMP-1 THREE-WAY MOTORIZED VALVE CLOSE COMMAND	MCP-10	FBCSO-SMP-1 THREE-WAY MOTORIZED VALVE ACTUATOR	I-101.00	
23	HSO-113	DO	FBCSO-SMP-1 THREE-WAY MOTORIZED VALVE OPEN COMMAND	MCP-10	FBCSO-SMP-1 THREE-WAY MOTORIZED VALVE ACTUATOR	I-101.00	
24	AI-114	AI	FBCSO-SMP-1 TOTAL CHLORINE RESIDUAL	AIT-114	MCP-10	I-101.00	
25	UA-114	DI	FBCSO-SMP-1 TOTAL CHLORINE RESIDUAL FAULT	AIT-114	MCP-10	I-101.00	
26	YIL-115	DI	FBCSO-SMP-2 RUNNING	FBCSO-SMP-2 MCC	MCP-10	I-101.00	
27	ZIL-115	DI	FBCSO-SMP-2 NOT IN REMOTE	FBCSO-SMP-2 MCC	MCP-10	I-101.00	
28	PAH-115	DI	FBCSO-SMP-2 DISCHARGE PRESSURE HIGH	FBCSO-SMP-2 MCC	MCP-10	I-101.00	
29	HS-115	DO	FBCSO-SMP-2 START/STOP COMMAND	MCP-10	FBCSO-SMP-2 MCC	I-101.00	
30	UA-115A	DI	FBCSO-SMP-2 FAULT	FBCSO-SMP-2 MCC	MCP-10	I-101.00	
31	UA-115B	DI	FBCSO-SMP-2 EMERGENCY STOP	FBCSO-SMP-2 MCC	MCP-10	I-101.00	
32	YIL-116	DI	FBCSO-STR-1 BACKWASH RUNNING	FBCSO-STR-1	MCP-10	I-101.00	
33	UA-116	DI	FBCSO-STR-1 STRAINER FAULT	FBCSO-STR-1	MCP-10	I-101.00	
34	FAL-117	DI	FBCSO-SMP-2 DISCHARGE NO FLOW DETECTED	FSL-117	MCP-10	I-101.00	
35	HSC-118	DO	FBCSO-SMP-2 THREE-WAY MOTORIZED VALVE CLOSE COMMAND	MCP-10	FBCSO-SMP-2 THREE-WAY MOTORIZED VALVE ACTUATOR	I-101.00	
36	HSO-118	DO	FBCSO-SMP-2 THREE-WAY MOTORIZED VALVE OPEN COMMAND	MCP-10	FBCSO-SMP-2 THREE-WAY MOTORIZED VALVE ACTUATOR	I-101.00	
37	AI-119	AI	FBCSO-SMP-2 TOTAL CHLORINE RESIDUAL	AIT-119	MCP-10	I-101.00	

NO.	TAG NUMBER	I/O TYPE	DESCRIPTION	HARD WIRED I/O		P&ID NUMBER	REMARKS
				SIGNAL FROM	SIGNAL TO		
38	UA-119	DI	FBCSO-SMP-2 TOTAL CHLORINE RESIDUAL FAULT	AIT-119	MCP-10	I-101.00	
39	ZIO-120	DI	CHEMICAL TRANSFER DRAIN VALVE OPENED	HYPO-FP-10	MCP-10	I-102.00	
40	ZIC-120	DI	CHEMICAL TRANSFER DRAIN VALVE CLOSED	HYPO-FP-10	MCP-10	I-102.00	
41	HSO-120	DO	CHEMICAL TRANSFER DRAIN VALVE OPEN COMMAND	MCP-10	HYPO-FP-10	I-102.00	
42	HSC-120	DO	CHEMICAL TRANSFER DRAIN VALVE CLOSE COMMAND	MCP-10	HYPO-FP-10	I-102.00	
43	ZIL-120B	DI	CHEMICAL TRANSFER DRAIN VALVE FILL PANEL / SCADA SELECTION FEEDBACK	HYPO-FP-10	MCP-10	I-102.00	
44	YIL-121	DO	HYPO-T-1 AVAILABLE	MCP-10	HYPO-FP-10	I-102.00	
45	LI-121	AI	HYPO-T-1 LEVEL	LY-121	MCP-10	I-102.00	
46	UA-121	DI	HYPO-T-1 LOSS OF ECHO	YS-121	MCP-10	I-102.00	
47	LAH-121A	DI	HYPO-T-1 HIGH LEVEL ALARM	LSH-121	MCP-10	I-102.00	
48	LAH-121B	DO	HYPO-T-1 HIGH LEVEL ALARM	MCP-10	HYPO-FP-10	I-102.00	
49	FAH-122	DI	HYPO-T-1 OVER FLOW DETECTED	FSH-122	MCP-10	I-102.00	
50	ZIO-123	DI	HYPO-T-1 DISCHARGE VALVE OPENED	HYPO-T-1 DISCHARGE VALVE ACTUATOR	MCP-10	I-102.00	
51	ZIC-123	DI	HYPO-T-1 DISCHARGE VALVE CLOSED	HYPO-T-1 DISCHARGE VALVE ACTUATOR	MCP-10	I-102.00	
52	HSO-123	DO	HYPO-T-1 DISCHARGE VALVE OPEN COMMAND	MCP-10	HYPO-T-1 DISCHARGE VALVE ACTUATOR	I-102.00	
53	HSC-123	DO	HYPO-T-1 DISCHARGE VALVE CLOSE COMMAND	MCP-10	HYPO-T-1 DISCHARGE VALVE ACTUATOR	I-102.00	
54	YIL-124	DO	HYPO-T-2 AVAILABLE	MCP-10	HYPO-FP-10	I-102.00	
55	LI-124	AI	HYPO-T-2 LEVEL	LY-124	MCP-10	I-102.00	
56	UA-124	DI	HYPO-T-2 LOSS OF ECHO	YS-124	MCP-10	I-102.00	
57	LAH-124A	DI	HYPO-T-2 HIGH LEVEL ALARM	LSH-124	MCP-10	I-102.00	
58	LAH-124B	DO	HYPO-T-2 HIGH LEVEL ALARM	MCP-10	HYPO-FP-10	I-102.00	
59	FAH-125	DI	HYPO-T-2 OVER FLOW DETECTED	FSH-125	MCP-10	I-102.00	
60	ZIO-126	DI	HYPO-T-2 DISCHARGE VALVE OPENED	HYPO-T-2 DISCHARGE VALVE ACTUATOR	MCP-10	I-102.00	
61	ZIC-126	DI	HYPO-T-2 DISCHARGE VALVE CLOSED	HYPO-T-2 DISCHARGE VALVE ACTUATOR	MCP-10	I-102.00	
62	HSO-126	DO	HYPO-T-2 DISCHARGE VALVE OPEN COMMAND	MCP-10	HYPO-T-2 DISCHARGE VALVE ACTUATOR	I-102.00	
63	HSC-126	DO	HYPO-T-2 DISCHARGE VALVE CLOSE COMMAND	MCP-10	HYPO-T-2 DISCHARGE VALVE ACTUATOR	I-102.00	
64	YIL-127	DO	HYPO-T-3 AVAILABLE	MCP-10	HYPO-FP-10	I-102.00	
65	LI-127	AI	HYPO-T-3 LEVEL	LY-127	MCP-10	I-102.00	
66	UA-127	DI	HYPO-T-3 LOSS OF ECHO	YS-127	MCP-10	I-102.00	
67	LAH-127A	DI	HYPO-T-3 HIGH LEVEL ALARM	LSH-127	MCP-10	I-102.00	
68	LAH-127B	DO	HYPO-T-3 HIGH LEVEL ALARM	MCP-10	HYPO-FP-10	I-102.00	
69	FAH-128	DI	HYPO-T-3 OVER FLOW DETECTED	FSH-128	MCP-10	I-102.00	
70	ZIO-129	DI	HYPO-T-3 DISCHARGE VALVE OPENED	HYPO-T-3 DISCHARGE VALVE ACTUATOR	MCP-10	I-102.00	
71	ZIC-129	DI	HYPO-T-3 DISCHARGE VALVE CLOSED	HYPO-T-3 DISCHARGE VALVE ACTUATOR	MCP-10	I-102.00	
72	HSO-129	DO	HYPO-T-3 DISCHARGE VALVE OPEN COMMAND	MCP-10	HYPO-T-3 DISCHARGE VALVE ACTUATOR	I-102.00	
73	HSC-129	DO	HYPO-T-3 DISCHARGE VALVE CLOSE COMMAND	MCP-10	HYPO-T-3 DISCHARGE VALVE ACTUATOR	I-102.00	
74	ZIO-130	DI	HYPO-TP-1 SUCTION VALVE OPENED	HYPO-TP-1 SUCTION VALVE ACTUATOR	MCP-10	I-102.00	

NO.	TAG NUMBER	I/O TYPE	DESCRIPTION	HARD WIRED I/O		P&ID NUMBER	REMARKS
				SIGNAL FROM	SIGNAL TO		
75	ZIC-130	DI	HYPO-TP-1 SUCTION VALVE CLOSED	HYPO-TP-1 SUCTION VALVE ACTUATOR	MCP-10	I-102.00	
76	HSO-130	DO	HYPO-TP-1 SUCTION VALVE OPEN COMMAND	MCP-10	HYPO-TP-1 SUCTION VALVE ACTUATOR	I-102.00	
77	HSC-130	DO	HYPO-TP-1 SUCTION VALVE CLOSE COMMAND	MCP-10	HYPO-TP-1 SUCTION VALVE ACTUATOR	I-102.00	
78	ZIL-131	DI	HYPO-TP-1 NOT IN REMOTE	HYPO-TP-1 MCC	MCP-10	I-102.00	
79	YIL-131	DI	HYPO-TP-1 RUNNING	HYPO-TP-1 MCC	MCP-10	I-102.00	
80	UA-131	DI	HYPO-TP-1 FAULT	HYPO-TP-1 MCC	MCP-10	I-102.00	
81	PAH-131	DI	HYPO-TP-1 DISCHARGE PRESSURE HIGH	HYPO-TP-1 MCC	MCP-10	I-102.00	
82	HS-131	DO	HYPO-TP-1 START/STOP COMMAND	MCP-10	HYPO-TP-1 MCC	I-102.00	
83	MAH-131	DI	HYPO-TP-1 HOSE LEAK DETECTED	HYPO-TP-1 MCC	MCP-10	I-102.00	
84	ZIO-132	DI	HYPO-TP-2 SUCTION VALVE OPENED	HYPO-TP-2 SUCTION VALVE ACTUATOR	MCP-10	I-102.00	
85	ZIC-132	DI	HYPO-TP-2 SUCTION VALVE CLOSED	HYPO-TP-2 SUCTION VALVE ACTUATOR	MCP-10	I-102.00	
86	HSO-132	DO	HYPO-TP-2 SUCTION VALVE OPEN COMMAND	MCP-10	HYPO-TP-2 SUCTION VALVE ACTUATOR	I-102.00	
87	HSC-132	DO	HYPO-TP-2 SUCTION VALVE CLOSE COMMAND	MCP-10	HYPO-TP-2 SUCTION VALVE ACTUATOR	I-102.00	
88	ZIL-133	DI	HYPO-TP-2 NOT IN REMOTE	HYPO-TP-2 MCC	MCP-10	I-102.00	
89	YIL-133	DI	HYPO-TP-2 RUNNING	HYPO-TP-2 MCC	MCP-10	I-102.00	
90	UA-133	DI	HYPO-TP-2 FAULT	HYPO-TP-2 MCC	MCP-10	I-102.00	
91	PAH-133	DI	HYPO-TP-2 DISCHARGE PRESSURE HIGH	HYPO-TP-2 MCC	MCP-10	I-102.00	
92	HS-133	DO	HYPO-TP-2 START/STOP COMMAND	MCP-10	HYPO-TP-2 MCC	I-102.00	
93	MAH-133	DI	HYPO-TP-2 HOSE LEAK DETECTED	HYPO-TP-2 MCC	MCP-10	I-102.00	
94	ZIO-134	DI	HYPO-T-1 RECIRCULATION LINE VALVE OPENED	HYPO-T-1 RECIRCULATION LINE VALVE ACTUATOR	MCP-10	I-102.00	
95	ZIC-134	DI	HYPO-T-1 RECIRCULATION LINE VALVE CLOSED	HYPO-T-1 RECIRCULATION LINE VALVE ACTUATOR	MCP-10	I-102.00	
96	HSO-134	DO	HYPO-T-1 RECIRCULATION LINE VALVE OPEN COMMAND	MCP-10	HYPO-T-1 RECIRCULATION LINE VALVE ACTUATOR	I-102.00	
97	HSC-134	DO	HYPO-T-1 RECIRCULATION LINE VALVE CLOSE COMMAND	MCP-10	HYPO-T-1 RECIRCULATION LINE VALVE ACTUATOR	I-102.00	
98	ZIO-135	DI	HYPO-T-2 RECIRCULATION LINE VALVE OPENED	HYPO-T-2 RECIRCULATION LINE VALVE ACTUATOR	MCP-10	I-102.00	
99	ZIC-135	DI	HYPO-T-2 RECIRCULATION LINE VALVE CLOSED	HYPO-T-2 RECIRCULATION LINE VALVE ACTUATOR	MCP-10	I-102.00	
100	HSO-135	DO	HYPO-T-2 RECIRCULATION LINE VALVE OPEN COMMAND	MCP-10	HYPO-T-2 RECIRCULATION LINE VALVE ACTUATOR	I-102.00	
101	HSC-135	DO	HYPO-T-2 RECIRCULATION LINE VALVE CLOSE COMMAND	MCP-10	HYPO-T-2 RECIRCULATION LINE VALVE ACTUATOR	I-102.00	
102	ZIO-136	DI	HYPO-T-3 RECIRCULATION LINE VALVE OPENED	HYPO-T-3 RECIRCULATION LINE VALVE ACTUATOR	MCP-10	I-102.00	
103	ZIC-136	DI	HYPO-T-3 RECIRCULATION LINE VALVE CLOSED	HYPO-T-3 RECIRCULATION LINE VALVE ACTUATOR	MCP-10	I-102.00	
104	HSO-136	DO	HYPO-T-3 RECIRCULATION LINE VALVE OPEN COMMAND	MCP-10	HYPO-T-3 RECIRCULATION LINE VALVE ACTUATOR	I-102.00	
105	HSC-136	DO	HYPO-T-3 RECIRCULATION LINE VALVE CLOSE COMMAND	MCP-10	HYPO-T-3 RECIRCULATION LINE VALVE ACTUATOR	I-102.00	
106	ZIO-137	DI	SERVICE WATER LINE TO HYPO SYSTEM VALVE OPENED	SERVICE WATER LINE TO HYPO SYSTEM VALVE ACTUATOR	MCP-10	I-102.00	
107	ZIC-137	DI	SERVICE WATER LINE TO HYPO SYSTEM VALVE CLOSED	SERVICE WATER LINE TO HYPO SYSTEM VALVE ACTUATOR	MCP-10	I-102.00	
108	HSO-137	DO	SERVICE WATER LINE TO HYPO SYSTEM VALVE OPEN COMMAND	MCP-10	SERVICE WATER LINE TO HYPO SYSTEM VALVE ACTUATOR	I-102.00	
109	HSC-137	DO	SERVICE WATER LINE TO HYPO SYSTEM VALVE CLOSE COMMAND	MCP-10	SERVICE WATER LINE TO HYPO SYSTEM VALVE ACTUATOR	I-102.00	
110	ZIO-140	DI	HYPO-MP-1A SUCTION VALVE OPENED	HYPO-MP-1A SUCTION VALVE ACTUATOR	MCP-10	I-103.00	
111	ZIC-140	DI	HYPO-MP-1A SUCTION VALVE CLOSED	HYPO-MP-1A SUCTION VALVE ACTUATOR	MCP-10	I-103.00	

NO.	TAG NUMBER	I/O TYPE	DESCRIPTION	HARD WIRED I/O		P&ID NUMBER	REMARKS
				SIGNAL FROM	SIGNAL TO		
112	HSO-140	DO	HYPO-MP-1A SUCTION VALVE OPEN COMMAND	MCP-10	HYPO-MP-1A SUCTION VALVE ACTUATOR	I-103.00	
113	HSC-140	DO	HYPO-MP-1A SUCTION VALVE CLOSE COMMAND	MCP-10	HYPO-MP-1A SUCTION VALVE ACTUATOR	I-103.00	
114	ZIL-141	DI	HYPO-MP-1A NOT IN REMOTE	HYPO-MP-1A VFD	MCP-10	I-103.00	
115	YIL-141	DI	HYPO-MP-1A RUNNING	HYPO-MP-1A VFD	MCP-10	I-103.00	
116	UA-141	DI	HYPO-MP-1A FAULT	HYPO-MP-1A VFD	MCP-10	I-103.00	
117	PAH-141	DI	HYPO-MP-1A DISCHARGE PRESSURE HIGH	HYPO-MP-1A VFD	MCP-10	I-103.00	
118	HS-141	DO	HYPO-MP-1A START/STOP COMMAND	MCP-10	HYPO-MP-1A VFD	I-103.00	
119	SI-141	AI	HYPO-MP-1A SPEED FEEDBACK	HYPO-MP-1A VFD	MCP-10	I-103.00	
120	SC-141	AO	HYPO-MP-1A SPEED COMMAND	MCP-10	HYPO-MP-1A VFD	I-103.00	
121	MAH-141	DI	HYPO-MP-1A HOSE LEAK DETECTED	HYPO-MP-1A VFD	MCP-10	I-103.00	
122	ZIO-142	DI	HYPO-MP-1B SUCTION VALVE OPENED	HYPO-MP-1B SUCTION VALVE ACTUATOR	MCP-10	I-103.00	
123	ZIC-142	DI	HYPO-MP-1B SUCTION VALVE CLOSED	HYPO-MP-1B SUCTION VALVE ACTUATOR	MCP-10	I-103.00	
124	HSO-142	DO	HYPO-MP-1B SUCTION VALVE OPEN COMMAND	MCP-10	HYPO-MP-1B SUCTION VALVE ACTUATOR	I-103.00	
125	HSC-142	DO	HYPO-MP-1B SUCTION VALVE CLOSE COMMAND	MCP-10	HYPO-MP-1B SUCTION VALVE ACTUATOR	I-103.00	
126	ZIL-143	DI	HYPO-MP-1B NOT IN REMOTE	HYPO-MP-1B VFD	MCP-10	I-103.00	
127	YIL-143	DI	HYPO-MP-1B RUNNING	HYPO-MP-1B VFD	MCP-10	I-103.00	
128	UA-143	DI	HYPO-MP-1B FAULT	HYPO-MP-1B VFD	MCP-10	I-103.00	
129	PAH-143	DI	HYPO-MP-1B DISCHARGE PRESSURE HIGH	HYPO-MP-1B VFD	MCP-10	I-103.00	
130	HS-143	DO	HYPO-MP-1B START/STOP COMMAND	MCP-10	HYPO-MP-1B VFD	I-103.00	
131	SI-143	AI	HYPO-MP-1B SPEED FEEDBACK	HYPO-MP-1B VFD	MCP-10	I-103.00	
132	SC-143	AO	HYPO-MP-1B SPEED COMMAND	MCP-10	HYPO-MP-1B VFD	I-103.00	
133	MAH-143	DI	HYPO-MP-1B HOSE LEAK DETECTED	HYPO-MP-1B VFD	MCP-10	I-103.00	
134	FI-144	AI	HYPO-MP-1A & 1B COMBINED FLOW	FIT-144	MCP-10	I-103.00	
135	ZIO-150	DI	HYPO-MP-2A SUCTION VALVE OPENED	HYPO-MP-2A SUCTION VALVE ACTUATOR	MCP-10	I-104.00	
136	ZIC-150	DI	HYPO-MP-2A SUCTION VALVE CLOSED	HYPO-MP-2A SUCTION VALVE ACTUATOR	MCP-10	I-104.00	
137	HSO-150	DO	HYPO-MP-2A SUCTION VALVE OPEN COMMAND	MCP-10	HYPO-MP-2A SUCTION VALVE ACTUATOR	I-104.00	
138	HSC-150	DO	HYPO-MP-2A SUCTION VALVE CLOSE COMMAND	MCP-10	HYPO-MP-2A SUCTION VALVE ACTUATOR	I-104.00	
139	ZIL-151	DI	HYPO-MP-2A NOT IN REMOTE	HYPO-MP-2A VFD	MCP-10	I-104.00	
140	YIL-151	DI	HYPO-MP-2A RUNNING	HYPO-MP-2A VFD	MCP-10	I-104.00	
141	UA-151	DI	HYPO-MP-2A FAULT	HYPO-MP-2A VFD	MCP-10	I-104.00	
142	PAH-151	DI	HYPO-MP-2A DISCHARGE PRESSURE HIGH	HYPO-MP-2A VFD	MCP-10	I-104.00	
143	HS-151	DO	HYPO-MP-2A START/STOP COMMAND	MCP-10	HYPO-MP-2A VFD	I-104.00	
144	SI-151	AI	HYPO-MP-2A SPEED FEEDBACK	HYPO-MP-2A VFD	MCP-10	I-104.00	
145	SC-151	AO	HYPO-MP-2A SPEED COMMAND	MCP-10	HYPO-MP-2A VFD	I-104.00	
146	MAH-151	DI	HYPO-MP-2A HOSE LEAK DETECTED	HYPO-MP-2A VFD	MCP-10	I-104.00	
147	ZIO-152	DI	HYPO-MP-2B SUCTION VALVE OPENED	HYPO-MP-2B SUCTION VALVE ACTUATOR	MCP-10	I-104.00	
148	ZIC-152	DI	HYPO-MP-2B SUCTION VALVE CLOSED	HYPO-MP-2B SUCTION VALVE ACTUATOR	MCP-10	I-104.00	

NO.	TAG NUMBER	I/O TYPE	DESCRIPTION	HARD WIRED I/O		P&ID NUMBER	REMARKS
				SIGNAL FROM	SIGNAL TO		
149	HSO-152	DO	HYPO-MP-2B SUCTION VALVE OPEN COMMAND	MCP-10	HYPO-MP-2B SUCTION VALVE ACTUATOR	I-104.00	
150	HSC-152	DO	HYPO-MP-2B SUCTION VALVE CLOSE COMMAND	MCP-10	HYPO-MP-2B SUCTION VALVE ACTUATOR	I-104.00	
151	ZIL-153	DI	HYPO-MP-2B NOT IN REMOTE	HYPO-MP-2B VFD	MCP-10	I-104.00	
152	YIL-153	DI	HYPO-MP-2B RUNNING	HYPO-MP-2B VFD	MCP-10	I-104.00	
153	UA-153	DI	HYPO-MP-2B FAULT	HYPO-MP-2B VFD	MCP-10	I-104.00	
154	PAH-153	DI	HYPO-MP-2B DISCHARGE PRESSURE HIGH	HYPO-MP-2B VFD	MCP-10	I-104.00	
155	HS-153	DO	HYPO-MP-2B START/STOP COMMAND	MCP-10	HYPO-MP-2B VFD	I-104.00	
156	SI-153	AI	HYPO-MP-2B SPEED FEEDBACK	HYPO-MP-2B VFD	MCP-10	I-104.00	
157	SC-153	AO	HYPO-MP-2B SPEED COMMAND	MCP-10	HYPO-MP-2B VFD	I-104.00	
158	MAH-153	DI	HYPO-MP-2B HOSE LEAK DETECTED	HYPO-MP-2B VFD	MCP-10	I-104.00	
159	FI-154	AI	HYPO-MP-2B SPEED FEEDBACK	HYPO-MP-2B VFD	MCP-10	I-104.00	
160	LAHH-160	DI	SODIUM HYPOCHLORITE CHEMICAL CONTAINMENT SUMP HI-HI LEVEL	HYPO-SPCP-10	MCP-10	I-104.00	
161	YIL-161	DI	SODIUM HYPOCHLORITE CHEMICAL CONTAINMENT SUMP SYSTEM RUNNING	HYPO-SPCP-10	MCP-10	I-104.00	
162	UA-161	DI	SODIUM HYPOCHLORITE CHEMICAL CONTAINMENT SUMP SYSTEM FAULT	HYPO-SPCP-10	MCP-10	I-104.00	
163	LAHH-170	DI	SODIUM HYPOCHLORITE CHEMICAL CONTAINMENT SUMP HI-HI LEVEL	LSHH-170	MCP-10	I-104.00	
164	FI-220	AI	DC-5 CHANNEL NO. 1 MASTER FLOW	FIT-220	DC5-CP	I-201.00	
165	LI-220A	AI	DC-5 CHANNEL NO. 1 LEVEL	FIT-220	DC5-CP	I-201.00	
166	VI-220A	AI	DC-5 CHANNEL NO. 1 VELOCITY	FIT-220	DC5-CP	I-201.00	
167	LI-220B	AI	DC-5 CHANNEL NO. 1 SURCHAGE LEVEL	FIT-220	DC5-CP	I-201.00	
168	VI-220B	AI	DC-5 CHANNEL NO. 1 SURCHARGE VELOCITY	FIT-220	DC5-CP	I-201.00	
169	FI-240	AI	DC-5 CHANNEL NO. 2 MASTER FLOW	FIT-240	DC5-CP	I-201.00	
170	LI-240A	AI	DC-5 CHANNEL NO. 2 LEVEL	FIT-240	DC5-CP	I-201.00	
171	VI-240A	AI	DC-5 CHANNEL NO. 2 VELOCITY	FIT-240	DC5-CP	I-201.00	
172	LI-240B	AI	DC-5 CHANNEL NO. 2 SURCHAGE LEVEL	FIT-240	DC5-CP	I-201.00	
173	VI-240B	AI	DC-5 CHANNEL NO. 2 SURCHARGE VELOCITY	FIT-240	DC5-CP	I-201.00	
174	FI-260	AI	DC-5 CHANNEL NO. 3 MASTER FLOW	FIT-260	DC5-CP	I-201.00	
175	LI-260A	AI	DC-5 CHANNEL NO. 3 LEVEL	FIT-260	DC5-CP	I-201.00	
176	VI-260A	AI	DC-5 CHANNEL NO. 3 VELOCITY	FIT-260	DC5-CP	I-201.00	
177	LI-260B	AI	DC-5 CHANNEL NO. 3 SURCHAGE LEVEL	FIT-260	DC5-CP	I-201.00	
178	VI-260B	AI	DC-5 CHANNEL NO. 3 SURCHARGE VELOCITY	FIT-260	DC5-CP	I-201.00	
179	YIL-301	DI	TI-010-SMP-1 RUNNING	TI-010-SMP-1 MCC	SBS-CP	I-301.00	
180	UA-301	DI	TI-010-SMP-1 FAULT	TI-010-SMP-1 MCC	SBS-CP	I-301.00	
181	PAH-301	DI	TI-010-SMP-1 DISCHARGE PRESSURE HIGH	TI-010-SMP-1 MCC	SBS-CP	I-301.00	
182	HS-301	DO	TI-010-SMP-1 START/STOP COMMAND	SBS-CP	TI-010-SMP-1 MCC	I-301.00	
183	YIL-302	DI	TI-010-STR-1 BACKWASH RUNNING	TI-010-STR-1	SBS-CP	I-301.00	
184	UA-302	DI	TI-010-STR-1 STRAINER FAULT	TI-010-STR-1	SBS-CP	I-301.00	
185	FAL-303	DI	TI-010-SMP-1 DISCHARGE NO FLOW DETECTED	FSL-303	SBS-CP	I-301.00	

NO.	TAG NUMBER	I/O TYPE	DESCRIPTION	HARD WIRED I/O		P&ID NUMBER	REMARKS
				SIGNAL FROM	SIGNAL TO		
186	HSC-304	DO	TI-010-SMP-1 THREE-WAY MOTORIZED VALVE CLOSE COMMAND	SBS-CP	TI-010-SMP-1 THREE-WAY MOTORIZED VALVE ACTUATOR	I-301.00	
187	HSO-304	DO	TI-010-SMP-1 THREE-WAY MOTORIZED VALVE OPEN COMMAND	SBS-CP	TI-010-SMP-1 THREE-WAY MOTORIZED VALVE ACTUATOR	I-301.00	
188	AI-305	AI	TI-010-SMP-1 TOTAL CHLORINE RESIDUAL	AIT-305	SBS-CP	I-301.00	
189	UA-305	DI	TI-010-SMP-1 CHLORINE ANALYZER FAULT	AIT-305	SBS-CP	I-301.00	
190	KV-306	DO	TI-010-SMP-1 TO TI-010-SMP-2 SOLENOID VALVE ENERGIZE COMMAND	SBS-CP	TI-010-SMP-1 TO TI-010-SMP-2 SOLENOID VALVE	I-301.00	
191	YIL-307	DI	TI-010-SMP-2 RUNNING	TI-010-SMP-2 MCC	SBS-CP	I-301.00	
192	UA-307	DI	TI-010-SMP-2 FAULT	TI-010-SMP-2 MCC	SBS-CP	I-301.00	
193	PAH-307	DI	TI-010-SMP-2 DISCHARGE PRESSURE HIGH	TI-010-SMP-2 MCC	SBS-CP	I-301.00	
194	HS-307	DO	TI-010-SMP-2 START/STOP COMMAND	SBS-CP	TI-010-SMP-2 MCC	I-301.00	
195	YIL-308	DI	TI-010-STR-2 BACKWASH RUNNING	TI-010-STR-2	SBS-CP	I-301.00	
196	UA-308	DI	TI-010-STR-2 STRAINER FAULT	TI-010-STR-2	SBS-CP	I-301.00	
197	FAL-309	DI	TI-010-SMP-2 DISCHARGE NO FLOW DETECTED	FSL-309	SBS-CP	I-301.00	
198	HSC-310	DO	TI-010-SMP-2 THREE-WAY MOTORIZED VALVE CLOSE COMMAND	SBS-CP	TI-010-SMP-2 THREE-WAY MOTORIZED VALVE ACTUATOR	I-301.00	
199	HSO-310	DO	TI-010-SMP-2 THREE-WAY MOTORIZED VALVE OPEN COMMAND	SBS-CP	TI-010-SMP-2 THREE-WAY MOTORIZED VALVE ACTUATOR	I-301.00	
200	AI-311	AI	TI-010-SMP-2 TOTAL CHLORINE RESIDUAL	AIT-311	SBS-CP	I-301.00	
201	UA-311	DI	TI-010-SMP-2 CHLORINE ANALYZER FAULT	AIT-311	SBS-CP	I-301.00	
202	YIL-321	DO	SBS-T-1 AVAILABLE	SBS-CP	SBS-FP-10	I-302.00	
203	LI-321	AI	SBS-T-1 LEVEL	LY-321	SBS-CP	I-302.00	
204	UA-321	DI	SBS-T-1 LOSS OF ECHO	YS-321	SBS-CP	I-302.00	
205	LAH-321A	DI	SBS-T-1 HIGH LEVEL ALARM	LSH-321	SBS-CP	I-302.00	
206	LAH-321B	DO	SBS-T-1 HIGH LEVEL ALARM	SBS-CP	SBS-FP-10	I-302.00	
207	FAH-322	DI	SBS-T-1 OVER FLOW DETECTED	FSH-322	SBS-CP	I-302.00	
208	ZIO-323	DI	SBS-T-1 DISCHARGE VALVE OPENED	SBS-T-1 DISCHARGE VALVE ACTUATOR	SBS-CP	I-302.00	
209	ZIC-323	DI	SBS-T-1 DISCHARGE VALVE CLOSED	SBS-T-1 DISCHARGE VALVE ACTUATOR	SBS-CP	I-302.00	
210	HSO-323	DO	SBS-T-1 DISCHARGE VALVE OPEN COMMAND	SBS-CP	SBS-T-1 DISCHARGE VALVE ACTUATOR	I-302.00	
211	HSC-323	DO	SBS-T-1 DISCHARGE VALVE CLOSE COMMAND	SBS-CP	SBS-T-1 DISCHARGE VALVE ACTUATOR	I-302.00	
212	ZIO-324	DI	SBS-T-1 DRAIN VALVE OPENED	SBS-T-1 DRAIN VALVE ACTUATOR	SBS-CP	I-302.00	
213	ZIC-324	DI	SBS-T-1 DRAIN VALVE CLOSED	SBS-T-1 DRAIN VALVE ACTUATOR	SBS-CP	I-302.00	
214	HSO-324	DO	SBS-T-1 DRAIN VALVE OPEN COMMAND	SBS-CP	SBS-T-1 DRAIN VALVE ACTUATOR	I-302.00	
215	HSC-324	DO	SBS-T-1 DRAIN VALVE CLOSE COMMAND	SBS-CP	SBS-T-1 DRAIN VALVE ACTUATOR	I-302.00	
216	YIL-325	DO	SBS-T-2 AVAILABLE	SBS-CP	SBS-FP-10	I-302.00	
217	LI-325	AI	SBS-T-2 LEVEL	LY-325	SBS-CP	I-302.00	
218	UA-325	DI	SBS-T-2 LOSS OF ECHO	YS-325	SBS-CP	I-302.00	
219	LAH-325A	DI	SBS-T-2 HIGH LEVEL ALARM	LSH-325	SBS-CP	I-302.00	
220	LAH-325B	DO	SBS-T-2 HIGH LEVEL ALARM	SBS-CP	SBS-FP-10	I-302.00	
221	FAH-326	DI	SBS-T-2 OVER FLOW DETECTED	FSH-326	SBS-CP	I-302.00	
222	ZIO-327	DI	SBS-T-2 DISCHARGE VALVE OPENED	SBS-T-2 DISCHARGE VALVE ACTUATOR	SBS-CP	I-302.00	

NO.	TAG NUMBER	I/O TYPE	DESCRIPTION	HARD WIRED I/O		P&ID NUMBER	REMARKS
				SIGNAL FROM	SIGNAL TO		
223	ZIC-327	DI	SBS-T-2 DISCHARGE VALVE CLOSED	SBS-T-2 DISCHARGE VALVE ACTUATOR	SBS-CP	I-302.00	
224	HSO-327	DO	SBS-T-2 DISCHARGE VALVE OPEN COMMAND	SBS-CP	SBS-T-2 DISCHARGE VALVE ACTUATOR	I-302.00	
225	HSC-327	DO	SBS-T-2 DISCHARGE VALVE CLOSE COMMAND	SBS-CP	SBS-T-2 DISCHARGE VALVE ACTUATOR	I-302.00	
226	ZIO-328	DI	SBS-T-2 DRAIN VALVE OPENED	SBS-T-2 DRAIN VALVE ACTUATOR	SBS-CP	I-302.00	
227	ZIC-328	DI	SBS-T-2 DRAIN VALVE CLOSED	SBS-T-2 DRAIN VALVE ACTUATOR	SBS-CP	I-302.00	
228	HSO-328	DO	SBS-T-2 DRAIN VALVE OPEN COMMAND	SBS-CP	SBS-T-2 DRAIN VALVE ACTUATOR	I-302.00	
229	HSC-328	DO	SBS-T-2 DRAIN VALVE CLOSE COMMAND	SBS-CP	SBS-T-2 DRAIN VALVE ACTUATOR	I-302.00	
230	ZIO-329	DI	SBS-TP-1 SUCTION VALVE OPENED	SBS-TP-1 SUCTION VALVE ACTUATOR	SBS-CP	I-302.00	
231	ZIC-329	DI	SBS-TP-1 SUCTION VALVE CLOSED	SBS-TP-1 SUCTION VALVE ACTUATOR	SBS-CP	I-302.00	
232	HSO-329	DO	SBS-TP-1 SUCTION VALVE OPEN COMMAND	SBS-CP	SBS-TP-1 SUCTION VALVE ACTUATOR	I-302.00	
233	HSC-329	DO	SBS-TP-1 SUCTION VALVE CLOSE COMMAND	SBS-CP	SBS-TP-1 SUCTION VALVE ACTUATOR	I-302.00	
234	ZIL-330	DI	SBS-TP-1 NOT IN REMOTE	SBS-TP-1 MCC	SBS-CP	I-302.00	
235	YIL-330	DI	SBS-TP-1 RUNNING	SBS-TP-1 MCC	SBS-CP	I-302.00	
236	UA-330	DI	SBS-TP-1 FAULT	SBS-TP-1 MCC	SBS-CP	I-302.00	
237	PAH-330	DI	SBS-TP-1 DISCHARGE PRESSURE HIGH	SBS-TP-1 MCC	SBS-CP	I-302.00	
238	HS-330	DO	SBS-TP-1 START/STOP COMMAND	SBS-CP	SBS-TP-1 MCC	I-302.00	
239	MAH-330	DI	SBS-TP-1 HOSE LEAK DETECTED	SBS-TP-1 MCC	SBS-CP	I-302.00	
240	ZIO-331	DI	SBS-TP-2 SUCTION VALVE OPENED	SBS-TP-2 SUCTION VALVE ACTUATOR	SBS-CP	I-302.00	
241	ZIC-331	DI	SBS-TP-2 SUCTION VALVE CLOSED	SBS-TP-2 SUCTION VALVE ACTUATOR	SBS-CP	I-302.00	
242	HSO-331	DO	SBS-TP-2 SUCTION VALVE OPEN COMMAND	SBS-CP	SBS-TP-2 SUCTION VALVE ACTUATOR	I-302.00	
243	HSC-331	DO	SBS-TP-2 SUCTION VALVE CLOSE COMMAND	SBS-CP	SBS-TP-2 SUCTION VALVE ACTUATOR	I-302.00	
244	ZIL-332	DI	SBS-TP-2 NOT IN REMOTE	SBS-TP-2 MCC	SBS-CP	I-302.00	
245	YIL-332	DI	SBS-TP-2 RUNNING	SBS-TP-2 MCC	SBS-CP	I-302.00	
246	UA-332	DI	SBS-TP-2 FAULT	SBS-TP-2 MCC	SBS-CP	I-302.00	
247	PAH-332	DI	SBS-TP-2 DISCHARGE PRESSURE HIGH	SBS-TP-2 MCC	SBS-CP	I-302.00	
248	HS-332	DO	SBS-TP-2 START/STOP COMMAND	SBS-CP	SBS-TP-2 MCC	I-302.00	
249	MAH-332	DI	SBS-TP-2 HOSE LEAK DETECTED	SBS-TP-2 MCC	SBS-CP	I-302.00	
250	ZIO-333	DI	SBS-T-1 RECIRCULATION LINE VALVE OPENED	SBS-T-1 RECIRCULATION LINE VALVE ACTUATOR	SBS-CP	I-302.00	
251	ZIC-333	DI	SBS-T-1 RECIRCULATION LINE VALVE CLOSED	SBS-T-1 RECIRCULATION LINE VALVE ACTUATOR	SBS-CP	I-302.00	
252	HSO-333	DO	SBS-T-1 RECIRCULATION LINE VALVE OPEN COMMAND	SBS-CP	SBS-T-1 RECIRCULATION LINE VALVE ACTUATOR	I-302.00	
253	HSC-333	DO	SBS-T-1 RECIRCULATION LINE VALVE CLOSE COMMAND	SBS-CP	SBS-T-1 RECIRCULATION LINE VALVE ACTUATOR	I-302.00	
254	ZIO-334	DI	SBS-T-2 RECIRCULATION LINE VALVE OPENED	SBS-T-2 RECIRCULATION LINE VALVE ACTUATOR	SBS-CP	I-302.00	
255	ZIC-334	DI	SBS-T-2 RECIRCULATION LINE VALVE CLOSED	SBS-T-2 RECIRCULATION LINE VALVE ACTUATOR	SBS-CP	I-302.00	
256	HSO-334	DO	SBS-T-2 RECIRCULATION LINE VALVE OPEN COMMAND	SBS-CP	SBS-T-2 RECIRCULATION LINE VALVE ACTUATOR	I-302.00	
257	HSC-334	DO	SBS-T-2 RECIRCULATION LINE VALVE CLOSE COMMAND	SBS-CP	SBS-T-2 RECIRCULATION LINE VALVE ACTUATOR	I-302.00	
258	ZIO-335	DI	SERVICE WATER TO SBS SYSTEM VALVE OPENED	SERVICE WATER TO SBS SYSTEM VALVE ACTUATOR	SBS-CP	I-302.00	
259	ZIC-335	DI	SERVICE WATER TO SBS SYSTEM VALVE CLOSED	SERVICE WATER TO SBS SYSTEM VALVE ACTUATOR	SBS-CP	I-302.00	

NO.	TAG NUMBER	I/O TYPE	DESCRIPTION	HARD WIRED I/O		P&ID NUMBER	REMARKS
				SIGNAL FROM	SIGNAL TO		
260	HSO-335	DO	SERVICE WATER TO SBS SYSTEM VALVE OPEN COMMAND	SBS-CP	SERVICE WATER TO SBS SYSTEM VALVE ACTUATOR	I-302.00	
261	HSC-335	DO	SERVICE WATER TO SBS SYSTEM VALVE CLOSE COMMAND	SBS-CP	SERVICE WATER TO SBS SYSTEM VALVE ACTUATOR	I-302.00	
262	ZIO-340	DI	SBS-MP-1 SUCTION VALVE OPENED	SBS-MP-1 SUCTION VALVE ACTUATOR	SBS-CP	I-303.00	
263	ZIC-340	DI	SBS-MP-1 SUCTION VALVE CLOSED	SBS-MP-1 SUCTION VALVE ACTUATOR	SBS-CP	I-303.00	
264	HSO-340	DO	SBS-MP-1 SUCTION VALVE OPEN COMMAND	SBS-CP	SBS-MP-1 SUCTION VALVE ACTUATOR	I-303.00	
265	HSC-340	DO	SBS-MP-1 SUCTION VALVE CLOSE COMMAND	SBS-CP	SBS-MP-1 SUCTION VALVE ACTUATOR	I-303.00	
266	ZIL-341	DI	SBS-MP-1 NOT IN REMOTE	SBS-MP-1 VFD	SBS-CP	I-303.00	
267	YIL-341	DI	SBS-MP-1 RUNNING	SBS-MP-1 VFD	SBS-CP	I-303.00	
268	UA-341	DI	SBS-MP-1 FAULT	SBS-MP-1 VFD	SBS-CP	I-303.00	
269	PAH-341	DI	SBS-MP-1 DISCHARGE PRESSURE HIGH	SBS-MP-1 VFD	SBS-CP	I-303.00	
270	HS-341	DO	SBS-MP-1 START/STOP COMMAND	SBS-CP	SBS-MP-1 VFD	I-303.00	
271	SI-341	AI	SBS-MP-1 SPEED FEEDBACK	SBS-MP-1 VFD	SBS-CP	I-303.00	
272	SC-341	AO	SBS-MP-1 SPEED COMMAND	SBS-CP	SBS-MP-1 VFD	I-303.00	
273	MAH-341	DI	SBS-MP-1 LEAK DETECTED	SBS-MP-1 VFD	SBS-CP	I-303.00	
274	ZIO-342	DI	SBS-MP-2 SUCTION VALVE OPENED	SBS-MP-2 SUCTION VALVE ACTUATOR	SBS-CP	I-303.00	
275	ZIC-342	DI	SBS-MP-2 SUCTION VALVE CLOSED	SBS-MP-2 SUCTION VALVE ACTUATOR	SBS-CP	I-303.00	
276	HSO-342	DO	SBS-MP-2 SUCTION VALVE OPEN COMMAND	SBS-CP	SBS-MP-2 SUCTION VALVE ACTUATOR	I-303.00	
277	HSC-342	DO	SBS-MP-2 SUCTION VALVE CLOSE COMMAND	SBS-CP	SBS-MP-2 SUCTION VALVE ACTUATOR	I-303.00	
278	ZIL-343	DI	SBS-MP-2 NOT IN REMOTE	SBS-MP-2 VFD	SBS-CP	I-303.00	
279	YIL-343	DI	SBS-MP-2 RUNNING	SBS-MP-2 VFD	SBS-CP	I-303.00	
280	UA-343	DI	SBS-MP-2 FAULT	SBS-MP-2 VFD	SBS-CP	I-303.00	
281	PAH-343	DI	SBS-MP-2 DISCHARGE PRESSURE HIGH	SBS-MP-2 VFD	SBS-CP	I-303.00	
282	HS-343	DO	SBS-MP-2 START/STOP COMMAND	SBS-CP	SBS-MP-2 VFD	I-303.00	
283	SI-343	AI	SBS-MP-2 SPEED FEEDBACK	SBS-MP-2 VFD	SBS-CP	I-303.00	
284	SC-343	AO	SBS-MP-2 SPEED COMMAND	SBS-CP	SBS-MP-2 VFD	I-303.00	
285	MAH-343	DI	SBS-MP-2 LEAK DETECTED	SBS-MP-2 VFD	SBS-CP	I-303.00	
286	ZIO-344	DI	SBS-MP-3 SUCTION VALVE OPENED	SBS-MP-3 SUCTION VALVE ACTUATOR	SBS-CP	I-303.00	
287	ZIC-344	DI	SBS-MP-3 SUCTION VALVE CLOSED	SBS-MP-3 SUCTION VALVE ACTUATOR	SBS-CP	I-303.00	
288	HSO-344	DO	SBS-MP-3 SUCTION VALVE OPEN COMMAND	SBS-CP	SBS-MP-3 SUCTION VALVE ACTUATOR	I-303.00	
289	HSC-344	DO	SBS-MP-3 SUCTION VALVE CLOSE COMMAND	SBS-CP	SBS-MP-3 SUCTION VALVE ACTUATOR	I-303.00	
290	ZIL-345	DI	SBS-MP-3 NOT IN REMOTE	SBS-MP-3 VFD	SBS-CP	I-303.00	
291	YIL-345	DI	SBS-MP-3 RUNNING	SBS-MP-3 VFD	SBS-CP	I-303.00	
292	UA-345	DI	SBS-MP-3 FAULT	SBS-MP-3 VFD	SBS-CP	I-303.00	
293	PAH-345	DI	SBS-MP-3 DISCHARGE PRESSURE HIGH	SBS-MP-3 VFD	SBS-CP	I-303.00	
294	HS-345	DO	SBS-MP-3 START/STOP COMMAND	SBS-CP	SBS-MP-3 VFD	I-303.00	
295	SI-345	AI	SBS-MP-3 SPEED FEEDBACK	SBS-MP-3 VFD	SBS-CP	I-303.00	
296	SC-345	AO	SBS-MP-3 SPEED COMMAND	SBS-CP	SBS-MP-3 VFD	I-303.00	

NO.	TAG NUMBER	I/O TYPE	DESCRIPTION	HARD WIRED I/O		P&ID NUMBER	REMARKS
				SIGNAL FROM	SIGNAL TO		
297	MAH-345	DI	SBS-MP-3 LEAK DETECTED	SBS-MP-3 VFD	SBS-CP	I-303.00	
298	FI-350	AI	SBS METERING PUMPS COMBINED FLOW	FIT-350	SBS-10	I-303.00	
299	LAHH-355	DI	SODIUM BISULFITE CHEMICAL CONTAINMENT SUMP HI-HI LEVEL	LSHH-355	SBS-CP	I-303.00	
300	UA-360	DI	TI-010C DOUBLE CONTAINMENT PIPING COMMON ALARM - LEAK DETECTED	LDP-10C	MCP-10	I-304.00	SIGNAL GENERATES FROM LEAK DETECTION PANEL PROVIDED UNDER SECTION 40 05 32
301	UA-365	DI	TI-010C DC-5 DOUBLE CONTAINMENT PIPING COMMON ALARM - LEAK DETECTED	LDP-DC5	DC5-CP	I-304.00	SIGNAL GENERATES FROM LEAK DETECTION PANEL PROVIDED UNDER SECTION 40 05 32
302	UA-370	DI	TI-010D TRIPLE CONTAINMENT PIPING COMMON ALARM - LEAK DETECTED	LDP-10D	SBS-CP	I-304.00	SIGNAL GENERATES FROM LEAK DETECTION PANEL PROVIDED UNDER SECTION 40 05 32
303	UA-370	DO	TI-010D TRIPLE CONTAINMENT PIPING COMMON ALARM - LEAK DETECTED	SBS-CP	TI-010D HMCS PANEL	I-304.00	SIGNAL GENERATES FROM LEAK DETECTION PANEL PROVIDED UNDER SECTION 40 05 32
304	AI-375	AI	TI-010D SODIUM BISULFITE ROOM SULFUR DIOXIDE GAS READING NO. 1	AE/AIT-375	SBS-CP	I-304.00	
305	AAH-375	DO	TI-010D SODIUM BISULFITE ROOM SULFUR DIOXIDE GAS HIGH LEVEL ALARM	SBS-CP	TI-010D HMCS PANEL	I-304.00	
306	AI-376	AI	TI-010D SODIUM BISULFITE ROOM SULFUR DIOXIDE GAS READING NO. 2	AE/AIT-375	SBS-CP	I-304.00	
307	FAH-380	DI	TI-010C CHEMICAL STORAGE AREA - BASEMENT EYEWASH/SHOWER NO. 1 ACTIVATED	FSH-380	MCP-10	I-304.00	SIGNAL GENERATES FROM EYWASH / SHOWER STATION PROVIDED UNDER SECTION 22 11 16
308	FAH-381	DI	TI-010C CHEMICAL STORAGE AREA - BASEMENT EYEWASH/SHOWER NO. 2 ACTIVATED	FSH-381	MCP-10	I-304.00	SIGNAL GENERATES FROM EYWASH / SHOWER STATION PROVIDED UNDER SECTION 22 11 16
309	FAH-382	DI	TI-010C CHEMICAL STORAGE AREA - BASEMENT EYEWASH/SHOWER NO. 3 ACTIVATED	FSH-382	MCP-10	I-304.00	SIGNAL GENERATES FROM EYWASH / SHOWER STATION PROVIDED UNDER SECTION 22 11 16
310	FAH-383	DI	TI-010C CHEMICAL STORAGE AREA - BASEMENT EYEWASH/SHOWER NO. 4 ACTIVATED	FSH-383	MCP-10	I-304.00	SIGNAL GENERATES FROM EYWASH / SHOWER STATION PROVIDED UNDER SECTION 22 11 16
311	FAH-384	DI	TI-010C CHEMICAL STORAGE AREA - BASEMENT EYEWASH/SHOWER NO. 5 ACTIVATED	FSH-384	MCP-10	I-304.00	SIGNAL GENERATES FROM EYWASH / SHOWER STATION PROVIDED UNDER SECTION 22 11 16
312	FAH-385	DI	TI-010C OUTSIDE - NEAR FILL STATION PANEL EYEWASH/SHOWER ACTIVATED	FSH-385	MCP-10	I-304.00	SIGNAL GENERATES FROM EYWASH / SHOWER STATION PROVIDED UNDER SECTION 22 11 16
313	FAH-386	DI	TI-010D CHEMICAL ROOM (B01) - INSIDE CONTAINMENT AREA EYEWASH/SHOWER NO. 1 ACTIVATED	FSH-386	SBS-CP	I-304.00	SIGNAL GENERATES FROM EYWASH / SHOWER STATION PROVIDED UNDER SECTION 22 11 16
314	FAH-387	DI	TI-010D CHEMICAL ROOM (B01) - INSIDE CONTAINMENT AREA EYEWASH/SHOWER NO. 2 ACTIVATED	FSH-387	SBS-CP	I-304.00	SIGNAL GENERATES FROM EYWASH / SHOWER STATION PROVIDED UNDER SECTION 22 11 16
315	FAH-388	DI	TI-010D OUTSIDE OF CHEMICAL ROOM (B01) - NEAR FILL STATION PANEL EYEWASH/SHOWER ACTIVATED	FSH-388	SBS-CP	I-304.00	SIGNAL GENERATES FROM EYWASH / SHOWER STATION PROVIDED UNDER SECTION 22 11 16
316	JI-390A	DI	TI-010C UTILITY SOURCE AVAILABLE	TI-010C ATS PANEL	MCP-10	I-304.00	SIGNAL GENERATES FROM ATS PANEL PROVIDED UNDER SECTION 26 36 23
317	JA-390	DI	TI-010C UTILITY SOURCE FAILURE	TI-010C ATS PANEL	MCP-10	I-304.00	SIGNAL GENERATES FROM ATS PANEL PROVIDED UNDER SECTION 26 36 23
318	JI-390B	DI	TI-010C UTILITY SOURCE POWER ON	TI-010C ATS PANEL	MCP-10	I-304.00	SIGNAL GENERATES FROM ATS PANEL PROVIDED UNDER SECTION 26 36 23
319	JI-391	DI	TI-010C GENERATOR SOURCE POWER ON	TI-010C ATS PANEL	MCP-10	I-304.00	SIGNAL GENERATES FROM ATS PANEL PROVIDED UNDER SECTION 26 36 23
320	JA-391	DI	TI-010C GENERATOR SOURCE FAILURE	TI-010C ATS PANEL	MCP-10	I-304.00	SIGNAL GENERATES FROM ATS PANEL PROVIDED UNDER SECTION 26 36 23
321	JI-393A	DI	TI-010D UTILITY SOURCE AVAILABLE	TI-010D ATS PANEL	SBS-CP	I-304.00	SIGNAL GENERATES FROM ATS PANEL PROVIDED UNDER SECTION 26 36 23
322	JA-393	DI	TI-010D UTILITY SOURCE FAILURE	TI-010D ATS PANEL	SBS-CP	I-304.00	SIGNAL GENERATES FROM ATS PANEL PROVIDED UNDER SECTION 26 36 23
323	JI-393B	DI	TI-010D UTILITY SOURCE POWER ON	TI-010D ATS PANEL	SBS-CP	I-304.00	SIGNAL GENERATES FROM ATS PANEL PROVIDED UNDER SECTION 26 36 23
324	JI-394	DI	TI-010D GENERATOR SOURCE POWER ON	TI-010D ATS PANEL	SBS-CP	I-304.00	SIGNAL GENERATES FROM ATS PANEL PROVIDED UNDER SECTION 26 36 23
325	JA-394	DI	TI-010D GENERATOR SOURCE FAILURE	TI-010D ATS PANEL	SBS-CP	I-304.00	SIGNAL GENERATES FROM ATS PANEL PROVIDED UNDER SECTION 26 36 23
326	LI-400	AI	DIVERSION CHAMBER LEVEL	LE/LIT-400	R-TI-09	I-401.00	EXISTING INSTRUMENT AND SIGNAL IN PANEL PROVIDED UNDER FLOATABLES REMOVAL CONTRACT BY OTHERS
327	LI-401	AI	OVERFLOW CHAMBER LEVEL	LE/LIT-401	R-TI-09	I-401.00	NEW INSTRUMENT AND SIGNAL PROVIDED UNDER THIS CONTRACT TO BE COORDINATED TO INTERFACE WITH PANEL PROVIDED UNDER FLOATABLES REMOVAL CONTRACT BY OTHERS
328	FI-404	AI	TI-011 MANHOLE NO. 1 MASTER FLOW	FIT-404	R-TI-09	I-401.00	NEW INSTRUMENT AND SIGNAL PROVIDED UNDER THIS CONTRACT TO BE COORDINATED TO INTERFACE WITH PANEL PROVIDED UNDER FLOATABLES REMOVAL CONTRACT BY OTHERS
329	LI-404A	AI	TI-011 MANHOLE NO. 1 LEVEL	FIT-404	R-TI-09	I-401.00	NEW INSTRUMENT AND SIGNAL PROVIDED UNDER THIS CONTRACT TO BE COORDINATED TO INTERFACE WITH PANEL PROVIDED UNDER FLOATABLES REMOVAL CONTRACT BY OTHERS
330	VI-404A	AI	TI-011 MANHOLE NO. 1 VELOCITY	FIT-404	R-TI-09	I-401.00	NEW INSTRUMENT AND SIGNAL PROVIDED UNDER THIS CONTRACT TO BE COORDINATED TO INTERFACE WITH PANEL PROVIDED UNDER FLOATABLES REMOVAL CONTRACT BY OTHERS
331	LI-404B	AI	TI-011 MANHOLE NO. 1 SURCHARGE LEVEL	FIT-404	R-TI-09	I-401.00	NEW INSTRUMENT AND SIGNAL PROVIDED UNDER THIS CONTRACT TO BE COORDINATED TO INTERFACE WITH PANEL PROVIDED UNDER FLOATABLES REMOVAL CONTRACT BY OTHERS
332	VI-404B	AI	TI-011 MANHOLE NO. 1 SURCHARGE VELOCITY	FIT-404	R-TI-09	I-401.00	NEW INSTRUMENT AND SIGNAL PROVIDED UNDER THIS CONTRACT TO BE COORDINATED TO INTERFACE WITH PANEL PROVIDED UNDER FLOATABLES REMOVAL CONTRACT BY OTHERS
333	FI-405	AI	TI-011 MANHOLE NO. 2 MASTER FLOW	FIT-405	R-TI-09	I-401.00	NEW INSTRUMENT AND SIGNAL PROVIDED UNDER THIS CONTRACT TO BE COORDINATED TO INTERFACE WITH PANEL PROVIDED UNDER FLOATABLES REMOVAL CONTRACT BY OTHERS

NO.	TAG NUMBER	I/O TYPE	DESCRIPTION	HARD WIRED I/O		P&ID NUMBER	REMARKS
				SIGNAL FROM	SIGNAL TO		
334	LI-405A	AI	TI-011 MANHOLE NO. 2 LEVEL	FIT-405	R-TI-09	I-401.00	NEW INSTRUMENT AND SIGNAL PROVIDED UNDER THIS CONTRACT TO BE COORDINATED TO INTERFACE WITH PANEL PROVIDED UNDER FLOATABLES REMOVAL CONTRACT BY OTHERS
335	VI-405A	AI	TI-011 MANHOLE NO. 2 VELOCITY	FIT-405	R-TI-09	I-401.00	NEW INSTRUMENT AND SIGNAL PROVIDED UNDER THIS CONTRACT TO BE COORDINATED TO INTERFACE WITH PANEL PROVIDED UNDER FLOATABLES REMOVAL CONTRACT BY OTHERS
336	LI-405B	AI	TI-011 MANHOLE NO. 2 SURCHARGE LEVEL	FIT-405	R-TI-09	I-401.00	NEW INSTRUMENT AND SIGNAL PROVIDED UNDER THIS CONTRACT TO BE COORDINATED TO INTERFACE WITH PANEL PROVIDED UNDER FLOATABLES REMOVAL CONTRACT BY OTHERS
337	VI-405B	AI	TI-011 MANHOLE NO. 2 SURCHARGE VELOCITY	FIT-405	R-TI-09	I-401.00	NEW INSTRUMENT AND SIGNAL PROVIDED UNDER THIS CONTRACT TO BE COORDINATED TO INTERFACE WITH PANEL PROVIDED UNDER FLOATABLES REMOVAL CONTRACT BY OTHERS
338	YIL-406	DI	TI-011-SMP-1 RUNNING	TI-011-SMP-1 MCC	MCP-11	I-401.00	
339	ZIL-406	DI	TI-011-SMP-1 NOT IN REMOTE	TI-011-SMP-1 MCC	MCP-11	I-401.00	
340	PAH-406	DI	TI-011-SMP-1 DISCHARGE PRESSURE HIGH	TI-011-SMP-1 MCC	MCP-11	I-401.00	
341	HS-406	DO	TI-011-SMP-1 START/STOP COMMAND	MCP-11	TI-011-SMP-1 MCC	I-401.00	
342	UA-406A	DI	TI-011-SMP-1 FAULT	TI-011-SMP-1 MCC	MCP-11	I-401.00	
343	UA-406B	DI	TI-011-SMP-1 EMERGENCY STOP	TI-011-SMP-1 MCC	MCP-11	I-401.00	
344	YIL-407	DI	TI-011-STR-1 BACKWASH RUNNING	TI-011-STR-1	MCP-11	I-401.00	
345	UA-407	DI	TI-011-STR-1 STRAINER FAULT	TI-011-STR-1	MCP-11	I-401.00	
346	FAL-408	DI	TI-011-SMP-1 NO FLOW DETECTED	FSL-408	MCP-11	I-401.00	
347	HSC-409	DO	TI-011-SMP-1 THREE-WAY MOTORIZED VALVE CLOSE COMMAND	MCP-11	TI-011-SMP-1 THREE-WAY MOTORIZED VALVE ACTUATOR	I-401.00	
348	HSO-409	DO	TI-011-SMP-1 THREE-WAY MOTORIZED VALVE OPEN COMMAND	MCP-11	TI-011-SMP-1 THREE-WAY MOTORIZED VALVE ACTUATOR	I-401.00	
349	AI-410	AI	TI-011-SMP-1 TOTAL CHLORINE RESIDUAL	AIT-410	MCP-11	I-401.00	
350	UA-410	DI	TI-011-SMP-1 CHLORINE ANALYZER FAULT	AIT-410	MCP-11	I-401.00	
351	KV-411	DO	TI-011-SMP-1 TO TI-011-SMP-2 SOLENOID VALVE ENERGIZE COMMAND	MCP-11	SOLENOID VALVE	I-401.00	
352	YIL-412	DI	TI-011-SMP-2 RUNNING	TI-011-SMP-2 MCC	MCP-11	I-401.00	
353	ZIL-412	DI	TI-011-SMP-2 NOT IN REMOTE	TI-011-SMP-2 MCC	MCP-11	I-401.00	
354	PAH-412	DI	TI-011-SMP-2 DISCHARGE PRESSURE HIGH	TI-011-SMP-2 MCC	MCP-11	I-401.00	
355	HS-412	DO	TI-011-SMP-2 START/STOP COMMAND	MCP-11	TI-011-SMP-2 MCC	I-401.00	
356	UA-412A	DI	TI-011-SMP-2 FAULT	TI-011-SMP-2 MCC	MCP-11	I-401.00	
357	UA-412B	DI	TI-011-SMP-2 EMERGENCY STOP	TI-011-SMP-2 MCC	MCP-11	I-401.00	
358	YIL-413	DI	TI-011-STR-2 BACKWASH RUNNING	TI-011-STR-2	MCP-11	I-401.00	
359	UA-413	DI	TI-011-STR-2 STRAINER FAULT	TI-011-STR-2	MCP-11	I-401.00	
360	FAL-414	DI	TI-011-SMP-2 NO FLOW DETECTED	FSL-414	MCP-11	I-401.00	
361	HSC-415	DO	TI-011-SMP-2 THREE-WAY MOTORIZED VALVE CLOSE COMMAND	MCP-11	TI-011-SMP-2 THREE-WAY MOTORIZED VALVE ACTUATOR	I-401.00	
362	HSO-415	DO	TI-011-SMP-2 THREE-WAY MOTORIZED VALVE OPEN COMMAND	MCP-11	TI-011-SMP-2 THREE-WAY MOTORIZED VALVE ACTUATOR	I-401.00	
363	AI-416	AI	TI-011-SMP-2 TOTAL CHLORINE RESIDUAL	AIT-416	MCP-11	I-401.00	
364	UA-416	DI	TI-011-SMP-2 CHLORINE ANALYZER FAULT	AIT-416	MCP-11	I-401.00	
365	YIL-421	DO	HYPO-T-1 AVAILABLE	MCP-11	HYPO-FP-11	I-402.00	
366	LI-421	AI	HYPO-T-1 LEVEL	LY-421	MCP-11	I-402.00	
367	UA-421	DI	HYPO-T-1 LOSS OF ECHO	YS-421	MCP-11	I-402.00	
368	LAH-421A	DI	HYPO-T-1 HIGH LEVEL ALARM	LSH-421	MCP-11	I-402.00	
369	LAH-421B	DO	HYPO-T-1 HIGH LEVEL ALARM	MCP-11	HYPO-FP-11	I-402.00	
370	FAH-422	DI	HYPO-T-1 OVER FLOW DETECTED	FSH-422	MCP-11	I-402.00	

NO.	TAG NUMBER	I/O TYPE	DESCRIPTION	HARD WIRED I/O		P&ID NUMBER	REMARKS
				SIGNAL FROM	SIGNAL TO		
371	ZIO-423	DI	HYPO-T-1 DISCHARGE VALVE OPENED	HYPO-T-1 DISCHARGE VALVE ACTUATOR	MCP-11	I-402.00	
372	ZIC-423	DI	HYPO-T-1 DISCHARGE VALVE CLOSED	HYPO-T-1 DISCHARGE VALVE ACTUATOR	MCP-11	I-402.00	
373	HSO-423	DO	HYPO-T-1 DISCHARGE VALVE OPEN COMMAND	MCP-11	HYPO-T-1 DISCHARGE VALVE ACTUATOR	I-402.00	
374	HSC-423	DO	HYPO-T-1 DISCHARGE VALVE CLOSE COMMAND	MCP-11	HYPO-T-1 DISCHARGE VALVE ACTUATOR	I-402.00	
375	ZIO-424	DI	HYPO-T-1 DRAIN VALVE OPENED	HYPO-T-1 DRAIN VALVE ACTUATOR	MCP-11	I-402.00	
376	ZIC-424	DI	HYPO-T-1 DRAIN VALVE CLOSED	HYPO-T-1 DRAIN VALVE ACTUATOR	MCP-11	I-402.00	
377	HSO-424	DO	HYPO-T-1 DRAIN VALVE OPEN COMMAND	MCP-11	HYPO-T-1 DRAIN VALVE ACTUATOR	I-402.00	
378	HSC-424	DO	HYPO-T-1 DRAIN VALVE CLOSE COMMAND	MCP-11	HYPO-T-1 DRAIN VALVE ACTUATOR	I-402.00	
379	YIL-425	DO	HYPO-T-2 AVAILABLE	MCP-11	HYPO-FP-11	I-402.00	
380	LI-425	AI	HYPO-T-2 LEVEL	LY-425	MCP-11	I-402.00	
381	UA-425	DI	HYPO-T-2 LOSS OF ECHO	YS-425	MCP-11	I-402.00	
382	LAH-425A	DI	HYPO-T-2 HIGH LEVEL ALARM	LSH-425	MCP-11	I-402.00	
383	LAH-425B	DO	HYPO-T-2 HIGH LEVEL ALARM	MCP-11	HYPO-FP-11	I-402.00	
384	FAH-426	DI	HYPO-T-2 OVER FLOW DETECTED	FSH-426	MCP-11	I-402.00	
385	ZIO-427	DI	HYPO-T-2 DISCHARGE VALVE OPENED	HYPO-T-2 DISCHARGE VALVE ACTUATOR	MCP-11	I-402.00	
386	ZIC-427	DI	HYPO-T-2 DISCHARGE VALVE CLOSED	HYPO-T-2 DISCHARGE VALVE ACTUATOR	MCP-11	I-402.00	
387	HSO-427	DO	HYPO-T-2 DISCHARGE VALVE OPEN COMMAND	MCP-11	HYPO-T-2 DISCHARGE VALVE ACTUATOR	I-402.00	
388	HSC-427	DO	HYPO-T-2 DISCHARGE VALVE CLOSE COMMAND	MCP-11	HYPO-T-2 DISCHARGE VALVE ACTUATOR	I-402.00	
389	ZIO-428	DI	HYPO-T-2 DRAIN VALVE OPENED	HYPO-T-2 DRAIN VALVE ACTUATOR	MCP-11	I-402.00	
390	ZIC-428	DI	HYPO-T-2 DRAIN VALVE CLOSED	HYPO-T-2 DRAIN VALVE ACTUATOR	MCP-11	I-402.00	
391	HSO-428	DO	HYPO-T-2 DRAIN VALVE OPEN COMMAND	MCP-11	HYPO-T-2 DRAIN VALVE ACTUATOR	I-402.00	
392	HSC-428	DO	HYPO-T-2 DRAIN VALVE CLOSE COMMAND	MCP-11	HYPO-T-2 DRAIN VALVE ACTUATOR	I-402.00	
393	ZIO-429	DI	HYPO-TP-1 SUCTION VALVE OPENED	HYPO-TP-1 SUCTION VALVE ACTUATOR	MCP-11	I-402.00	
394	ZIC-429	DI	HYPO-TP-1 SUCTION VALVE CLOSED	HYPO-TP-1 SUCTION VALVE ACTUATOR	MCP-11	I-402.00	
395	HSO-429	DO	HYPO-TP-1 SUCTION VALVE OPEN COMMAND	MCP-11	HYPO-TP-1 SUCTION VALVE ACTUATOR	I-402.00	
396	HSC-429	DO	HYPO-TP-1 SUCTION VALVE CLOSE COMMAND	MCP-11	HYPO-TP-1 SUCTION VALVE ACTUATOR	I-402.00	
397	ZIL-430	DI	HYPO-TP-1 NOT IN REMOTE	HYPO-TP-1 MCC	MCP-11	I-402.00	
398	YIL-430	DI	HYPO-TP-1 RUNNING	HYPO-TP-1 MCC	MCP-11	I-402.00	
399	UA-430	DI	HYPO-TP-1 FAULT	HYPO-TP-1 MCC	MCP-11	I-402.00	
400	PAH-430	DI	HYPO-TP-1 DISCHARGE PRESSURE HIGH	HYPO-TP-1 MCC	MCP-11	I-402.00	
401	HS-430	DO	HYPO-TP-1 START/STOP COMMAND	MCP-11	HYPO-TP-1 MCC	I-402.00	
402	MAH-430	DI	HYPO-TP-1 HOSE LEAK DETECTED	HYPO-TP-1 MCC	MCP-11	I-402.00	
403	ZIO-431	DI	HYPO-TP-2 SUCTION VALVE OPENED	HYPO-TP-2 SUCTION VALVE ACTUATOR	MCP-11	I-402.00	
404	ZIC-431	DI	HYPO-TP-2 SUCTION VALVE CLOSED	HYPO-TP-2 SUCTION VALVE ACTUATOR	MCP-11	I-402.00	
405	HSO-431	DO	HYPO-TP-2 SUCTION VALVE OPEN COMMAND	MCP-11	HYPO-TP-2 SUCTION VALVE ACTUATOR	I-402.00	
406	HSC-431	DO	HYPO-TP-2 SUCTION VALVE CLOSE COMMAND	MCP-11	HYPO-TP-2 SUCTION VALVE ACTUATOR	I-402.00	
407	ZIL-432	DI	HYPO-TP-2 NOT IN REMOTE	HYPO-TP-2 MCC	MCP-11	I-402.00	

NO.	TAG NUMBER	I/O TYPE	DESCRIPTION	HARD WIRED I/O		P&ID NUMBER	REMARKS
				SIGNAL FROM	SIGNAL TO		
408	YIL-432	DI	HYPO-TP-2 RUNNING	HYPO-TP-2 MCC	MCP-11	I-402.00	
409	UA-432	DI	HYPO-TP-2 FAULT	HYPO-TP-2 MCC	MCP-11	I-402.00	
410	PAH-432	DI	HYPO-TP-2 DISCHARGE PRESSURE HIGH	HYPO-TP-2 MCC	MCP-11	I-402.00	
411	HS-432	DO	HYPO-TP-2 START/STOP COMMAND	MCP-11	HYPO-TP-2 MCC	I-402.00	
412	MAH-432	DI	HYPO-TP-2 HOSE LEAK DETECTED	HYPO-TP-2 MCC	MCP-11	I-402.00	
413	ZIO-433	DI	HYPO-T-1 RECIRCULATION LINE VALVE OPENED	HYPO-T-1 RECIRCULATION LINE VALVE ACTUATOR	MCP-11	I-402.00	
414	ZIC-433	DI	HYPO-T-1 RECIRCULATION LINE VALVE CLOSED	HYPO-T-1 RECIRCULATION LINE VALVE ACTUATOR	MCP-11	I-402.00	
415	HSO-433	DO	HYPO-T-1 RECIRCULATION LINE VALVE OPEN COMMAND	MCP-11	HYPO-T-1 RECIRCULATION LINE VALVE ACTUATOR	I-402.00	
416	HSC-433	DO	HYPO-T-1 RECIRCULATION LINE VALVE CLOSE COMMAND	MCP-11	HYPO-T-1 RECIRCULATION LINE VALVE ACTUATOR	I-402.00	
417	ZIO-434	DI	HYPO-T-2 RECIRCULATION LINE VALVE OPENED	HYPO-T-2 RECIRCULATION LINE VALVE ACTUATOR	MCP-11	I-402.00	
418	ZIC-434	DI	HYPO-T-2 RECIRCULATION LINE VALVE CLOSED	HYPO-T-2 RECIRCULATION LINE VALVE ACTUATOR	MCP-11	I-402.00	
419	HSO-434	DO	HYPO-T-2 RECIRCULATION LINE VALVE OPEN COMMAND	MCP-11	HYPO-T-2 RECIRCULATION LINE VALVE ACTUATOR	I-402.00	
420	HSC-434	DO	HYPO-T-2 RECIRCULATION LINE VALVE CLOSE COMMAND	MCP-11	HYPO-T-2 RECIRCULATION LINE VALVE ACTUATOR	I-402.00	
421	ZIO-435	DI	SERVICE WATER TO HYPO SYSTEM VALVE OPENED	SERVICE WATER TO HYPO SYSTEM VALVE ACTUATOR	MCP-11	I-402.00	
422	ZIC-435	DI	SERVICE WATER TO HYPO SYSTEM VALVE CLOSED	SERVICE WATER TO HYPO SYSTEM VALVE ACTUATOR	MCP-11	I-402.00	
423	HSO-435	DO	SERVICE WATER TO HYPO SYSTEM VALVE OPEN COMMAND	MCP-11	SERVICE WATER TO HYPO SYSTEM VALVE ACTUATOR	I-402.00	
424	HSC-435	DO	SERVICE WATER TO HYPO SYSTEM VALVE CLOSE COMMAND	MCP-11	SERVICE WATER TO HYPO SYSTEM VALVE ACTUATOR	I-402.00	
425	ZIO-440	DI	HYPO-MP-1 SUCTION VALVE OPENED	HYPO-MP-1 SUCTION VALVE ACTUATOR	MCP-11	I-403.00	
426	ZIC-440	DI	HYPO-MP-1 SUCTION VALVE CLOSED	HYPO-MP-1 SUCTION VALVE ACTUATOR	MCP-11	I-403.00	
427	HSO-440	DO	HYPO-MP-1 SUCTION VALVE OPEN COMMAND	MCP-11	HYPO-MP-1 SUCTION VALVE ACTUATOR	I-403.00	
428	HSC-440	DO	HYPO-MP-1 SUCTION VALVE CLOSE COMMAND	MCP-11	HYPO-MP-1 SUCTION VALVE ACTUATOR	I-403.00	
429	ZIL-441	DI	HYPO-MP-1 NOT IN REMOTE	HYPO-MP-1 VFD	MCP-11	I-403.00	
430	YIL-441	DI	HYPO-MP-1 RUNNING	HYPO-MP-1 VFD	MCP-11	I-403.00	
431	UA-441	DI	HYPO-MP-1 FAULT	HYPO-MP-1 VFD	MCP-11	I-403.00	
432	PAH-441	DI	HYPO-MP-1 DISCHARGE PRESSURE HIGH	HYPO-MP-1 VFD	MCP-11	I-403.00	
433	HS-441	DO	HYPO-MP-1 START/STOP COMMAND	MCP-11	HYPO-MP-1 VFD	I-403.00	
434	SI-441	AI	HYPO-MP-1 SPEED FEEDBACK	HYPO-MP-1 VFD	MCP-11	I-403.00	
435	SC-441	AO	HYPO-MP-1 SPEED COMMAND	MCP-11	HYPO-MP-1 VFD	I-403.00	
436	MAH-441	DI	HYPO-MP-1 LEAK DETECTED	HYPO-MP-1 VFD	MCP-11	I-403.00	
437	ZIO-442	DI	HYPO-MP-2 SUCTION VALVE OPENED	HYPO-MP-2 SUCTION VALVE ACTUATOR	MCP-11	I-403.00	
438	ZIC-442	DI	HYPO-MP-2 SUCTION VALVE CLOSED	HYPO-MP-2 SUCTION VALVE ACTUATOR	MCP-11	I-403.00	
439	HSO-442	DO	HYPO-MP-2 SUCTION VALVE OPEN COMMAND	MCP-11	HYPO-MP-2 SUCTION VALVE ACTUATOR	I-403.00	
440	HSC-442	DO	HYPO-MP-2 SUCTION VALVE CLOSE COMMAND	MCP-11	HYPO-MP-2 SUCTION VALVE ACTUATOR	I-403.00	
441	ZIL-443	DI	HYPO-MP-2 NOT IN REMOTE	HYPO-MP-2 VFD	MCP-11	I-403.00	
442	YIL-443	DI	HYPO-MP-2 RUNNING	HYPO-MP-2 VFD	MCP-11	I-403.00	
443	UA-443	DI	HYPO-MP-2 FAULT	HYPO-MP-2 VFD	MCP-11	I-403.00	
444	PAH-443	DI	HYPO-MP-2 DISCHARGE PRESSURE HIGH	HYPO-MP-2 VFD	MCP-11	I-403.00	

NO.	TAG NUMBER	I/O TYPE	DESCRIPTION	HARD WIRED I/O		P&ID NUMBER	REMARKS
				SIGNAL FROM	SIGNAL TO		
445	HS-443	DO	HYPO-MP-2 START/STOP COMMAND	MCP-11	HYPO-MP-2 VFD	I-403.00	
446	SI-443	AI	HYPO-MP-2 SPEED FEEDBACK	HYPO-MP-2 VFD	MCP-11	I-403.00	
447	SC-443	AO	HYPO-MP-2 SPEED COMMAND	MCP-11	HYPO-MP-2 VFD	I-403.00	
448	MAH-443	DI	HYPO-MP-2 LEAK DETECTED	HYPO-MP-2 VFD	MCP-11	I-403.00	
449	ZIO-444	DI	HYPO-MP-3 SUCTION VALVE OPENED	HYPO-MP-3 SUCTION VALVE ACTUATOR	MCP-11	I-403.00	
450	ZIC-444	DI	HYPO-MP-3 SUCTION VALVE CLOSED	HYPO-MP-3 SUCTION VALVE ACTUATOR	MCP-11	I-403.00	
451	HSO-444	DO	HYPO-MP-3 SUCTION VALVE OPEN COMMAND	MCP-11	HYPO-MP-3 SUCTION VALVE ACTUATOR	I-403.00	
452	HSC-444	DO	HYPO-MP-3 SUCTION VALVE CLOSE COMMAND	MCP-11	HYPO-MP-3 SUCTION VALVE ACTUATOR	I-403.00	
453	ZIL-445	DI	HYPO-MP-3 NOT IN REMOTE	HYPO-MP-3 VFD	MCP-11	I-403.00	
454	YIL-445	DI	HYPO-MP-3 RUNNING	MCP-11	HYPO-MP-3 VFD	I-403.00	
455	UA-445	DI	HYPO-MP-3 FAULT	HYPO-MP-3 VFD	MCP-11	I-403.00	
456	PAH-445	DI	HYPO-MP-3 DISCHARGE PRESSURE HIGH	HYPO-MP-3 VFD	MCP-11	I-403.00	
457	HS-445	DO	HYPO-MP-3 START/STOP COMMAND	MCP-11	HYPO-MP-3 VFD	I-403.00	
458	SI-445	AI	HYPO-MP-3 SPEED FEEDBACK	HYPO-MP-3 VFD	MCP-11	I-403.00	
459	SC-445	AO	HYPO-MP-3 SPEED COMMAND	MCP-11	HYPO-MP-3 VFD	I-403.00	
460	MAH-445	DI	HYPO-MP-3 LEAK DETECTED	HYPO-MP-3 VFD	MCP-11	I-403.00	
461	FI-446	AI	HYPO METERING PUMPS COMBINED FLOW	FIT-446	MCP-11	I-403.00	
462	LAHH-448	DI	SODIUM HYPOCHLORITE CHEMICAL CONTAINMENT SUMP HI-HI LEVEL	LSHH-448	MCP-11	I-403.00	
463	YIL-451	DO	SBS-T-1 AVAILABLE	MCP-11	SBS-FP-11	I-404.00	
464	LI-451	AI	SBS-T-1 LEVEL	LY-451	MCP-11	I-404.00	
465	UA-451	DI	SBS-T-1 LOSS OF ECHO	YS-451	MCP-11	I-404.00	
466	LAH-451A	DI	SBS-T-1 HIGH LEVEL ALARM	LSH-451	MCP-11	I-404.00	
467	LAH-451B	DO	SBS-T-1 HIGH LEVEL ALARM	MCP-11	SBS-FP-11	I-404.00	
468	FAH-452	DI	SBS-T-1 OVER FLOW DETECTED	FSL-310	MCP-11	I-404.00	
469	ZIO-453	DI	SBS-T-1 DISCHARGE VALVE OPENED	SBS-T-1 DISCHARGE VALVE ACTUATOR	MCP-11	I-404.00	
470	ZIC-453	DI	SBS-T-1 DISCHARGE VALVE CLOSED	SBS-T-1 DISCHARGE VALVE ACTUATOR	MCP-11	I-404.00	
471	HSO-453	DO	SBS-T-1 DISCHARGE VALVE OPEN COMMAND	MCP-11	SBS-T-1 DISCHARGE VALVE ACTUATOR	I-404.00	
472	HSC-453	DO	SBS-T-1 DISCHARGE VALVE CLOSE COMMAND	MCP-11	SBS-T-1 DISCHARGE VALVE ACTUATOR	I-404.00	
473	ZIO-454	DI	SBS-T-1 DRAIN VALVE OPENED	SBS-T-1 DRAIN VALVE ACTUATOR	MCP-11	I-404.00	
474	ZIC-454	DI	SBS-T-1 DRAIN VALVE CLOSED	SBS-T-1 DRAIN VALVE ACTUATOR	MCP-11	I-404.00	
475	HSO-454	DO	SBS-T-1 DRAIN VALVE OPEN COMMAND	MCP-11	SBS-T-1 DRAIN VALVE ACTUATOR	I-404.00	
476	HSC-454	DO	SBS-T-1 DRAIN VALVE CLOSE COMMAND	MCP-11	SBS-T-1 DRAIN VALVE ACTUATOR	I-404.00	
477	YIL-455	DO	SBS-T-2 AVAILABLE	MCP-11	SBS-FP-11	I-404.00	
478	LI-455	AI	SBS-T-2 LEVEL	LY-455	MCP-11	I-404.00	
479	UA-455	DI	SBS-T-2 LOSS OF ECHO	YS-455	MCP-11	I-404.00	
480	LAH-455A	DI	SBS-T-2 HIGH LEVEL ALARM	LSH-455	MCP-11	I-404.00	
481	LAH-455B	DO	SBS-T-2 HIGH LEVEL ALARM	MCP-11	SBS-FP-11	I-404.00	

NO.	TAG NUMBER	I/O TYPE	DESCRIPTION	HARD WIRED I/O		P&ID NUMBER	REMARKS
				SIGNAL FROM	SIGNAL TO		
482	FAH-456	DI	SBS-T-1 OVER FLOW DETECTED	FSH-456	MCP-11	I-404.00	
483	ZIO-457	DI	SBS-T-2 DISCHARGE VALVE OPENED	SBS-T-2 DISCHARGE VALVE ACTUATOR	MCP-11	I-404.00	
484	ZIC-457	DI	SBS-T-2 DISCHARGE VALVE CLOSED	SBS-T-2 DISCHARGE VALVE ACTUATOR	MCP-11	I-404.00	
485	HSO-457	DO	SBS-T-2 DISCHARGE VALVE OPEN COMMAND	MCP-11	SBS-T-2 DISCHARGE VALVE ACTUATOR	I-404.00	
486	HSC-457	DO	SBS-T-2 DISCHARGE VALVE CLOSE COMMAND	MCP-11	SBS-T-2 DISCHARGE VALVE ACTUATOR	I-404.00	
487	ZIO-458	DI	SBS-T-2 DRAIN VALVE OPENED	SBS-T-2 DRAIN VALVE ACTUATOR	MCP-11	I-404.00	
488	ZIC-458	DI	SBS-T-2 DRAIN VALVE CLOSED	SBS-T-2 DRAIN VALVE ACTUATOR	MCP-11	I-404.00	
489	HSO-458	DO	SBS-T-2 DRAIN VALVE OPEN COMMAND	MCP-11	SBS-T-2 DRAIN VALVE ACTUATOR	I-404.00	
490	HSC-458	DO	SBS-T-2 DRAIN VALVE CLOSE COMMAND	MCP-11	SBS-T-2 DRAIN VALVE ACTUATOR	I-404.00	
491	ZIO-459	DI	SBS-TP-1 SUCTION VALVE OPENED	SBS-TP-1 SUCTION VALVE ACTUATOR	MCP-11	I-404.00	
492	ZIC-459	DI	SBS-TP-1 SUCTION VALVE CLOSED	SBS-TP-1 SUCTION VALVE ACTUATOR	MCP-11	I-404.00	
493	HSO-459	DO	SBS-TP-1 SUCTION VALVE OPEN COMMAND	MCP-11	SBS-TP-1 SUCTION VALVE ACTUATOR	I-404.00	
494	HSC-459	DO	SBS-TP-1 SUCTION VALVE CLOSE COMMAND	MCP-11	SBS-TP-1 SUCTION VALVE ACTUATOR	I-404.00	
495	ZIL-460	DI	SBS-TP-1 NOT IN REMOTE	SBS-TP-1 MCC	MCP-11	I-404.00	
496	YIL-460	DI	SBS-TP-1 RUNNING	SBS-TP-1 MCC	MCP-11	I-404.00	
497	UA-460	DI	SBS-TP-1 FAULT	SBS-TP-1 MCC	MCP-11	I-404.00	
498	PAH-460	DI	SBS-TP-1 DISCHARGE PRESSURE HIGH	SBS-TP-1 MCC	MCP-11	I-404.00	
499	HS-460	DO	SBS-TP-1 START/STOP COMMAND	MCP-11	SBS-TP-1 MCC	I-404.00	
500	MAH-460	DI	SBS-TP-1 HOSE LEAK DETECTED	SBS-TP-1 MCC	MCP-11	I-404.00	
501	ZIO-461	DI	SBS-TP-2 SUCTION VALVE OPENED	SBS-TP-2 SUCTION VALVE ACTUATOR	MCP-11	I-404.00	
502	ZIC-461	DI	SBS-TP-2 SUCTION VALVE CLOSED	SBS-TP-2 SUCTION VALVE ACTUATOR	MCP-11	I-404.00	
503	HSO-461	DO	SBS-TP-2 SUCTION VALVE OPEN COMMAND	MCP-11	SBS-TP-2 SUCTION VALVE ACTUATOR	I-404.00	
504	HSC-461	DO	SBS-TP-2 SUCTION VALVE CLOSE COMMAND	MCP-11	SBS-TP-2 SUCTION VALVE ACTUATOR	I-404.00	
505	ZIL-462	DI	SBS-TP-2 NOT IN REMOTE	SBS-TP-2 MCC	MCP-11	I-404.00	
506	YIL-462	DI	SBS-TP-2 RUNNING	SBS-TP-2 MCC	MCP-11	I-404.00	
507	UA-462	DI	SBS-TP-2 FAULT	SBS-TP-2 MCC	MCP-11	I-404.00	
508	PAH-462	DI	SBS-TP-2 DISCHARGE PRESSURE HIGH	SBS-TP-2 MCC	MCP-11	I-404.00	
509	HS-462	DO	SBS-TP-2 START/STOP COMMAND	MCP-11	SBS-TP-2 MCC	I-404.00	
510	MAH-462	DI	SBS-TP-2 HOSE LEAK DETECTED	SBS-TP-2 MCC	MCP-11	I-404.00	
511	ZIO-463	DI	SBS-T-1 RECIRCULATION LINE VALVE OPENED	SBS-T-1 RECIRCULATION LINE VALVE ACTUATOR	MCP-11	I-404.00	
512	ZIC-463	DI	SBS-T-1 RECIRCULATION LINE VALVE CLOSED	SBS-T-1 RECIRCULATION LINE VALVE ACTUATOR	MCP-11	I-404.00	
513	HSO-463	DO	SBS-T-1 RECIRCULATION LINE VALVE OPEN COMMAND	MCP-11	SBS-T-1 RECIRCULATION LINE VALVE ACTUATOR	I-404.00	
514	HSC-463	DO	SBS-T-1 RECIRCULATION LINE VALVE CLOSE COMMAND	MCP-11	SBS-T-1 RECIRCULATION LINE VALVE ACTUATOR	I-404.00	
515	ZIO-464	DI	SBS-T-2 RECIRCULATION LINE VALVE OPENED	SBS-T-2 RECIRCULATION LINE VALVE ACTUATOR	MCP-11	I-404.00	
516	ZIC-464	DI	SBS-T-2 RECIRCULATION LINE VALVE CLOSED	SBS-T-2 RECIRCULATION LINE VALVE ACTUATOR	MCP-11	I-404.00	
517	HSO-464	DO	SBS-T-2 RECIRCULATION LINE VALVE OPEN COMMAND	MCP-11	SBS-T-2 RECIRCULATION LINE VALVE ACTUATOR	I-404.00	
518	HSC-464	DO	SBS-T-2 RECIRCULATION LINE VALVE CLOSE COMMAND	MCP-11	SBS-T-2 RECIRCULATION LINE VALVE ACTUATOR	I-404.00	

NO.	TAG NUMBER	I/O TYPE	DESCRIPTION	HARD WIRED I/O		P&ID NUMBER	REMARKS
				SIGNAL FROM	SIGNAL TO		
519	ZIO-465	DI	SBS-T-3 RECIRCULATION LINE VALVE OPENED	SBS-T-3 RECIRCULATION LINE VALVE ACTUATOR	MCP-11	I-404.00	
520	ZIC-465	DI	SBS-T-3 RECIRCULATION LINE VALVE CLOSED	SBS-T-3 RECIRCULATION LINE VALVE ACTUATOR	MCP-11	I-404.00	
521	HSO-465	DO	SBS-T-3 RECIRCULATION LINE VALVE OPEN COMMAND	MCP-11	SBS-T-3 RECIRCULATION LINE VALVE ACTUATOR	I-404.00	
522	HSC-465	DO	SBS-T-3 RECIRCULATION LINE VALVE CLOSE COMMAND	MCP-11	SBS-T-3 RECIRCULATION LINE VALVE ACTUATOR	I-404.00	
523	ZIO-470	DI	SBS-MP-1 SUCTION VALVE OPENED	SBS-MP-1 SUCTION VALVE ACTUATOR	MCP-11	I-405.00	
524	ZIC-470	DI	SBS-MP-1 SUCTION VALVE CLOSED	SBS-MP-1 SUCTION VALVE ACTUATOR	MCP-11	I-405.00	
525	HSO-470	DO	SBS-MP-1 SUCTION VALVE OPEN COMMAND	MCP-11	SBS-MP-1 SUCTION VALVE ACTUATOR	I-405.00	
526	HSC-470	DO	SBS-MP-1 SUCTION VALVE CLOSE COMMAND	MCP-11	SBS-MP-1 SUCTION VALVE ACTUATOR	I-405.00	
527	ZIL-471	DI	SBS-MP-1 NOT IN REMOTE	SBS-MP-1 VFD	MCP-11	I-405.00	
528	YIL-471	DI	SBS-MP-1 RUNNING	SBS-MP-1 VFD	MCP-11	I-405.00	
529	UA-471	DI	SBS-MP-1 FAULT	SBS-MP-1 VFD	MCP-11	I-405.00	
530	PAH-471	DI	SBS-MP-1 DISCHARGE PRESSURE HIGH	SBS-MP-1 VFD	MCP-11	I-405.00	
531	HS-471	DO	SBS-MP-1 START/STOP COMMAND	MCP-11	SBS-MP-1 VFD	I-405.00	
532	SI-471	AI	SBS-MP-1 SPEED FEEDBACK	SBS-MP-1 VFD	MCP-11	I-405.00	
533	SC-471	AO	SBS-MP-1 SPEED COMMAND	MCP-11	SBS-MP-1 VFD	I-405.00	
534	MAH-471	DI	SBS-MP-1 LEAK DETECTED	SBS-MP-1 VFD	MCP-11	I-405.00	
535	ZIO-472	DI	SBS-MP-2 SUCTION VALVE OPENED	SBS-MP-2 SUCTION VALVE ACTUATOR	MCP-11	I-405.00	
536	ZIC-472	DI	SBS-MP-2 SUCTION VALVE CLOSED	SBS-MP-2 SUCTION VALVE ACTUATOR	MCP-11	I-405.00	
537	HSO-472	DO	SBS-MP-2 SUCTION VALVE OPEN COMMAND	MCP-11	SBS-MP-2 SUCTION VALVE ACTUATOR	I-405.00	
538	HSC-472	DO	SBS-MP-2 SUCTION VALVE CLOSE COMMAND	MCP-11	SBS-MP-2 SUCTION VALVE ACTUATOR	I-405.00	
539	ZIL-473	DI	SBS-MP-2 NOT IN REMOTE	SBS-MP-2 VFD	MCP-11	I-405.00	
540	YIL-473	DI	SBS-MP-2 RUNNING	SBS-MP-2 VFD	MCP-11	I-405.00	
541	UA-473	DI	SBS-MP-2 FAULT	SBS-MP-2 VFD	MCP-11	I-405.00	
542	PAH-473	DI	SBS-MP-2 DISCHARGE PRESSURE HIGH	SBS-MP-2 VFD	MCP-11	I-405.00	
543	HS-473	DO	SBS-MP-2 START/STOP COMMAND	MCP-11	SBS-MP-2 VFD	I-405.00	
544	SI-473	AI	SBS-MP-2 SPEED FEEDBACK	SBS-MP-2 VFD	MCP-11	I-405.00	
545	SC-473	AO	SBS-MP-2 SPEED COMMAND	MCP-11	SBS-MP-2 VFD	I-405.00	
546	MAH-473	DI	SBS-MP-2 LEAK DETECTED	SBS-MP-2 VFD	MCP-11	I-405.00	
547	ZIO-474	DI	SBS-MP-3 SUCTION VALVE OPENED	SBS-MP-3 SUCTION VALVE ACTUATOR	MCP-11	I-405.00	
548	ZIC-474	DI	SBS-MP-3 SUCTION VALVE CLOSED	SBS-MP-3 SUCTION VALVE ACTUATOR	MCP-11	I-405.00	
549	HSO-474	DO	SBS-MP-3 SUCTION VALVE OPEN COMMAND	MCP-11	SBS-MP-3 SUCTION VALVE ACTUATOR	I-405.00	
550	HSC-474	DO	SBS-MP-3 SUCTION VALVE CLOSE COMMAND	MCP-11	SBS-MP-3 SUCTION VALVE ACTUATOR	I-405.00	
551	ZIL-475	DI	SBS-MP-3 NOT IN REMOTE	SBS-MP-3 VFD	MCP-11	I-405.00	
552	YIL-475	DI	SBS-MP-3 RUNNING	SBS-MP-3 VFD	MCP-11	I-405.00	
553	UA-475	DI	SBS-MP-3 FAULT	SBS-MP-3 VFD	MCP-11	I-405.00	
554	PAH-475	DI	SBS-MP-3 DISCHARGE PRESSURE HIGH	SBS-MP-3 VFD	MCP-11	I-405.00	
555	HS-475	DO	SBS-MP-3 START/STOP COMMAND	MCP-11	SBS-MP-3 VFD	I-405.00	

NO.	TAG NUMBER	I/O TYPE	DESCRIPTION	HARD WIRED I/O		P&ID NUMBER	REMARKS
				SIGNAL FROM	SIGNAL TO		
556	SI-475	AI	SBS-MP-3 SPEED FEEDBACK	SBS-MP-3 VFD	MCP-11	I-405.00	
557	SC-475	AO	SBS-MP-3 SPEED COMMAND	MCP-11	SBS-MP-3 VFD	I-405.00	
558	MAH-475	DI	SBS-MP-3 LEAK DETECTED	SBS-MP-3 VFD	MCP-11	I-405.00	
559	FI-476	AI	SBS METERING PUMPS COMBINED FLOW	FIT-403	MCP-11	I-405.00	
560	LAHH-478	DI	SODIUM BISULFITE CHEMICAL CONTAINMENT SUMP HI-HI LEVEL	LSHH-478	MCP-11	I-405.00	
561	UA-480	DO	TI-011C TRIPLE CONTAINMENT PIPING COMMON ALARM - LEAK DETECTED	MCP-11	TI-011 HMCS PANEL	I-406.00	SIGNAL GENERATES FROM LEAK DETECTION PANEL PROVIDED UNDER SECTION 40 05 32
562	UA-480	DI	TI-011C TRIPLE CONTAINMENT PIPING COMMON ALARM - LEAK DETECTED	LDP-11C	MCP-11	I-406.00	SIGNAL GENERATES FROM LEAK DETECTION PANEL PROVIDED UNDER SECTION 40 05 32
563	AAH-481	DO	TI-011C SODIUM HYPOCHLORITE ROOM CHLORINE GAS HIGH LEVEL ALARM	MCP-11	TI-011 HMCS PANEL	I-406.00	
564	AI-481	AI	TI-011C SODIUM HYPOCHLORITE ROOM CHLORINE GAS READING NO. 1	AE/AIT-481	MCP-11	I-406.00	
565	AI-482	AI	TI-011C SODIUM HYPOCHLORITE ROOM CHLORINE GAS READING NO. 2	AE/AIT-481	MCP-11	I-406.00	
566	UA-485	DI	TI-011D TRIPLE CONTAINMENT PIPING COMMON ALARM - LEAK DETECTED	LDP-11D	MCP-11	I-406.00	SIGNAL GENERATES FROM LEAK DETECTION PANEL PROVIDED UNDER SECTION 40 05 32
567	UA-485	DO	TI-011D TRIPLE CONTAINMENT PIPING COMMON ALARM - LEAK DETECTED	MCP-11	TI-011 HMCS PANEL	I-406.00	SIGNAL GENERATES FROM LEAK DETECTION PANEL PROVIDED UNDER SECTION 40 05 32
568	AAH-486	DO	TI-011D SODIUM BISULFITE ROOM SULFUR DIOXIDE GAS HIGH LEVEL ALARM	MCP-11	TI-011 HMCS PANEL	I-406.00	
569	AI-486	AI	TI-011D SODIUM BISULFITE ROOM SULFURE DIOXIDE GAS READING NO. 1	AE/AIT-486	MCP-11	I-406.00	
570	AI-487	AI	TI-011D SODIUM BISULFITE ROOM SULFURE DIOXIDE GAS READING NO. 2	AE/AIT-486	MCP-11	I-406.00	
571	FAH-490	DI	TI-011C CHLORINATION CHEMICAL ROOM (B04) EYEWASH/SHOWER NO. 1 ACTIVATED	FSH-490	MCP-11	I-406.00	SIGNAL GENERATES FROM EYWASH / SHOWER STATION PROVIDED UNDER SECTION 22 11 16
572	FAH-491	DI	TI-011C CHLORINATION CHEMICAL ROOM (B04) EYEWASH/SHOWER NO. 2 ACTIVATED	FSH-491	MCP-11	I-406.00	SIGNAL GENERATES FROM EYWASH / SHOWER STATION PROVIDED UNDER SECTION 22 11 16
573	FAH-492	DI	TI-011C NEAR SODIUM HYPOCHLORITE FILL STATION EYEWASH/SHOWER ACTIVATED	FSH-492	MCP-11	I-406.00	SIGNAL GENERATES FROM EYWASH / SHOWER STATION PROVIDED UNDER SECTION 22 11 16
574	FAH-493	DI	TI-011D DECHLORINATION CHEMICAL ROOM (B03) EYEWASH/SHOWER NO. 1 ACTIVATED	FSH-493	MCP-11	I-406.00	SIGNAL GENERATES FROM EYWASH / SHOWER STATION PROVIDED UNDER SECTION 22 11 16
575	FAH-494	DI	TI-011D DECHLORINATION CHEMICAL ROOM (B03) EYEWASH/SHOWER NO. 2 ACTIVATED	FSH-494	MCP-11	I-406.00	SIGNAL GENERATES FROM EYWASH / SHOWER STATION PROVIDED UNDER SECTION 22 11 16
576	FAH-495	DI	TI-011D NEAR SODIUM BISULFITE FILL STATION EYEWASH/SHOWER ACTIVATED	FSH-495	MCP-11	I-406.00	SIGNAL GENERATES FROM EYWASH / SHOWER STATION PROVIDED UNDER SECTION 22 11 16
577	JI-496A	DI	TI-011 UTILITY SOURCE AVAILABLE	TI-011 ATS PANEL	MCP-10	I-406.00	SIGNAL GENERATES FROM ATS PANEL PROVIDED UNDER SECTION 26 36 23
578	JA-496	DI	TI-011 UTILITY SOURCE FAILURE	TI-011 ATS PANEL	MCP-10	I-406.00	SIGNAL GENERATES FROM ATS PANEL PROVIDED UNDER SECTION 26 36 23
579	JI-496B	DI	TI-011 UTILITY SOURCE POWER ON	TI-011 ATS PANEL	MCP-10	I-406.00	SIGNAL GENERATES FROM ATS PANEL PROVIDED UNDER SECTION 26 36 23
580	JI-497	DI	TI-011 GENERATOR SOURCE POWER ON	TI-011 ATS PANEL	MCP-10	I-406.00	SIGNAL GENERATES FROM ATS PANEL PROVIDED UNDER SECTION 26 36 23
581	JA-497	DI	TI-011 GENERATOR SOURCE FAILURE	TI-011 ATS PANEL	MCP-10	I-406.00	SIGNAL GENERATES FROM ATS PANEL PROVIDED UNDER SECTION 26 36 23
582	JA-501	DI	MCP-10 120 VAC POWER LOSS ALARM	MCP-10 120 VAC POWER RELAY	MCP-10	N/A	INTERNAL PANEL WIRING
583	JA-502	DI	MCP-10 SURGE SUPPRESSOR FAILURE	MCP-10 SURGE SUPPRESSOR	MCP-10	N/A	INTERNAL PANEL WIRING
584	JA-503	DI	MCP-10 POWER SUPPLY NO. 1 FAILURE	MCP-10 POWER SUPPLY NO. 1	MCP-10	N/A	INTERNAL PANEL WIRING
585	JA-504	DI	MCP-10 POWER SUPPLY NO. 2 FAILURE	MCP-10 POWER SUPPLY NO. 2	MCP-10	N/A	INTERNAL PANEL WIRING
586	UA-505	DI	MCP-10 UPS LOW BATTERY	MCP-10 UPS	MCP-10	N/A	INTERNAL PANEL WIRING
587	UA-506	DI	MCP-10 UPS FAULT	MCP-10 UPS	MCP-10	N/A	INTERNAL PANEL WIRING
588	UA-507	DI	MCP-10 MANAGED ETHERNET SWITCH FAULT	MCP-10 MANAGED ETHERNET SWITCH	MCP-10	N/A	INTERNAL PANEL WIRING
589	XA-508	DI	MCP-10 INTRUSION ALARM	MCP-10 INTRUSION SWITCH (XS-508)	MCP-10	N/A	INTERNAL PANEL WIRING
590	JA-511	DI	DC5-CP 120 VAC POWER LOSS ALARM	DC5-CP 120 VAC POWER RELAY	DC5-CP	N/A	INTERNAL PANEL WIRING
591	JA-512	DI	DC5-CP SURGE SUPPRESSOR FAILURE	DC5-CP SURGE SUPPRESSOR	DC5-CP	N/A	INTERNAL PANEL WIRING
592	JA-513	DI	DC5-CP POWER SUPPLY NO. 1 FAILURE	DC5-CP POWER SUPPLY NO. 1	DC5-CP	N/A	INTERNAL PANEL WIRING

NO.	TAG NUMBER	I/O TYPE	DESCRIPTION	HARD WIRED I/O		P&ID NUMBER	REMARKS
				SIGNAL FROM	SIGNAL TO		
593	JA-514	DI	DC5-CP POWER SUPPLY NO. 2 FAILURE	DC5-CP POWER SUPPLY NO. 2	DC5-CP	N/A	INTERNAL PANEL WIRING
594	UA-515	DI	DC5-CP UPS LOW BATTERY	DC5-CP UPS	DC5-CP	N/A	INTERNAL PANEL WIRING
595	UA-516	DI	DC5-CP UPS FAULT	DC5-CP UPS	DC5-CP	N/A	INTERNAL PANEL WIRING
596	UA-517	DI	DC5-CP MANAGED ETHERNET SWITCH FAULT	DC5-CP MANAGED ETHERNET SWITCH	DC5-CP	N/A	INTERNAL PANEL WIRING
597	XA-518	DI	DC5 INSTRUMENTATION PANEL INTRUSION ALARM	DC5 INSTRUMENTATION PANEL INTRUSION SWITCH (XS-518)	DC5-CP	N/A	INTERNAL PANEL WIRING
598	XA-519	DI	DC5-CP INTRUSION ALARM	DC5-CP INTRUSION SWITCH (XS-519)	DC5-CP	N/A	INTERNAL PANEL WIRING
599	JA-521	DI	SBS-CP 120 VAC POWER LOSS ALARM	SBS-CP 120 VAC POWER RELAY	SBS-CP	N/A	INTERNAL PANEL WIRING
600	JA-522	DI	SBS-CP SURGE SUPPRESSOR FAILURE	SBS-CP SURGE SUPPRESSOR	SBS-CP	N/A	INTERNAL PANEL WIRING
601	JA-523	DI	SBS-CP POWER SUPPLY NO. 1 FAILURE	SBS-CP POWER SUPPLY NO. 1	SBS-CP	N/A	INTERNAL PANEL WIRING
602	JA-524	DI	SBS-CP POWER SUPPLY NO. 2 FAILURE	SBS-CP POWER SUPPLY NO. 2	SBS-CP	N/A	INTERNAL PANEL WIRING
603	UA-525	DI	SBS-CP UPS LOW BATTERY	SBS-CP UPS	SBS-CP	N/A	INTERNAL PANEL WIRING
604	UA-526	DI	SBS-CP UPS FAULT	SBS-CP UPS	SBS-CP	N/A	INTERNAL PANEL WIRING
605	UA-527	DI	SBS-CP MANAGED ETHERNET SWITCH FAULT	SBS-CP MANAGED ETHERNET SWITCH	SBS-CP	N/A	INTERNAL PANEL WIRING
606	XA-528	DI	SBS-CP INTRUSION ALARM	SBS-CP INTRUSION SWITCH (XS-528)	SBS-CP	N/A	INTERNAL PANEL WIRING
607	JA-531	DI	MCP-11 120 VAC POWER LOSS ALARM	MCP-11 120 VAC POWER RELAY	MCP-11	N/A	INTERNAL PANEL WIRING
608	JA-532	DI	MCP-11 SURGE SUPPRESSOR FAILURE	MCP-11 SURGE SUPPRESSOR	MCP-11	N/A	INTERNAL PANEL WIRING
609	JA-533	DI	MCP-11 POWER SUPPLY NO. 1 FAILURE	MCP-11 POWER SUPPLY NO. 1	MCP-11	N/A	INTERNAL PANEL WIRING
610	JA-534	DI	MCP-11 POWER SUPPLY NO. 2 FAILURE	MCP-11 POWER SUPPLY NO. 2	MCP-11	N/A	INTERNAL PANEL WIRING
611	UA-535	DI	MCP-11 UPS LOW BATTERY	MCP-11 UPS	MCP-11	N/A	INTERNAL PANEL WIRING
612	UA-536	DI	MCP-11 UPS FAULT	MCP-11 UPS	MCP-11	N/A	INTERNAL PANEL WIRING
613	UA-537	DI	MCP-11 MANAGED ETHERNET SWITCH FAULT	MCP-11 MANAGED ETHERNET SWITCH	MCP-11	N/A	INTERNAL PANEL WIRING
614	XA-538	DI	MCP-11 INTRUSION ALARM	MCP-11 INTRUSION SWITCH (XS-538)	MCP-11	N/A	INTERNAL PANEL WIRING

SECTION 40 61 94 – PMCS INSTRUMENT INDEX
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. This Section provides a listing of the minimum field and panel Instruments to be provided by the Contractor.

B. Additional Instruments may be required based on the actual equipment provided by the Contractor, and these additional Instruments shall be provided at no additional cost to the City.

C. The Instrument Index is given in a table after the "End of Section" and is available from the Engineer on electronic media. Allow 30 days from request to delivery of the media.

D. The following index of this Section is presented for convenience:

Article	Title	Section Page
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1.01	Summary	1
1.02	Payment	1
1.03	Related Sections	2
1.04	References	2
1.05	Description	2
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2.03	Fabrication / Assembling / Finishes	4
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3.02	Application	5
3.03	Field Testing / Quality Control	5
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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 40 61 13 - PMCS General Requirements
B. Section 40 61 26 - PMCS Training
C. Section 40 61 93 - PMCS Input Output List
D. Section 40 61 95 - PMCS Monitoring and Control Criteria
E. Section 40 61 96 - PMCS Control Strategies
F. Section 40 63 43 - PMCS Programmable Logic Controllers
G. Section 40 63 53 - PMCS Network Equipment
H. Section 40 67 16 - PMCS Panels and Enclosures
I. Section 40 70 01 - Measurement
J. Section 40 78 90 - PMCS Panel Mounted Instruments and Devices
K. Section 40 79 91 - PMCS Field Instruments
L. Section 40 80 81 - PMCS Factory Testing
M. Section 40 80 82 - PMCS Startup and Field Testing

1.04 REFERENCES

A. Definitions

1. I/O – Input/Output
2. SFT – Start-up and Field Testing.
3. OAD – Operational Availability Demonstration.
4. URT – Upset and Recovery Testing.
5. WFAT - Witnessed Factory Acceptance Tests.
6. Section 40 61 13 – PMCS General Requirements defines the terms and abbreviations used in this Section and the PMCS.

B. Reference Standards

1. Section 40 61 13 – PMCS General Requirements lists the standards applicable to this Section and the PMCS.

1.05 DESCRIPTION

A. Field and Panel Instruments:

1. As a minimum, the Contractor shall furnish and install all field and panel instruments indicated in the accompanying Instrument Index.
2. The Contractor shall review the P&IDs, Mechanical and Electrical drawings and individual equipment specifications for additional requirements.
3. Individual control and indicating devices such as selector switches, pushbuttons and indicating lights are not included in the Instrument Index

and must be accounted for from the drawings, control sequence descriptions and individual equipment specifications.

4. The listing includes information on signal functions, signal ranges and range conversions and set points.

5. As a minimum, the Contractor shall provide all hardware [and software] to provide the Instruments in the accompanying Index as indicated in the Contract documents and as required.

B. Instrument Index Column Headings

1. NO or Ref NO or Item NO – is a sequential number starting with a discrete number used to order the entries in the Index and permitting the Index to sorted and resorted to its original order.

2. TAG NUMBER – is an alpha numeric character string used to identify the instrument function and is defined in Section 40 61 83 – Input/Output Lists.

3. INSTRUMENT TYPE – is an alphanumeric string up 30 positions describing the kind of Instrument such as:

   a. Rotameter

   b. Magnetic Flow Meter

   c. Pressure Gauge

   d. Level Transmitter

   e. CL2 Analyzer

4. DESCRIPTION – is an alphanumeric string describing where the instrument is used.

5. SERVICE – is an alphanumeric string up 30 positions describing the process function the Instrument is used for.

6. LOCATION – is the listing of the physical location of the instrument.

7. P&ID NUMBER – is the listing of the P&ID Drawing where the Instrument can be found.

8. RANGE – is the monitoring range of the Instrument in engineering units.

9. SET POINT – is the setting in engineering units at which Instrument will initiate an action in the PMCS or equipment control or just provide an alarm indication.

10. REMARKS – can be used for supplementary information or to cross-reference information.

1.06 QUALITY ASSURANCE

A. The Contractor shall comply with the Quality Assurance requirements listed in Section 40 61 13 – PMCS General Requirements, this Section and the Specifications.

B. For each Instrument listed in the Instrument Index which cannot be used exactly as listed, submit an explanation of the reason for the deviation and propose a method to modify the Instrument Index information.

C. Information specific to all Instruments shall in addition be submitted with the submittal covering that Instrument.

D. Instrumentation Index shall be kept current, updated regularly and shall be available for inspection by the City at the project site.

1.07 SUBMITTALS

A. The Contractor shall comply with submittal requirements listed in Section 40 61 13 – PMCS General Requirements, this Section and the Specifications.

B. Contractor shall submit Instrument Index and schedules for the approval of the Engineer.

C. The Contractor is solely responsible for the timing of Instrument Index submittals to enable approval by the Engineer and subsequent use by the PMCS Supplier.

D. The Contractor shall create, maintain and submit for review, an updated Instrument Index of all instruments.

E. Submittal shall be made at least 90 days in advance of any proposed use by the PMCS Supplier.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall comply with delivery, storage and handling requirements listed in Section 40 61 13 – PMCS General Requirements.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. PMCS Instrument Index shall be implemented by the PMCS Supplier.

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. PMCS Factory Test shall conform to the requirements of Section 40 80 81 – PMCS Factory Tests.

B. Section 40 80 81 details how the Instruments specified under this Section shall be verified against approved submittals.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 APPLICATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. PMCS Field Testing shall conform to the requirements of Section 40 80 82 – PMCS Startup and Field Testing.

B. Section 40 80 82 details how the Instruments specified under this Section shall be verified during Field Testing.

3.04 STARTUP / DEMONSTRATION

A. Section 40 80 82 – PMCS Startup and Field Testing details the requirements for OAD and PMCS Upset and Recovery Testing.

B. The OAD and the PMCS Upset and Recovery Testing shall serve as the final verification of the correct functioning of all Instruments.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

NO.	TAG NUMBER	INSTRUMENT TYPE	DESCRIPTION	LOCATION	P&ID NUMBER	RANGE	SETPOINT	REMARKS
1	LE/SE/FIT-101	NON-CONTACT FLOW METER	CHANNEL NO. 1 NON-CONTACT FLOW METER	FLUSHING CSO FACILITY CHANNEL NO. 1	I-101.00	LEVEL: 0 - 18 FEET FLOW: XX MGD	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
2	LE/SE/FIT-102	NON-CONTACT FLOW METER	CHANNEL NO. 2 NON-CONTACT FLOW METER	FLUSHING CSO FACILITY CHANNEL NO. 2	I-101.00	LEVEL: 0 - 18 FEET FLOW: XX MGD	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
3	PIT-105	PRESSURE TRANSMITTER	STORAGE CELL NO. 7 LEVEL (PRESSURE) TRANSMITTER	FLUSHING CSO FACILITY STORAGE CELL NO. 7	I-101.00	0 - XX FEET	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
4	PIT-106	PRESSURE TRANSMITTER	STORAGE CELL NO. 15 LEVEL (PRESSURE) TRANSMITTER	FLUSHING CSO FACILITY STORAGE CELL NO. 15	I-101.00	0 - XX FEET	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
5	PSH-110	PRESSURE SWITCH (HIGH)	FBCSO-SMP-1 DISCHARGE HIGH PRESSURE SWITCH	FBCSO-SMP-1 DISCHARGE	I-101.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
6	FSL-112	SWINGING VANE TYPE FLOW SWITCH (LOW)	FBCSO-SMP-1 DISCHARGE LOW FLOW SWITCH	FBCSO-SMP-1 DISCHARGE	I-101.00	0 - 15 GPM	LOW FLOW / NO FLOW	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
7	FE-114	ROTAMETER	FBCSO-SMP-1 TO CHLORINE ANALYZER ROTAMETER	FBCSO TOTAL CHLORINE RESIDUAL ANALYZER PANEL	I-101.00	0 - 300 mL/MIN	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
8	AE/AIT-114	TOTAL CHLORINE RESIDUAL ANALYZER	FBCSO CHLORINE ANALYZER NO. 1	FBCSO TOTAL CHLORINE RESIDUAL ANALYZER PANEL	I-101.00	0 - 10 PPM	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
9	PSH-115	PRESSURE SWITCH (HIGH)	FBCSO-SMP-2 DISCHARGE HIGH PRESSURE SWITCH	FBCSO-SMP-2 DISCHARGE	I-101.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
10	FSL-117	SWINGING VANE TYPE FLOW SWITCH (LOW)	FBCSO-SMP-2 DISCHARGE LOW FLOW SWITCH	FBCSO-SMP-2 DISCHARGE	I-101.00	0 - 15 GPM	LOW FLOW / NO FLOW	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
11	FE-119	ROTAMETER	FBCSO-SMP-2 TO CHLORINE ANALYZER ROTAMETER	FBCSO TOTAL CHLORINE RESIDUAL ANALYZER PANEL	I-101.00	0 - 300 mL/MIN	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
12	AE/AIT-119	TOTAL CHLORINE RESIDUAL ANALYZER	FBCSO CHLORINE ANALYZER NO. 2	FBCSO TOTAL CHLORINE RESIDUAL ANALYZER PANEL	I-101.00	0 - 10 PPM	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
13	LE/LIT-121	ULTRASONIC LEVEL TRANSMITTER	TI-010 HYPO-T-1 LEVEL TRANSMITTER	TI-010 HYPO-T-1	I-102.00	0 - 10 FEET	XX FEET; OPERATOR ADJUSTABLE AT THE INSTRUMENT	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
14	LI-121	TANK LEVEL GAUGE	TI-010 HYPO-T-1 LEVEL GAUGE	TI-010 HYPO-T-1	I-102.00	0 - XX FEET	N/A	PROVIDED UNDER SECTION 43 41 45.01
15	FSH-122	SWINGING VANE TYPE FLOW SWITCH (HIGH)	TI-010 HYPO-T-1 OVERFLOW SWITCH	TI-010 HYPO-T-1	I-102.00	0 - 15 GPM	HIGH FLOW / FLOW DETECTED	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
16	LE/LIT-124	ULTRASONIC LEVEL TRANSMITTER	TI-010 HYPO-T-2 LEVEL TRANSMITTER	TI-010 HYPO-T-2	I-102.00	0 - 10 FEET	XX FEET; OPERATOR ADJUSTABLE AT THE INSTRUMENT	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
17	LI-124	TANK LEVEL GAUGE	TI-010 HYPO-T-2 LEVEL GAUGE	TI-010 HYPO-T-2	I-102.00	0 - XX FEET	N/A	PROVIDED UNDER SECTION 43 41 45.01
18	FSH-125	SWINGING VANE TYPE FLOW SWITCH (HIGH)	TI-010 HYPO-T-2 OVERFLOW SWITCH	TI-010 HYPO-T-2	I-102.00	0 - 15 GPM	HIGH FLOW / FLOW DETECTED	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
19	LE/LIT-127	ULTRASONIC LEVEL TRANSMITTER	TI-010 HYPO-T-3 LEVEL TRANSMITTER	TI-010 HYPO-T-3	I-102.00	0 - 10 FEET	XX FEET; OPERATOR ADJUSTABLE AT THE INSTRUMENT	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
20	LI-127	TANK LEVEL GAUGE	TI-010 HYPO-T-3 LEVEL GAUGE	TI-010 HYPO-T-3	I-102.00	0 - XX FEET	N/A	PROVIDED UNDER SECTION 43 41 45.01
21	FSH-128	SWINGING VANE TYPE FLOW SWITCH (HIGH)	TI-010 HYPO-T-3 OVERFLOW SWITCH	TI-010 HYPO-T-3	I-102.00	0 - 15 GPM	HIGH FLOW / FLOW DETECTED	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
22	PI-130	PRESSURE GAUGE	TI-010 HYPO-TP-1 SUCTION PRESSURE GAUGE	TI-010 HYPO-TP-1	I-102.00	XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
23	PI-131	PRESSURE GAUGE	TI-010 HYPO-TP-1 DISCHARGE PRESSURE GAUGE	TI-010 HYPO-TP-1	I-102.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
24	PSH-131	PRESSURE SWITCH (HIGH)	TI-010 HYPO-TP-1 DISCHARGE PRESSURE SWITCH HIGH	TI-010 HYPO-TP-1	I-102.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
25	PI-132	PRESSURE GAUGE	TI-010 HYPO-TP-2 SUCTION PRESSURE GAUGE	TI-010 HYPO-TP-2	I-102.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
26	PI-133	PRESSURE GAUGE	TI-010 HYPO-TP-2 DISCHARGE PRESSURE GAUGE	TI-010 HYPO-TP-2	I-102.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
27	PSH-133	PRESSURE SWITCH (HIGH)	TI-010 HYPO-TP-2 DISCHARGE PRESSURE SWITCH HIGH	TI-010 HYPO-TP-2	I-102.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
28	PI-140	PRESSURE GAUGE	TI-010 HYPO-MP-1A SUCTION PRESSURE GAUGE	TI-010 HYPO-MP-1A	I-103.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01

NO.	TAG NUMBER	INSTRUMENT TYPE	DESCRIPTION	LOCATION	P&ID NUMBER	RANGE	SETPOINT	REMARKS
29	PI-141	PRESSURE GAUGE	TI-010 HYPO-MP-1A DISCHARGE PRESSURE GAUGE	TI-010 HYPO-MP-1A	I-103.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
30	PSH-141	PRESSURE SWITCH (HIGH)	TI-010 HYPO-MP-1A DISCHARGE PRESSURE SWITCH HIGH	TI-010 HYPO-MP-1A	I-103.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
31	PI-142	PRESSURE GAUGE	TI-010 HYPO-MP-1B SUCTION PRESSURE GAUGE	TI-010 HYPO-MP-1B	I-103.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
32	PI-143	PRESSURE GAUGE	TI-010 HYPO-MP-1B DISCHARGE PRESSURE GAUGE	TI-010 HYPO-MP-1B	I-103.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
33	PSH-143	PRESSURE SWITCH (HIGH)	TI-010 HYPO-MP-1B DISCHARGE PRESSURE SWITCH HIGH	TI-010 HYPO-MP-1B	I-103.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
34	FE/FIT-144	MAGNETIC FLOW METER	TI-010 HYPO-MP-1A & 1B COMMON DISCHARGE FLOW METER	TI-010 HYPO-MP-1A & 1B	I-103.00	0 - 50 GPM	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
35	PI-150	PRESSURE GAUGE	TI-010 HYPO-MP-2A SUCTION PRESSURE GAUGE	TI-010 HYPO-MP-2A	I-104.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
36	PI-151	PRESSURE GAUGE	TI-010 HYPO-MP-2A DISCHARGE PRESSURE GAUGE	TI-010 HYPO-MP-2A	I-104.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
37	PSH-151	PRESSURE SWITCH (HIGH)	TI-010 HYPO-MP-2A DISCHARGE PRESSURE SWITCH HIGH	TI-010 HYPO-MP-2A	I-104.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
38	PI-152	PRESSURE GAUGE	TI-010 HYPO-MP-2B SUCTION PRESSURE GAUGE	TI-010 HYPO-MP-2B	I-104.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
39	PI-153	PRESSURE GAUGE	TI-010 HYPO-MP-2B DISCHARGE PRESSURE GAUGE	TI-010 HYPO-MP-2B	I-104.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
40	PSH-153	PRESSURE SWITCH (HIGH)	TI-010 HYPO-MP-2B DISCHARGE PRESSURE SWITCH HIGH	TI-010 HYPO-MP-2B	I-104.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
41	FE/FIT-154	MAGNETIC FLOW METER	TI-010 HYPO-MP-2A & 2B COMMON DISCHARGE FLOW METER	TI-010 HYPO-MP-2A & 2B	I-104.00	0 - 100 GPM	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
42	LSHH-160	SUMP LEVEL FLOAT SWITCH	TI-010 SODIUM HYPOCHLORITE CHEMICAL CONTAINMENT SUMP HIGH-HIGH LEVEL FLOAT SWITCH	TI-010 SODIUM HYPOCHLORITE CHEMICAL CONTAINMENT SUMP	I-104.00	N/A	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 43 23 31.03 IN CONFORMANCE WITH THE REQUIREMENTS OF SECTION 40 79 91
43	LSH-160	SUMP LEVEL FLOAT SWITCH	TI-010 SODIUM HYPOCHLORITE CHEMICAL CONTAINMENT SUMP HIGH LEVEL FLOAT SWITCH	TI-010 SODIUM HYPOCHLORITE CHEMICAL CONTAINMENT SUMP	I-104.00	N/A	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 43 23 31.03 IN CONFORMANCE WITH THE REQUIREMENTS OF SECTION 40 79 91
44	LS1-160	SUMP LEVEL FLOAT SWITCH	TI-010 SODIUM HYPOCHLORITE CHEMICAL CONTAINMENT SUMP 1ST LEVEL FLOAT SWITCH	TI-010 SODIUM HYPOCHLORITE CHEMICAL CONTAINMENT SUMP	I-104.00	N/A	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 43 23 31.03 IN CONFORMANCE WITH THE REQUIREMENTS OF SECTION 40 79 91
45	LS2-160	SUMP LEVEL FLOAT SWITCH	TI-010 SODIUM HYPOCHLORITE CHEMICAL CONTAINMENT SUMP 2ND LEVEL FLOAT SWITCH	TI-010 SODIUM HYPOCHLORITE CHEMICAL CONTAINMENT SUMP	I-104.00	N/A	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 43 23 31.03 IN CONFORMANCE WITH THE REQUIREMENTS OF SECTION 40 79 91
46	LSHH-170	REED LEVEL SWITCH (HIGH-HIGH)	TI-010 SODIUM HYPOCHLORITE CHEMICAL CONTAINMENT SUMP HIGH-HIGH LEVEL SWITCH	TI-010 SODIUM HYPOCHLORITE CHEMICAL CONTAINMENT SUMP	I-104.00	N/A	6 INCHES FROM FLOOR	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
47	LE/SE/FIT-220	NON-CONTACT FLOW METER	TI-010 DC-5 CULVERT NO. 1 NON-CONTACT FLOW METER	TI-010 DC-5 CULVERT NO. 1	I-201.00	LEVEL: 0 - 12 FEET FLOW: XX MGD	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
48	LE/SE/FIT-240	NON-CONTACT FLOW METER	TI-010 DC-5 CULVERT NO. 2 NON-CONTACT FLOW METER	TI-010 DC-5 CULVERT NO. 2	I-201.00	LEVEL: 0 - 12 FEET FLOW: XX MGD	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
49	LE/SE/FIT-260	NON-CONTACT FLOW METER	TI-010 DC-5 CULVERT NO. 3 NON-CONTACT FLOW METER	TI-010 DC-5 CULVERT NO. 3	I-201.00	LEVEL: 0 - 12 FEET FLOW: XX MGD	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
50	PSH-301	PRESSURE SWITCH (HIGH)	TI-010-SMP-1 DISCHARGE HIGH PRESSURE SWITCH	TI-010-SMP-1 DISCHARGE	I-301.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
51	FSL-303	SWINGING VANE TYPE FLOW SWITCH (LOW)	TI-010-SMP-1 DISCHARGE LOW FLOW SWITCH	TI-010-SMP-1 DISCHARGE	I-301.00	0 - 15 GPM	LOW FLOW / NO FLOW	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
52	FE-305	ROTAMETER	TI-010-SMP-1 TO CHLORINE ANALYZER ROTAMETER	TI-010 DC-5 TOTAL CHLORINE RESIDUAL ANALYZER PANEL	I-301.00	0 - 300 mL/MIN	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
53	AE/AIT-305	TOTAL CHLORINE RESIDUAL ANALYZER	TI-010 DC-5 CHLORINE ANALYZER NO. 1	TI-010 DC-5 TOTAL CHLORINE RESIDUAL ANALYZER PANEL	I-301.00	0 - 10 PPM	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
54	PSH-307	PRESSURE SWITCH (HIGH)	TI-010-SMP-2 DISCHARGE HIGH PRESSURE SWITCH	TI-010-SMP-2 DISCHARGE	I-301.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
55	FSL-309	SWINGING VANE TYPE FLOW SWITCH (LOW)	TI-010-SMP-2 DISCHARGE LOW FLOW SWITCH	TI-010-SMP-2 DISCHARGE	I-301.00	0 - 15 GPM	LOW FLOW / NO FLOW	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
56	FE-311	ROTAMETER	TI-010-SMP-2 TO CHLORINE ANALYZER ROTAMETER	TI-010 DC-5 TOTAL CHLORINE RESIDUAL ANALYZER PANEL	I-301.00	0 - 300 mL/MIN	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91

NO.	TAG NUMBER	INSTRUMENT TYPE	DESCRIPTION	LOCATION	P&ID NUMBER	RANGE	SETPOINT	REMARKS
57	AE/AIT-311	TOTAL CHLORINE RESIDUAL ANALYZER	TI-010 DC-5 CHLORINE ANALYZER NO. 2	TI-010 DC-5 TOTAL CHLORINE RESIDUAL ANALYZER PANEL	I-301.00	0 - 10 PPM	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
58	LE/LIT-321	ULTRASONIC LEVEL TRANSMITTER	TI-010 SBS-T-1 LEVEL TRANSMITTER	TI-010 SBS-T-1	I-302.00	0 - XX FEET	XX FEET; OPERATOR ADJUSTABLE AT THE INSTRUMENT	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
59	LI-321	TANK LEVEL GAUGE	TI-010 SBS-T-1 LEVEL GAUGE	TI-010 SBS-T-1	I-302.00	0 - XX FEET	N/A	PROVIDED WITH TANK VENDOR UNDER SECTION 43 41 45
60	FSH-322	SWINGING VANE TYPE FLOW SWITCH (HIGH)	TI-010 SBS-T-1 OVERFLOW SWITCH	TI-010 SBS-T-1	I-302.00	0 - 15 GPM	HIGH FLOW / FLOW DETECTED	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
61	LE/LIT-325	ULTRASONIC LEVEL TRANSMITTER	TI-010 SBS-T-2 LEVEL TRANSMITTER	TI-010 SBS-T-2	I-302.00	0 - XX FEET	XX FEET; OPERATOR ADJUSTABLE AT THE INSTRUMENT	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
62	LI-325	TANK LEVEL GAUGE	TI-010 SBS-T-2 LEVEL GAUGE	TI-010 SBS-T-2	I-302.00	0 - XX FEET	N/A	PROVIDED WITH TANK VENDOR UNDER SECTION 43 41 45
63	FSH-326	SWINGING VANE TYPE FLOW SWITCH (HIGH)	TI-010 SBS-T-2 OVERFLOW SWITCH	TI-010 SBS-T-2	I-302.00	0 - 15 GPM	HIGH FLOW / FLOW DETECTED	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
64	PI-329	PRESSURE GAUGE	TI-010 SBS-TP-1 SUCTION PRESSURE GAUGE	TI-010 SBS-TP-1	I-302.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
65	PI-330	PRESSURE GAUGE	TI-010 SBS-TP-1 DISCHARGE PRESSURE GAUGE	TI-010 SBS-TP-1	I-302.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
66	PSH-330	PRESSURE SWITCH (HIGH)	TI-010 SBS-TP-1 DISCHARGE PRESSURE SWITCH HIGH	TI-010 SBS-TP-1	I-302.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
67	PI-331	PRESSURE GAUGE	TI-010 SBS-TP-2 SUCTION PRESSURE GAUGE	TI-010 SBS-TP-2	I-302.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
68	PI-331	PRESSURE GAUGE	TI-010 SBS-TP-2 DISCHARGE PRESSURE GAUGE	TI-010 SBS-TP-2	I-302.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
69	PSH-332	PRESSURE SWITCH (HIGH)	TI-010 SBS-TP-2 DISCHARGE PRESSURE SWITCH HIGH	TI-010 SBS-TP-2	I-302.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
70	PI-340	PRESSURE GAUGE	TI-010 SBS-MP-1 SUCTION PRESSURE GAUGE	TI-010 SBS-MP-1	I-303.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
71	PI-341	PRESSURE GAUGE	TI-010 SBS-MP-1 DISCHARGE PRESSURE GAUGE	TI-010 SBS-MP-1	I-303.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
72	PSH-341	PRESSURE SWITCH (HIGH)	TI-010 SBS-MP-1 DISCHARGE PRESSURE SWITCH HIGH	TI-010 SBS-MP-1	I-303.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
73	PI-342	PRESSURE GAUGE	TI-010 SBS-MP-2 SUCTION PRESSURE GAUGE	TI-010 SBS-MP-2	I-303.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
74	PI-343	PRESSURE GAUGE	TI-010 SBS-MP-2 DISCHARGE PRESSURE GAUGE	TI-010 SBS-MP-2	I-303.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
75	PSH-343	PRESSURE SWITCH (HIGH)	TI-010 SBS-MP-2 DISCHARGE PRESSURE SWITCH HIGH	TI-010 SBS-MP-2	I-303.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
76	PI-344	PRESSURE GAUGE	TI-010 SBS-MP-3 SUCTION PRESSURE GAUGE	TI-010 SBS-MP-3	I-303.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
77	PI-345	PRESSURE GAUGE	TI-010 SBS-MP-3 DISCHARGE PRESSURE GAUGE	TI-010 SBS-MP-3	I-303.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
78	PSH-345	PRESSURE SWITCH (HIGH)	TI-010 SBS-MP-3 DISCHARGE PRESSURE SWITCH HIGH	TI-010 SBS-MP-3	I-303.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
79	FE/FIT-350	MAGNETIC FLOW METER	TI-010 SBS-MP-1, 2, & 3 COMMON DISCHARGE FLOW METER	TI-010 SBS-MP-1, 2, & 3	I-303.00	0 - XX GPM	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
80	LSHH-355	REED LEVEL SWITCH (HIGH-HIGH)	TI-010 SODIUM BISULFITE CHEMICAL CONTAINMENT SUMP HIGH-HIGH LEVEL SWITCH	TI-010 SODIUM BISULFITE CHEMICAL CONTAINMENT SUMP	I-303.00	N/A	6 INCHES FROM FLOOR	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
81	LSH-360	LOW POINT LEAK DETECTION SENSOR	TI-010C LOW POINT LEAK DETECTION SENSOR	TI-010C LEAK DETECTION PANEL (LDP-10C)	I-304.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 40 05 32; QUANTITY OF LOW POINT LEAK DETECTION SENSORS DEPENDENT ON FINAL PIPE LAYOUT BY CONTRACTOR
82	LT-365	CONTINUOUS LEAK DETECTION SENSOR	TI-010C DC-5 CONTINUOUS LEAK DETECTION SENSOR	TI-010C DC-5 LEAK DETECTION PANEL (LDP-DC5)	I-304.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 40 05 32
83	LT-370	CONTINUOUS LEAK DETECTION SENSOR	TI-010D CONTINUOUS LEAK DETECTION SENSOR	TI-010D LEAK DETECTION PANEL (LDP-10D)	I-304.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 40 05 32
84	AE/AIT-375	SO2 GAS SENSOR / TRANSMITTER	TI-010 SODIUM BISULFITE ROOM SO2 GAS ANALYZER	TI-010 SODIUM BISULFITE ROOM	I-304.00	0 - 100 %	TBD	PROVIDED UNDER SPECIFICATION SECTION 40 79 91

NO.	TAG NUMBER	INSTRUMENT TYPE	DESCRIPTION	LOCATION	P&ID NUMBER	RANGE	SETPOINT	REMARKS
85	AE-376	SO2 GAS SENSOR	TI-010 SODIUM BISULFITE ROOM SO2 GAS SENSOR	TI-010 SODIUM BISULFITE ROOM	I-304.00	0 - 100%	TBD	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
86	FSH-380	EYEWASH SHOWER STATION FLOW SWITCH (HIGH)	TI-010C CHEMICAL STORAGE AREA (BASEMENT) EYEWASH SHOWER STATION FLOW SWITCH HIGH NO. 1	TI-010C CHEMICAL STORAGE AREA - BASEMENT	I-304.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 22 11 16
87	FSH-381	EYEWASH SHOWER STATION FLOW SWITCH (HIGH)	TI-010C CHEMICAL STORAGE AREA (BASEMENT) EYEWASH SHOWER STATION FLOW SWITCH HIGH NO. 2	TI-010C CHEMICAL STORAGE AREA - BASEMENT	I-304.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 22 11 16
88	FSH-382	EYEWASH SHOWER STATION FLOW SWITCH (HIGH)	TI-010C CHEMICAL STORAGE AREA (BASEMENT) EYEWASH SHOWER STATION FLOW SWITCH HIGH NO. 3	TI-010C CHEMICAL STORAGE AREA - BASEMENT	I-304.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 22 11 16
89	FSH-383	EYEWASH SHOWER STATION FLOW SWITCH (HIGH)	TI-010C CHEMICAL STORAGE AREA (BASEMENT) EYEWASH SHOWER STATION FLOW SWITCH HIGH NO. 4	TI-010C CHEMICAL STORAGE AREA - BASEMENT	I-304.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 22 11 16
90	FSH-384	EYEWASH SHOWER STATION FLOW SWITCH (HIGH)	TI-010C (OUTSIDE NEAR FILL STATION PANEL) EYEWASH SHOWER STATION FLOW SWITCH HIGH	TI-010C (OUTSIDE NEAR FILL STATION PANEL)	I-304.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 22 11 16
91	FSH-385	EYEWASH SHOWER STATION FLOW SWITCH (HIGH)	TI-010D CHEMICAL ROOM (B01) EYEWASH SHOWER STATION FLOW SWITCH HIGH NO. 1	TI-010D CHEMICAL ROOM (B01) - INSIDE CONTAINMENT AREA	I-304.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 22 11 16
92	FSH-386	EYEWASH SHOWER STATION FLOW SWITCH (HIGH)	TI-010D CHEMICAL ROOM (B01) EYEWASH SHOWER STATION FLOW SWITCH HIGH NO. 2	TI-010D CHEMICAL ROOM (B01) - INSIDE CONTAINMENT AREA	I-304.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 22 11 16
93	FSH-387	EYEWASH SHOWER STATION FLOW SWITCH (HIGH)	TI-010D (OUTSIDE OF CHEMICAL ROOM NEAR FILL STATION PANEL) EYEWASH SHOWER STATION FLOW SWITCH HIGH	TI-010D OUTSIDE OF CHEMICAL ROOM (B01) - NEAR FILL STATION PANEL	I-304.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 22 11 16
94	LE/LIT-400	EXISTING; TBD	TI-011 DIVERSION CHAMBER LEVEL TRANSMITTER	TI-011 DIVERSION CHAMBER	I-401.00	0 - XX FEET	N/A	EXISTING INSTRUMENT
95	LE/LIT-401	RADAR LEVEL TRANSMITTER	TI-011 OVERFLOW CHAMBER LEVEL TRANSMITTER	TI-011 OVERFLOW CHAMBER	I-401.00	0 - XX FEET	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
96	LE/SE/FIT-404	NON-CONTACT FLOW METER	TI-011 MANHOLE NO. 1 NON-CONTACT FLOW METER	TI-011 MANHOLE NO. 1	I-401.00	LEVEL: 0 - XX FEET FLOW: XX MGD	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
97	LE/SE/FIT-405	NON-CONTACT FLOW METER	TI-011 MANHOLE NO. 2 NON-CONTACT FLOW METER	TI-011 MANHOLE NO. 2	I-401.00	LEVEL: 0 - XX FEET FLOW: XX MGD	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
98	PSH-406	PRESSURE SWITCH (HIGH)	TI-011-SMP-1 DISCHARGE HIGH PRESSURE SWITCH	TI-011-SMP-1 DISCHARGE	I-401.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
99	FSL-408	SWINGING VANE TYPE FLOW SWITCH (LOW)	TI-011-SMP-1 DISCHARGE LOW FLOW SWITCH	TI-011-SMP-1 DISCHARGE	I-401.00	0 - 15 GPM	LOW FLOW / NO FLOW	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
100	FE-410	ROTAMETER	TI-011-SMP-1 TO CHLORINE ANALYZER ROTAMETER	TI-011 TOTAL CHLORINE RESIDUAL ANALYZER PANEL	I-401.00	0 - 300 mL/MIN	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
101	AE/AIT-410	TOTAL CHLORINE RESIDUAL ANALYZER	TI-011 CHLORINE ANALYZER NO. 1	TI-011 TOTAL CHLORINE RESIDUAL ANALYZER PANEL	I-401.00	0 - 10 PPM	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
102	PSH-412	PRESSURE SWITCH (HIGH)	TI-011-SMP-2 DISCHARGE HIGH PRESSURE SWITCH	TI-011-SMP-2 DISCHARGE	I-401.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
103	FSL-414	SWINGING VANE TYPE FLOW SWITCH (LOW)	TI-011-SMP-2 DISCHARGE LOW FLOW SWITCH	TI-011-SMP-2 DISCHARGE	I-401.00	0 - 15 GPM	LOW FLOW / NO FLOW	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
104	FE-416	ROTAMETER	TI-011-SMP-2 TO CHLORINE ANALYZER ROTAMETER	TI-011 TOTAL CHLORINE RESIDUAL ANALYZER PANEL	I-401.00	0 - 300 mL/MIN	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
105	AE/AIT-416	TOTAL CHLORINE RESIDUAL ANALYZER	TI-011 CHLORINE ANALYZER NO. 2	TI-011 TOTAL CHLORINE RESIDUAL ANALYZER PANEL	I-401.00	0 - 10 PPM	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
106	LE/LIT-421	ULTRASONIC LEVEL TRANSMITTER	TI-011 HYPO-T-1 LEVEL TRANSMITTER	TI-011 HYPO-T-1	I-402.00	0 - XX FEET	XX FEET; OPERATOR ADJUSTABLE AT THE INSTRUMENT	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
107	LI-421	TANK LEVEL GAUGE	TI-011 HYPO-T-1 LEVEL GAUGE	TI-011 HYPO-T-1	I-402.00	0 - XX FEET	N/A	PROVIDED WITH TANK VENDOR UNDER SECTION 43 41 45
108	FSH-422	SWINGING VANE TYPE FLOW SWITCH (HIGH)	TI-011 HYPO-T-1 OVERFLOW SWITCH	TI-011 HYPO-T-1	I-402.00	0 - 15 GPM	HIGH FLOW / FLOW DETECTED	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
109	LE/LIT-425	ULTRASONIC LEVEL TRANSMITTER	TI-011 HYPO-T-2 LEVEL TRANSMITTER	TI-011 HYPO-T-2	I-402.00	0 - XX FEET	XX FEET; OPERATOR ADJUSTABLE AT THE INSTRUMENT	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
110	LI-425	TANK LEVEL GAUGE	TI-011 HYPO-T-2 LEVEL GAUGE	TI-011 HYPO-T-2	I-402.00	0 - XX FEET	N/A	PROVIDED WITH TANK VENDOR UNDER SECTION 43 41 45
111	FSH-426	SWINGING VANE TYPE FLOW SWITCH (HIGH)	TI-011 HYPO-T-2 OVERFLOW SWITCH	TI-011 HYPO-T-2	I-402.00	0 - 15 GPM	HIGH FLOW / FLOW DETECTED	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
112	PI-429	PRESSURE GAUGE	TI-011 HYPO-TP-1 SUCTION PRESSURE GAUGE	TI-011 HYPO-TP-1	I-402.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01

NO.	TAG NUMBER	INSTRUMENT TYPE	DESCRIPTION	LOCATION	P&ID NUMBER	RANGE	SETPOINT	REMARKS
113	PI-430	PRESSURE GAUGE	TI-011 HYPO-TP-1 DISCHARGE PRESSURE GAUGE	TI-011 HYPO-TP-1	I-402.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
114	PSH-430	PRESSURE SWITCH (HIGH)	TI-011 HYPO-TP-1 DISCHARGE PRESSURE SWITCH HIGH	TI-011 HYPO-TP-1	I-402.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
115	PI-431	PRESSURE GAUGE	TI-011 HYPO-TP-2 SUCTION PRESSURE GAUGE	TI-011 HYPO-TP-2	I-402.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
116	PI-432	PRESSURE GAUGE	TI-011 HYPO-TP-2 DISCHARGE PRESSURE GAUGE	TI-011 HYPO-TP-2	I-402.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
117	PSH-432	PRESSURE SWITCH (HIGH)	TI-011 HYPO-TP-2 DISCHARGE PRESSURE SWITCH HIGH	TI-011 HYPO-TP-2	I-402.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
118	PI-440	PRESSURE GAUGE	TI-011 HYPO-MP-1 SUCTION PRESSURE GAUGE	TI-011 HYPO-MP-1	I-403.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
119	PI-441	PRESSURE GAUGE	TI-011 HYPO-MP-1 DISCHARGE PRESSURE GAUGE	TI-011 HYPO-MP-1	I-403.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
120	PSH-441	PRESSURE SWITCH (HIGH)	TI-011 HYPO-MP-1 DISCHARGE PRESSURE SWITCH HIGH	TI-011 HYPO-MP-1	I-403.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
121	PI-442	PRESSURE GAUGE	TI-011 HYPO-MP-2 SUCTION PRESSURE GAUGE	TI-011 HYPO-MP-2	I-403.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
122	PI-443	PRESSURE GAUGE	TI-011 HYPO-MP-2 DISCHARGE PRESSURE GAUGE	TI-011 HYPO-MP-2	I-403.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
123	PSH-443	PRESSURE SWITCH (HIGH)	TI-011 HYPO-MP-2 DISCHARGE PRESSURE SWITCH HIGH	TI-011 HYPO-MP-2	I-403.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
124	PI-444	PRESSURE GAUGE	TI-011 HYPO-MP-3 SUCTION PRESSURE GAUGE	TI-011 HYPO-MP-3	I-403.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
125	PI-445	PRESSURE GAUGE	TI-011 HYPO-MP-3 DISCHARGE PRESSURE GAUGE	TI-011 HYPO-MP-3	I-403.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
126	PSH-445	PRESSURE SWITCH (HIGH)	TI-011 HYPO-MP-3 DISCHARGE PRESSURE SWITCH HIGH	TI-011 HYPO-MP-3	I-403.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
127	FE/FIT-446	MAGNETIC FLOW METER	TI-011 HYPO-MP-1. 2. & 3 COMMON DISCHARGE FLOW METER	TI-010 HYPO-MP-1, 2, & 3	I-403.00	0 - XX GPM	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
128	LSHH-448	REED LEVEL SWITCH (HIGH-HIGH)	TI-011 SODIUM HYPOCHLORITE CHEMICAL CONTAINMENT SUMP HIGH-HIGH LEVEL SWITCH	TI-011 SODIUM HYPOCHLORITE CHEMICAL CONTAINMENT SUMP	I-403.00	N/A	6 INCHES FROM FLOOR	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
129	LE/LIT-451	ULTRASONIC LEVEL TRANSMITTER	TI-011 SBS-T-1 LEVEL TRANSMITTER	TI-011 SBS-T-1	I-404.00	0 - XX FEET	XX FEET; OPERATOR ADJUSTABLE AT THE INSTRUMENT	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
130	LI-451	TANK LEVEL GAUGE	TI-011 SBS-T-1 LEVEL GAUGE	TI-011 SBS-T-1	I-404.00	0 - XX FEET	N/A	PROVIDED WITH TANK VENDOR UNDER SECTION 43 41 45
131	FSH-452	SWINGING VANE TYPE FLOW SWITCH (HIGH)	TI-011 SBS-T-1 OVERFLOW SWITCH	TI-011 SBS-T-1	I-404.00	0 - 15 GPM	HIGH FLOW / FLOW DETECTED	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
132	LE/LIT-455	ULTRASONIC LEVEL TRANSMITTER	TI-011 SBS-T-2 LEVEL TRANSMITTER	TI-011 SBS-T-2	I-404.00	0 - XX FEET	XX FEET; OPERATOR ADJUSTABLE AT THE INSTRUMENT	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
133	LI-455	TANK LEVEL GAUGE	TI-011 SBS-T-2 LEVEL GAUGE	TI-011 SBS-T-2	I-404.00	0 - XX FEET	N/A	PROVIDED WITH TANK VENDOR UNDER SECTION 43 41 45
134	FSH-456	SWINGING VANE TYPE FLOW SWITCH (HIGH)	TI-011 SBS-T-2 OVERFLOW SWITCH	TI-011 SBS-T-2	I-404.00	0 - 15 GPM	HIGH FLOW / FLOW DETECTED	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
135	PI-459	PRESSURE GAUGE	TI-011 SBS-TP-1 SUCTION PRESSURE GAUGE	TI-011 SBS-TP-1	I-404.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
136	PI-460	PRESSURE GAUGE	TI-011 SBS-TP-1 DISCHARGE PRESSURE GAUGE	TI-011 SBS-TP-1	I-404.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
137	PSH-460	PRESSURE SWITCH (HIGH)	TI-011 SBS-TP-1 DISCHARGE PRESSURE SWITCH HIGH	TI-011 SBS-TP-1	I-404.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
138	PI-461	PRESSURE GAUGE	TI-011 SBS-TP-2 SUCTION PRESSURE GAUGE	TI-011 SBS-TP-2	I-404.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
139	PI-462	PRESSURE GAUGE	TI-011 SBS-TP-2 DISCHARGE PRESSURE GAUGE	TI-011 SBS-TP-2	I-404.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
140	PSH-462	PRESSURE SWITCH (HIGH)	TI-011 SBS-TP-2 DISCHARGE PRESSURE SWITCH HIGH	TI-011 SBS-TP-2	I-404.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91

NO.	TAG NUMBER	INSTRUMENT TYPE	DESCRIPTION	LOCATION	P&ID NUMBER	RANGE	SETPOINT	REMARKS
141	PI-470	PRESSURE GAUGE	TI-011 SBS-MP-1 SUCTION PRESSURE GAUGE	TI-011 SBS-MP-1	I-405.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
142	PI-471	PRESSURE GAUGE	TI-011 SBS-MP-1 DISCHARGE PRESSURE GAUGE	TI-011 SBS-MP-1	I-405.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
143	PSH-471	PRESSURE SWITCH (HIGH)	TI-011 SBS-MP-1 DISCHARGE PRESSURE SWITCH HIGH	TI-011 SBS-MP-1	I-405.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
144	PI-472	PRESSURE GAUGE	TI-011 SBS-MP-2 SUCTION PRESSURE GAUGE	TI-011 SBS-MP-2	I-405.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
145	PI-473	PRESSURE GAUGE	TI-011 SBS-MP-2 DISCHARGE PRESSURE GAUGE	TI-011 SBS-MP-2	I-405.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
146	PSH-473	PRESSURE SWITCH (HIGH)	TI-011 SBS-MP-2 DISCHARGE PRESSURE SWITCH HIGH	TI-011 SBS-MP-2	I-405.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
147	PI-474	PRESSURE GAUGE	TI-011 SBS-MP-3 SUCTION PRESSURE GAUGE	TI-011 SBS-MP-3	I-405.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
148	PI-475	PRESSURE GAUGE	TI-011 SBS-MP-3 DISCHARGE PRESSURE GAUGE	TI-011 SBS-MP-3	I-405.00	0 - XX PSI	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 70 01
149	PSH-475	PRESSURE SWITCH (HIGH)	TI-011 SBS-MP-3 DISCHARGE PRESSURE SWITCH HIGH	TI-011 SBS-MP-3	I-405.00	0 - XX PSI	XX PSI	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
150	FE/FIT-476	MAGNETIC FLOW METER	TI-011 SBS-MP-1, 2, & 3 COMMON DISCHARGE FLOW METER	TI-010 SBS-MP-1, 2, & 3	I-405.00	0 - XX GPM	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
151	LSHH-478	REED LEVEL SWITCH (HIGH-HIGH)	TI-011 SODIUM BISULFITE CHEMICAL CONTAINMENT SUMP HIGH-HIGH LEVEL SWITCH	TI-011 SODIUM BISULFITE CHEMICAL CONTAINMENT SUMP	I-405.00	N/A	6 INCHES FROM FLOOR	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
152	LT-480	CONTINUOUS LEAK DETECTION SENSOR	TI-011C CONTINUOUS LEAK DETECTION SENSOR	TI-011C LEAK DETECTION PANEL (LDP-11C)	I-406.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 40 05 32
153	AE/AIT-481	CL2 GAS SENSOR / TRANSMITTER	TI-011 SODIUM HYPOCHLORITE ROOM CL2 GAS ANALYZER	TI-011 SODIUM HYPOCHLORITE ROOM	I-406.00	0 - 100 %	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
154	AE-482	CL2 GAS SENSOR	TI-011 SODIUM HYPOCHLORITE ROOM CL2 GAS SENSOR	TI-011 SODIUM BISULFITE ROOM	I-406.00	0 - 100%	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
155	LT-485	CONTINUOUS LEAK DETECTION SENSOR	TI-011D CONTINUOUS LEAK DETECTION SENSOR	TI-011D LEAK DETECTION PANEL (LDP-11D)	I-406.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 40 05 32
156	AE/AIT-486	SO2 GAS SENSOR / TRANSMITTER	TI-011 SODIUM BISULFITE CHEMICAL ROOM SO2 GAS ANALYZER	TI-011 SODIUM BISULFITE ROOM	I-406.00	0 - 100 %	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
157	AE-487	SO2 GAS SENSOR	TI-011 SODIUM BISULFITE CHEMICAL ROOM SO2 GAS SENSOR	TI-011 SODIUM BISULFITE ROOM	I-406.00	0 - 100%	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 79 91
158	FSH-490	EYEWASH SHOWER STATION FLOW SWITCH (HIGH)	TI-011C CHLORINATION CHEMICAL ROOM (B04) EYEWASH SHOWER STATION FLOW SWITCH HIGH NO. 1	TI-011C CHLORINATION CHEMICAL ROOM (B04)	I-406.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 22 11 16
159	FSH-491	EYEWASH SHOWER STATION FLOW SWITCH (HIGH)	TI-011C CHLORINATION CHEMICAL ROOM (B04) EYEWASH SHOWER STATION FLOW SWITCH HIGH NO. 2	TI-011C CHLORINATION CHEMICAL ROOM (B04)	I-406.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 22 11 16
160	FSH-492	EYEWASH SHOWER STATION FLOW SWITCH (HIGH)	TI-011C NEAR SODIUM HYPOCHLORITE FILL STATION EYEWASH SHOWER STATION FLOW SWITCH HIGH	TI-011C NEAR SODIUM HYPOCHLORITE FILL STATION	I-406.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 22 11 16
161	FSH-493	EYEWASH SHOWER STATION FLOW SWITCH (HIGH)	TI-011D DECHLORINATION CHEMICAL ROOM (B03) EYEWASH SHOWER STATION FLOW SWITCH HIGH NO. 1	TI-011D DECHLORINATION CHEMICAL ROOM (B03)	I-406.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 22 11 16
162	FSH-494	EYEWASH SHOWER STATION FLOW SWITCH (HIGH)	TI-011D DECHLORINATION CHEMICAL ROOM (B03) EYEWASH SHOWER STATION FLOW SWITCH HIGH NO. 2	TI-011D DECHLORINATION CHEMICAL ROOM (B03)	I-406.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 22 11 16
163	FSH-495	EYEWASH SHOWER STATION FLOW SWITCH (HIGH)	TI-011D NEAR SODIUM BISULFITE FILL STATION EYEWASH SHOWER STATION FLOW SWITCH HIGH	TI-011D NEAR SODIUM BISULFITE FILL STATION	I-406.00	BY VENDOR	BY VENDOR	PROVIDED UNDER SPECIFICATION SECTION 22 11 16
164	XS-508	PANEL INTRUSION SWITCH	MCP-10 PANEL INTRUSION SWITCH	MCP-10	N/A	N/A	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 78 90
165	XS-518	PANEL INTRUSION SWITCH	DC5 INSTRUMENTATION PANEL INTRUSION SWITCH	DC5 INSTRUMENTATION PANEL	N/A	N/A	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 78 90
166	XS-519	PANEL INTRUSION SWITCH	DC5 PANEL INTRUSION SWITCH	DC5-CP	N/A	N/A	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 78 90
167	XS-528	PANEL INTRUSION SWITCH	SBS-CP PANEL INTRUSION SWITCH	SBS-CP	N/A	N/A	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 78 90
168	XS-538	PANEL INTRUSION SWITCH	MCP-11 PANEL INTRUSION SWITCH	MCP-11	N/A	N/A	N/A	PROVIDED UNDER SPECIFICATION SECTION 40 78 90

SECTION 40 61 95 – PMCS MONITORING AND CONTROL CRITERIA
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide the services of the PMCS Supplier, to develop, load, configure, test, document and place in satisfactory operation all software associated with the PMCS and all its ancillary devices, as described herein, as required by other Sections, as indicated on the Contract Drawings and as necessary for the Contractor to provide a properly operating and integrated system.

B. The Contractor shall provide a uniform appearance, seamless integration between all PMCS equipment and simplification of operation and maintenance, for the software being used and developed for all operator interfaces throughout the Contract.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 40 61 13 - PMCS General Requirements
B. Section 40 61 26 - PMCS Training
C. Section 40 61 93 - PMCS Input Output List
D. Section 40 61 94 - PMCS Instrument Index
E. Section 40 61 96 - PMCS Control Strategies
F. Section 40 63 43 - PMCS Programmable Logic Controllers
G. Section 40 63 53 - PMCS Network Equipment
H. Section 40 67 16 - PMCS Panels and Enclosures
I. Section 40 70 01 - Measurement
J. Section 40 78 90 - PMCS Panel Mounted Instruments and Devices
K. Section 40 79 91 - PMCS Field Instruments
L. Section 40 80 81 - PMCS Factory Testing
M. Section 40 80 82 - PMCS Startup and Field Testing

1.04 REFERENCES

A. Definitions

1. HMI – Human Machine Interface; refers to CCFISS Workstations and panel located OITs.
2. I/O – Input/Output
3. SFT – Start-up and Field Testing.
4. OAD – Operational Availability Demonstration.
5. OIT – Operator Interface Terminal.
6. URT – Upset and Recovery Testing.
7. WFAT - Witnessed Factory Acceptance Tests.
8. Section 40 61 13 – PMCS General Requirements defines the terms and abbreviations used in this Section and the PMCS.

B. Reference Standards

1. Section 40 61 13 – PMCS General Requirements lists the standards applicable to this Section and the PMCS.

1.05 DESCRIPTION

A. PMCS Software Required

1. The software packages the Contractor will be required to furnish, install, customize, configure, and develop shall include, but shall not be limited to:

a. OIT Operating Systems.

b. OIT Networking Software.

c. PLC Ladder Logic Development and Documentation Software.

d. PLC Ladder Logic Application Software.

e. PLC Specialty Software and Programming Languages.

f. PLC Controller Configuration Software.

1.06 QUALITY ASSURANCE

A. The Contractor shall comply with the Quality Assurance requirements listed in Section 40 61 13 – PMCS General Requirements, this Section and the Specifications.

B. The PMCS Supplier shall utilize System and Software engineers who have been factory trained and certified on the respective software packages, to perform all programming functions, develop control strategies, create graphic displays, customize applications, document all work and coordinate the software interface.

C. System and Software engineers shall be intimately familiar with the details of this Plant, instrumentation and control in general and the Contract goals and requirements.

D. System and Software engineers shall have a minimum of five years of experience in the PMCS development work required under this Contract.

1.07 SUBMITTALS

A. The Contractor shall comply with submittal requirements listed in Section 40 61 13 – PMCS General Requirements, this Section and the Specifications.

B. The PMCS Supplier shall submit, through the Contractor, the following information for approval prior to beginning of the actual work of developing software for this Contract:

1. Qualifications and certifications of system software engineers.

2. A listing of all proposed software packages indicating quantities and where they will be installed.

3. Preliminary ladder logic for all PLC(s) and general methods of implementing the various control strategies.

4. Preliminary database and I/O listing showing system tag names and references.

5. Preliminary screen display count with general system structure.

6. Preliminary screen display development, general display organization and common components.

C. The PMCS Supplier shall submit all completed items to the Engineer for review and approval. As a minimum, the items to be submitted shall include, but shall not be limited to:

1. PLC Controller ladder logic with full documentation and annotation
2. Full Color copies of all unique Graphic display screens
3. Screen animation and control
4. Databases
5. Alarm and event log lists, formats and messages

D. Submittals shall be made at least 60 days in advance of any proposed use by the PMCS Supplier.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall comply with delivery, storage and handling requirements listed in Section 40 61 13 – PMCS General Requirements.

B. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. PMCS Monitoring and Control Criteria shall be implemented by the PMCS Supplier.

B. Existing CCFISS SCADA HMI software shall be utilized for HMI displays configuration at CCFISS. Contractor shall provide software and licenses required for the OITs and PLCs.

C. OIT visualization software shall be as manufactured by:

1. Wonderware, Lake Forest, CA;
2. No substitution allowed.

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. PMCS Factory Testing shall confirm to the requirements of Section 40 80 81 – PMCS Factory Testing.

B. PMCS Monitoring and Control Criteria specified under this Section shall be functionally verified during PMCS Factory Testing.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 APPLICATION

A. PMCS Software

1 . Software package used for HMIs in this Contract shall be approved by the City and Engineer.

2. All HMI modifications, new HMI displays, database, alarming, trends, reports, historian etc., required for the sites shall be performed at existing CCFISS (Citywide Collection Facilities Integrated SCADA System) SCADA servers and software. No additional software or licenses for SCADA HMI shall be provided by the scope of this Contract.

3. Once installed and operating and the Contract completed and accepted, all licenses, media, documentation and packaging shall be turned over/ returned to the City.

4. It shall be the responsibility of the Contractor to maintain all items entrusted to her or him in excellent condition.

5. Any damaged items or items not returned shall be replaced at the Contractor's expense.

6. For City furnished PMCS Software required by this Section, it shall be the responsibility of the PMCS Supplier to provide factory training for her or his personnel, to allow them to become intimately familiar with all aspects of the supplied software package. This cost shall be included in the bid price and shall be done at no additional cost to the City.

7. It shall also be the responsibility of the Contractor, through the services of the PMCS supplier to install, setup, configure and place in optimum working order all PMCS Software as well as all other software referenced in this Section and as required.

8. All software shall be installed and configured with strict adherence to manufacturer's recommendations and the requirements of this Section, on all workstations supplied under this Contract.

B. General Control Philosophy

1. In order for the Contractor to provide the most reliable and fault tolerant PMCS, the following approach to programming shall be implemented:

a. All control logic, loop control, critical alarming and I/O shall be done in the controller at the local level.

b. HMIs and OITs shall contain the database for their attached controllers.

c. Remote controllers shall access needed data from the respective local controller via the PMCS network shown in the Contract Drawings.

d. Where the PMCS network is an Ethernet LAN the Contractor shall obtain designated non-routable IP addresses for this contract from DEP OIT.

e. Workstations and OITs shall send only valid data to the PLC where it shall be "latched in" until such time as new valid data is made available.

f. A failure of the workstation shall not prevent the PLC from continuing to function normally using the last valid data it received.

g. All workstations, OITs, controllers and network components, shall be monitored for failures by the redundancy of components and through the use of "watchdog timers" programmed into the software.

h. Failure of any component shall be alarmed and annunciated at the next level of control and the information shall be immediately made available on the network.

i. Workstations and OITs shall monitor and display all digital and analog data available on their local PLCs and all pertinent data available on the network.

j. Where possible, the software shall be configured to verify the validity of that data.

k. Data that is in disagreement or out of valid range shall be indicated as such through the extensive use of displays and alarms.

C. PLC Programming Conventions

1. General

a. All logic, sequencing, interlocking, safety and critical alarm and control, shall be implemented at the PLC local level in the respective PLC using ladder type logic.

1) Individual "rungs" shall be provided for each logic function.

2) Subroutines shall be used where repetitive logic is required.

3) Alarm logic shall not be performed in subroutines as they may not be active at all times.

b. Commands such as start, stop, open, close, operating mode, sequence selection, etc., that are sent from the remote workstation by operator initiative or response, shall be "pulsed" and "latched" into the PLC logic.

c. All analog loop control such as temperature, flow or level shall be performed at the local PLC level not in the workstation.

d. All calculations and logic necessary to keep an individual loop in operation, in the event of failure of, or loss of communication with the HMI, shall also be done in the local PLC.

e. Where possible, all data points both analog and digital associated with the PLC based loop controllers, shall be available to the operator at the HMI and fully displayed and adjustable.

f. The ladder program shall be so written that the operator, via a local or remote workstation/OIT, can select the mode in which each individual loop is to operate, i.e., manual/auto or local/remote setpoint.

g. The operator also be able to view and manually adjust all parameters such as setpoint, output, gain, integral, derivative, etc., from the HMI.

h. Once entered, the valid data shall remain stored in the PLC until such time as new valid data is received.

2. Program Structure

a. All programming shall be implemented using ladder logic style programming only.

b. Other styles of programming, where necessary, shall only be used with the prior written permission of the Engineer and only when the task cannot be performed using ladder type logic.

c. The program shall be written using a well-organized and well documented structured approach.

d. All common elements shall be grouped together as much as possible.

e. For example, all logic for a single piece of equipment such as start/stop, indication, fault and alarm logic shall be grouped together to allow a phased or sequential startup and trouble-shooting.

3. Safeties and Interlocks

a. Upon initial startup or a subsequent restart of the PLC programs shall be written as follows:

1) First initialize all logic and data

2) Second bring all equipment and controls to a safe and ready status as allowed by safety and interlock status.

3) Only when equipment is in the safe and ready status shall equipment be permitted to be started as indicated in the individual control strategies.

4) When all start permissives are satisfied, a "ready" status for each piece of affected equipment, shall be issued for display by the HMI.

b. Upon startup or restart of equipment and/or systems after a power failure, the program shall retain the status of all equipment prior to the interruption.

c. Upon restoration of stable power, with a suitable and adjustable time delay on each piece of equipment, the program shall check the status of all controlled equipment and systems for faults and/or safety trips and only then allow equipment to be started as indicated in the individual control strategies.

d. Items indicating a faulted or unsafe condition shall be immediately locked out and the appropriate alarms generated for display by the HMI.

e. Where at all possible, all preset values (for timers, counters, etc.) and variables shall be stored in register memory and shall be made available to the operator at the HMI for both display and adjustment.

D. PMCS Programming Conventions

1. General

a. The operator interface to the PMCS Software shall be through an organized system of graphic displays and tabular data displayed on the HMIs,OITs and interface units installed throughout the PMCS.

b. Graphic displays shall be based on schematic representations of the process, as shown on the Contract P&IDs and general equipment arrangement.

c. While only one of each type of similar equipment may be detailed on the P&IDs, all equipment, instrumentation and devices shall be represented on graphic displays in the level of detail depicted for the one typical equipment, device or instrument shown.

d. Displays of process equipment and piping shall be neatly laid out so as to be uncluttered and easily interpreted.

e. PMCS shall be displayed on multiple screens to allow all equipment and data to be shown clearly.

f. Displays of process piping and vessels shall be color coded to match the colors listed in the process piping schedules and shall match painting color schemes.

g. Color coding shall allow the operators to easily identify, by color, what process is being viewed.

h. If no color has been assigned to a certain process, the Contractor shall notify the Engineer who shall assign one.

i. Extensive use of animation; color and appearance change and sound shall be employed within displays.

j. Log-on and Password protection shall be required for all functions other than viewing general displays.

k. The Engineer shall decide the operator access level for each function provided by the Contractor.

2. Display System Structure

a. Displays shall be generally organized into areas based on the process with which they are associated.

b. An area index screen shall be provided showing “links” which when picked, will access all other screens in that system.

c. A general plant-wide index screen, accessible from the area index screen, having links to access all other area index screens shall be provided.

d. If previously created, the plant-wide index screen and all associated software shall be updated under this Contract to reflect the additions and/or changes made as part of this Contract.

e. All changes and updates shall be made on a plant wide basis, updating all workstations in the plant with the latest screens and information.

f. All displays throughout the PMCS shall have certain common elements. These elements shall include but shall not be limited to the following:

1) There shall be a group of quick access “buttons” located at the top of each screen.

a) Each of these buttons shall be assigned to screen within an area and shall provide a link, which when picked, will display the assigned screens.

b) When there are no alarms present on a given screen, the button shall be blank and disabled.

c) When there is any unacknowledged alarm present on a screen, its assigned button shall flash the system name in amber.

d) These screen names shall be assigned by the Engineer.

e) When the alarm(s) has (have) been acknowledged but is(are) still present, the system name shall show steady amber on the button.

f) The relative position of these buttons shall not change from screen to screen within an area.

2) There shall be additional buttons provided at the bottom of each screen allowing access to frequently needed items as follows:

a) The first items shall be an alarm SILENCE button and an ACKNOWLEDGE button.

(1) The SILENCE button shall silence alarms generated on any screen from any screen.

(2) This button shall silence both workstation audio alarms and any audible devices in the field and control room.

(3) The ACKNOWLEDGE button shall only acknowledge alarms generated on that screen.

(4) All alarms and alarms not associated with a given screen, shall be acknowledged from the alarm history screen.

b) The second item shall be an ALARM HISTORY button.

(1) This button shall immediately bring up the alarm history tabular display screen with the most recent alarms on the top of the list.

c) The third common item shall be an INDEX button. This button shall immediately bring up on the display, the area index screen previously described.

d) The remaining bottom buttons shall be used to provide direct links to other screens associated with the current screen.

(1) Some of these associated screens will be defined later.

(2) When possible, buttons for links to a particular screen shall occupy the same relative position from screen to screen.

3. Equipment Control Location Status

a. Each process and piece of process equipment (pumps, grinders, blowers, fans, etc.) shall have selector switches to transfer control of the equipment from one control location to another control location.

b. The graphic representation for each unit shall have an adjacent text field indicating where the current control location is.

c. The text background shall read "SCADA" on a blue background when control is at the workstation and read "LOCAL" as appropriate on a gray background when control is elsewhere.

4. Equipment Start/Stop Control

a. All equipment started and stopped by the PLC shall have an operator graphic display on one or more of the graphic display screens.

b. As indicated on the P&IDs, each piece of equipment shall have a specific method of starting and stopping inclusive of emergency stop or one or a combination of the following

1) Manual ON/OFF control

2) Manual START/STOP

3) Combination of HAND/OFF/AUTOMATIC.

c. Starting, stopping or changing operating mode of any equipment or system shall require double action followed by a confirming dialog box.

1) The operator shall "double click" on a predefined pick box within the desired equipment symbol causing a dialog box to appear.

2) The dialog box shall contain buttons for the different mode selections available to the operator for that piece of equipment or system.

3) An "OK" button shall also appear in the box which shall confirm the selection.

4) Once completed, a second dialog box shall appear to reconfirm the selection with dialog such as "DO YOU WISH TO PLACE PUMP 3 IN RUN MODE".

5) The operator shall select a "YES" or "NO" button to confirm the selection.

6) All dialog boxes shall have a "CANCEL" button which shall leave the system unchanged.

5. Alarms

a. Provide eight (8) levels of alarming for each analog variable. There shall be high-high-high, high-high, high, deviation low, deviation high, low, low-low, low-low-low.

b. Annunciate alarm with horn provided in the HMI/s and display appropriate alarm.

c. Assign alarm to printer(s) for logging.

d. The software shall display alarm status via color change or blink in line, text, or fill attributes.

e. The software shall have both alarm summary and alarm history displays with configurable message text including: DATE, TIME, TAG NAME, ALARM EVENT, ALARM TYPE, VALUE, SETPOINT, SEVERITY.

f. The alarm summary and alarm history displays shall be configurable for color of alarm window, new alarms, ACK alarms, and RTN alarms.

g. Momentary alarms shall be reported by the software if the signal made a transition from the normal state to the alarm state and back to the normal state between the polling sequences of a remote unit.

h. Momentary normal states shall be reported by the software if the signal made a transition from the alarm state to the normal state and back to alarm state between the polling sequences of a remote unit.

i. Multiple alarm and multiple normal states shall be reported by the software if multiple transitions were made between polling sequences.

j. Alarms shall be able to be routed to screen, printer, and/or disk file.

k. Proposed alarms shall be submitted to the City, Plant Operations, and the Engineer for approval, and will be based on specific monitoring parameters.

l. Provision shall be made in the PLC logic to suppress nuisance alarms and control actions by the following means:

1) For alarms and control actions derived from analog input signals, use adjustable time delays and deadbands.

2) For alarms and control actions derived from discrete input signals, use adjustable time delays.

3) Initial settings for time delays shall be 10 seconds (range 0-120 seconds). Initial settings for deadbands shall be 5% of span (0-100%).

4) Equipment that is started or stopped manually by the operator shall start or stop immediately, with no time delay.

6. Trending

a. Software shall allow the configuration of real time trend displays which update continuously as new values are acquired.

b. Real time trend display shall be in Variable versus Time format.

c. Real time trend display shall support scaling of both variable and time axes.

d. Real time trend display shall support a minimum 4 variables per graph.

e. Software shall allow any number of real time trend graphs per screen.

f. Software shall allow configuration of Real time trends and Historical trends on same screen.

g. Software shall allow configuration of trend graphs and other animation (bar charts, push buttons, etc.) on the same screen.

h. Real time trend shall support trending result of arithmetic and/or logical expressions involving Tag names by typing in the expression in the desired pen field.

i. The PMCS supplier shall develop and assign real time trends for all monitored system analog variables, and shall submit proposed trend plot groupings as part of the system software documentation submittal.

j. All trending requirements shall be discussed in detail with the City including Plant Operation and Process Engineers prior to submission. Based on this discussion, the samples of trends graphs

shall be submitted to the City for review and approval. The historical trends and frequency of storage shall be discussed with the City.

7. Historical Data Management

   a. The PMCS shall use the City's existing historian to configure historical data collection for the Plant sites.

   b. The Historical data shall be collected from the real time database and from these samples.

   c. The Historical system shall be configurable to calculate the average, maximum, minimum, standard deviation and total values over sampled data time intervals configurable on a per point basis.

   d. Signal values from the Historical Data Base shall be available for graphic displays, reports and trending.

   e. The size of the Historical Data Base in the local OITs shall be limited only by available disk space which at minimum shall be capable of holding 18 months of data. Archiving capability shall be provided.

8. Reports

   a. PMCS shall use City's existing reporting software for processing and reporting data related to the Plant sites.

   b. Set up report templates that allows screen prints based on demand (i.e. push button), event, time, or combination thereof.

   c. PMCS Supplier shall submit actual copies of suggested report layouts for review and approval in accordance with the requirements of this Section.

   d. Configuration shall be flexible so that contents of the reports can be easily modified. At a minimum, the PMCS Supplier shall provide a report with the following details of parameters:

      1) Date and Time Stamps

      2) Tank Levels and Rate of Change

      3) Dry Weather Flow Rates

      4) Wet Weather Flow Rates

      5) Flow Totalizations for:

         a) Yesterday's Flow

         b) Today's Flow

         c) Monthly Flow

         d) Yearly Flow

6) TRC Residual Readings

e. As a minimum, the following data collection functions shall be provided for all analog variables:

1) Instantaneous value; value at the end of the data collection interval.

2) Average value over the time interval.

3) Totalization over the time interval.

4) Highest value over the time interval.

5) Lowest value over the time interval.

f. Equipment Run Times shall be monitored, calculated and reported for all major process equipment items in the system.

g. Report data developed shall include year-to-date and month-to-date run times and starts for each item.

h. The maximum time intervals shall depend on the variable being measured and shall be discussed and coordinated with the City, and then submitted for review as part of the Proposed Reports shop drawing.

i. Each log report page shall have the capability to contain information for ten log points as a minimum. Log points per page shall be configurable and adjustable based on user preferences. Dynamic page sizing shall be used based on the available data.

j. Periodic log reports shall be printed automatically at the end of the time period. Provide scheduling capabilities for automated report generation. Options shall be provided for digital distribution in addition to printing via email.

k. A calculation extension capability shall be provided to perform calculations on data that has been accumulated for report generation. These reports shall include customization capabilities.

1) Calculations shall consist of addition, subtraction, multiplication, and division functions for calculations of such items as engineering unit changes, totalization values where measurement values are different, and performance indexes.

2) Provisions shall be made for a minimum of 200 calculation extensions.

l. All reports shall be free form, thereby printing all general information, headings and data in an established format at the time of generation.

1) Pre- printed sheets shall not be acceptable.

2) Each page of a report shall have printed the plant name, type of report, date and time the report was printed, and page numbers.

m. Software shall be provided for generation of special event, hourly, daily, monthly and annual reports. Include options for real-time notifications in addition to the scheduled reports.

1) Reports shall be generated using process input/output, event information, analog, digital, manual and/or computed point information from records in database.

9. Process Variable Indicators and Controllers

a. Where indicated on the P&IDs, required by the specifications or wherever available, all instruments providing analog data whether real or calculated shall be graphically displayed on the screen in its relative position in the process or in tabular form as required.

b. Process indicators such as “PI”, “FI”, “TI”, “FIC”, “TIC”, etc., shall be provided with all of the following features.

1) Each “instrument” shall appear as a standard instrument “bubble” or “lollipop” containing the ISA instrument type designation.

2) The instrument tag number shall appear using the same format as the Contract Drawings.

3) When instruments of the same equipment number appear on the same screen, the loop number alone shall be sufficient provided there are no duplicate loop numbers and it is clear what equipment the instrument is associated with.

4) Adjacent to the instrument symbol, the current “real time” value of the variable, in engineering units, shall be displayed.

5) Next to this shall appear the appropriate units.

c. All analog values, whether real or calculated, shall have alarm points configured in the software.

1) Those of a critical nature or where used to control equipment shall have this performed in the local PLC while being set and monitored from a remote point.

2) While within the normal range, variables shall appear in black.

3) When the variable moves outside the normal range, the text shall flash in red and the bubble shall flash amber.

4) Once acknowledged, both will cease flashing and remain steady colors until the condition is corrected.

5) A signal out of range or containing invalid data shall cause the text to display question marks on a flashing red background.

d. The operator shall be able to "double click" the instrument symbol and cause a dialog box to appear.

1) This box shall contain the full tag number of the instrument, measured variable name (i.e. Sodium Hypochlorite Pumps No. 1, 2 & 3 Common Discharge Flow), calibrated range and current alarm points.

2) One button shall be provided in the box to edit the alarm setpoints.

3) A second button shall allow the operator to display a trend graph, on a partial screen, of the variable against a time base of minutes, or hours (selectable).

10. Accumulators

a. Provide HMI configuration for accumulations.

1) Include run time for each piece of equipment.

2) Include downtime information for each piece of equipment. Include options for displaying historical run time trends for predictive maintenance planning.

3) Include number of starts for each motor.

4) Include totalized values for all flows, including totalized values daily, monthly, yearly, and since the system initialization.

11. Security

a. System Protection from unauthorized access to the PMCS interfaces shall be provided by means of software and hardware interlocks. Coordinate with the City for the latest Security Standards to accommodate the system.

b. Provide at least four (4) levels of security.

c. All new HMI displays developed shall comply with the existing user access security registrations currently available on CCFISS.

d. Software interlocks shall provide a minimum of two levels of security, Operator and Process/System Engineer.

e. Operators shall only be permitted access to PMCS HMI software allowing only operating and configuration of equipment for

operational actions only, such as start, stop, modes changes such as local and remote, placing multiple items of similar equipment in and out of service, generating trends, dealing with alarms and all actions required by Operators to maintain processes 24 hours a day, 365/366 days a year.

f. Only Process/System Engineers shall be allowed to exit the HMI software and access the operating system and other resident software applications for hardware and software operating system, controller/PLC programming and editing.

g. Program editing access shall require entry of a minimum sixteen (16) character entry code. Code shall be required to be a string of mixed-case letters, numbers, and symbols. Provide notification alert to user that the password must be a "Strong Password that is unique and used for only one account", and shall be configured within the controller program.

h. All PMCS users shall be required to log on to the LAN network and PMCS Software interface with a predefined username and password before access to operate or modify the system can be obtained.

i. All defined user names shall be associated with a set security level.

j. Each display shall be assigned a security level required to access it.

k. All signals and control functions shall have separately assignable security levels required for viewing functions signal value change functions to restrict control access where required or desired.

l. Provide password login as follows:

View Only – Level 1	No Login Required
Operator Level – Level 2	Login required for normal controls including setpoint changes.
Supervisor Level – Level 3	Login required for controls and adjustments.
System Engineer Level – Level 4	Full access.

m. Login / Logout: The operator or user shall enter username and password to gain access to the system. Exceeding the standby time of 15 minutes shall cause a timeout function to automatically log out the user.

3.03 FIELD TESTING / QUALITY CONTROL

A. PMCS Field Testing shall conform to the requirements of Section 40 80 82 – PMCS Startup and Field Testing.

B. PMCS Monitoring and Control Criteria specified under this Section shall be verified during PMCS Startup and Field Testing.

3.04 STARTUP / DEMONSTRATION

A. Section 40 80 82 – PMCS Startup and Field Testing details the requirements for OAD and PMCS Upset and Recovery Testing.

B. The OAD and the PMCS Upset and Recovery Testing shall serve as the final verification of the correct implementation of the PMCS Monitoring and Control Criteria specified under this Section.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 40 61 96 – PMCS CONTROL STRATEGIES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish Control Strategy diagrams, configuration sheets and Control Strategy descriptions as shop drawings for approval for all control strategies specified in this section.

B. The Contractor shall perform all programming, configuration, and tuning required to implement each Control Strategy listed in this Section.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 22 11 16 - Domestic Water Piping

B. Section 23 09 00 - Instrumentation and Control for HVAC

C. Section 26 32 14 - Mobile Generator

D. Section 26 36 23 - Automatic Transfer Switches
E. Section 40 05 32 - Double Containment Chemical Piping
F. Section 40 61 13 - PMCS General Requirements
G. Section 40 61 26 - PMCS Training
H. Section 40 61 93 - PMCS Input Output List
I. Section 40 61 94 - PMCS Instrument Index
J. Section 40 61 95 - PMCS Monitoring and Control Criteria
K. Section 40 63 43 - PMCS Programmable Logic Controllers
L. Section 40 63 53 - PMCS Network Equipment
M. Section 40 67 16 - PMCS Panels and Enclosures
N. Section 40 70 01 - Measurement
O. Section 40 78 90 - PMCS Panel Mounted Instruments and Devices
P. Section 40 79 91 - PMCS Field Instruments
Q. Section 40 80 81 - PMCS Factory Testing
R. Section 40 80 82 - PMCS Startup and Field Testing

1.04 REFERENCES

A. Definitions

1. CS - Control Strategy
2. Section 40 61 13 – PMCS General Requirements defines the terms and abbreviations used in this Section and the PMCS
3. HMI – Human Machine Interface which refers to the CCFISS SCADA Screens, and the respective control panel OIT where the signal is interfaced with its respective PLC.

B. Reference Standards

1. Section 40 61 13 – PMCS General Requirements lists the standards applicable to this Section and the PMCS.

1.05 DESCRIPTION

A. The Control Strategies in this Section are written descriptions of the basic configuration and/or programming required to implement regulatory and sequential control of the unit processes as shown on the P&IDs.

B. The Control Strategies do not in all cases describe the process characteristics fully, many of which may only become apparent during shop drawing assembly or during start-up.

C. Control Strategies shall fully reside in the memory of the designated PLC.

D. The process inputs/outputs referred to in the Control Strategies are all shown on the P&IDs.

E. Any additional I/O (Maximum 20%) required shall be added during Shop Drawing Review and shall be provided at no additional cost to the City.

F. Process Control Functions

1. Process control function shall be structured to permit the realization of all Control Strategy requirements.

2. Each control function shall be designed so that bumpless, balance free transfers are obtained during operating mode changeover and/or initialization.

3. Where applicable, user-changeable parameters shall be automatically defaulted to a preset value if a specific value is not given during system generation.

4. Provision shall be made to include certain control functions that apply to all analog inputs, virtual variables, analog controllers and discrete control whether or not shown on the P&IDs, even though one or more of the functions may be disabled by the user for a given data base point:

a. Analog Data Scaling

1) This control function shall scale all analog inputs to a common span and shall normalize the digital representation of each analog input to a percent of the operating span.

2) The processed value shall be expressed as a binary number that specifies the analog input's position on a straight line lying between zero and full scale as defined for a given input by the zero span values in the data base.

b. Amplitude Limit Check

1) This control function shall perform dual level, high/low amplitude limit checking and shall identify a limit violation every time a measured or virtual variable goes out-of-limits and returns back into limits.

2) The control function shall determine the time at which each limit excursion occurred.

3) A deadband shall be provided on each limit and shall be expressed as a percentage of span or in engineering units.

4) Low and high limiting default values will be set-up for each measured or calculated variables used in the process control loops.

c. Engineering Unit Conversion

1) This control function shall convert scaled analog data to engineering units by means of the following equation:

a) Y = ((H - L) (D/DH) + L) where

b) Y is the value in engineering units.

c) H is the high value of span, expressed in engineering units

d) L is the low value of span, expressed in engineering units.

e) D is the digitized scaled input value in counts.

f) DH is the full scale digitized value in counts

d. Manual Control

1) It shall be possible for operator or plant engineer to interrupt any sequence, loop or automatic operation and operate the same manually through panel OIT.

e. Verification of Digital Outputs

1) This control function shall verify that the equipment has responded to the digital commands before proceeding to next step during automatic operation.

2) If any discrepancy is detected, an alarm will be annunciated.

G. Hardware

1. The Contractor shall provide all the hardware, whether or not shown or specified that may be necessary to implement the Control Strategies as described in this Section or the Specifications.

H. Configuration

1. All set points, tuning parameters and engineering scales, etc., shall be documented for each control point and each control strategy on configuration sheets or similar documents.

2. These documents shall be updated during factory testing and finally during start-up and commissioning.

I. Control Strategy Displays

1. Control Strategy displays shall be submitted for review to the Engineer and the City.

2. Displays shall clearly show initial conditions, start, and progression of the control strategies.

3. Each Control Strategy shall be displayed in a minimum number of displays for ease of monitoring by the operator.

J. Power Failure

1. Equipment controlled by the PLC shall be programmed to automatically reset upon failure. During shop drawing review, restart logic and status of

equipment controlled by PLC shall be confirmed with Engineer and the City.

K. Restart

1. All equipment and motors shall be automatically restarted or require manual intervention as approved by the Engineer and the City during shop drawing review.

2. Final approval of the restart sequence shall be given by the Engineer during factory testing and start-up.

L. Position indication of Gates and Valve in transition.

1. Open pilot lights and indicators in/at all Control Stations and HMIs shall blink when a gate or valve is in the open transition and shall stay steady on when fully open.

2. Closed pilot lights and indicators in/at all Control Stations and HMIs shall blink when a gate or valve is in the closed transition and shall stay steady on when fully closed.

1.06 QUALITY ASSURANCE

A. The Contractor shall comply with the Quality Assurance requirements listed in Section 40 61 13 – PMCS General Requirements.

1.07 SUBMITTALS

A. Control Strategies detailed in this Section shall be submitted for approval by the Engineer.

B. The Contractor shall comply with submittal requirements listed in Section 40 61 13 – PMCS General Requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall comply with delivery, storage and handling requirements listed in Section 40 61 13 – PMCS General Requirements.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Control Strategies shall be as implemented by the PMCS Supplier.

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. The control strategies included in this Section are organized based on the control strategy numbering designation (CS-XX). These numbers are associated with those indicated on the P&IDs in the I-Drawing Set. The functional descriptions include:

1. CS-01: TI-010-FBCSO Chlorination Control Description
2. CS-02: TI-010-DC-5 Disinfection Control Description
3. CS-03: TI-010-Dechlorination Control Description
4. CS-04: TI-010-Sodium Hypochlorite System Control Description
5. CS-05: TI-010-Sodium Bisulfite System Control Description
6. CS-06: TI-011-Disinfection and Dechlorination Control Description
7. CS-07: TI-011-Sodium Hypochlorite System Control Description
8. CS-08: TI-011-Sodium Bisulfite System Control Description
9. CS-09: TI-010 Auxiliary Systems Control Description
10. CS-10: TI-011 Auxiliary Systems Control Description

B. TI-010 – Flushing CSO Chemical Disinfection (CS-01):

1. Reference Drawing(s): I-101.00
2. Process Overview:
   a. Flow enters from the sewer barrels into Diversion Chamber No. 3 (DC-3) to Diversion Chamber No. 2 (DC-2), and then finally through Diversion Chamber No. 4 (DC-4) into the Flushing Bay CSO Retention Facility (FB CSO). The FB CSO will fill up and can overflow to an overflow channel that discharges to the Fowler Avenue sewer barrel. The Facility can also be closed off by closing influent sluice gates, and diverting all flow to the Diversion Chambers outlined below.
   b. DC-3 splits flow to either FB CSO or to Diversion Chamber No. 5 (DC-5), when the FB CSO cannot accept any flow.
   c. DC-2 and DC-4 are secondary overflow locations that diverts flow to the Fowler Avenue sewer barrel when FB CSO cannot accept flow.
   d. Storm water enters the FB CSO and splits into five channels, each equipped with a coarse bar screen to capture and remove large debris and floatable.
   e. After the flow is screened, it combines again before splitting into two channels to pass the flow through Storage Cells 1-7 and 8-15. The two channels have a sodium hypochlorite injection point for disinfection. Flow monitoring will be provided in Channel No. 1 and Channel No. 2 and level monitoring will be provided in Storage Cell

No. 7 and Storage Cell No. 15. Two sample pump feed lines, one from Storage Cell No. 7 and one from Storage Cell No. 15 will be used to measure the Total Chlorine Residual (TCR) in the effluent overflow to the outfall.

3. Control:

   a. Pressure Transmitters (PIT-105 & PIT-106) measure the level in Storage Cell No. 7 and Storage Cell No. 15, with the associated level signals input to the MCP-10 PLC.

   b. When the level in the Storage Cell No. 7 and No. 15 is reading above an operator adjustable "Wet Weather Level Activation" setpoint (Initial setpoint: 16 FT), and after an operator adjustable time delay (initial 10 seconds), the CSO wet weather event is activated. When the level in both Storage cells drops below "Wet Weather Level Deactivations" setpoint (Initial setpoint: 16 FT), and after an operator adjustable time delay (initial 10 seconds), the CSO wet weather event is deactivated.

   c. Upon CSO wet weather event activation, the facility shall not initiate sodium hypochlorite dosing until the following permissives have been met:

      1) At least one Sodium Bisulfite pump is in Ready mode: A pump is running at minimum speed and flow meter (FIT-350) is detecting flow based on the operator adjustable "Low Flow" setpoint.

      2) Sample pump TI-010-SMP-2 is running, flow switch (FSL-309) is detecting flow, and Total Chlorine Residual (TRC) analyzer (AIT-311) is online with no faults.

   d. Sample Pumps (FBCSO-SMP-1 and FBCSO-SMP-2) shall draw flow from Storage cells 7 & 15 respectively to a Total Chlorine Residual (TCR) Analyzer (AIT-114 & AIT-119) for monitoring of Total Chlorine Residual on the effluent overflow.

      1) The pump controls will be designed with a Local/Off/Remote (L/O/R) selector switch at the Local Control Station (LCS) provided under Division 26. When the L/O/R selector switch is in local mode, start/stop control of the pump will be accomplished from the pushbuttons located at the LCS. When the L/O/R selector switch is in remote mode, pump control will be based on the control signals received from the MCP-10 PLC.

      2) When in remote mode, the operator shall have provisions at the HMI for Automatic/Manual (A/M) control of the pump via soft selector switch. When A/M switch is in manual mode, the pump will be operated from the start/stop soft pushbuttons from the OIT screen. When the A/M switch is

in automatic mode, pump will be controlled based on the following logic:

a) When a CSO wet weather event is activated, the control systems shall energize the pump discharge three-way valve to close the feed line from service water, and open the feed line from the storage cells to allow sample flow to pass through the automatic strainer and then to the TCR Analyzer (AE/AIT-114 & AE/AIT-119).

b) When a CSO wet weather event is deactivated, stop the sample pumps and de-energize the pump discharge three-way valve to open the feed line from service water and close the feed line from the storage cells to allow service water flow to pass through the TCR Analyzers.

3) MCP-10 PLC shall send a pump start signal to the pump starter and confirm pump running status. A high discharge pressure switch shall be used for pump protection such that at high pressure, after a user adjustable time delay the pump shall automatically stop and display an alarm condition. A low flow switch shall be installed on the discharge of the automatic strainer to alarm if no flow is detected through the strainer, while the sample pump is running.

4) Configure interlocks to trip the sample pump regardless of local or remote pump operation:

a) High discharge pressure

b) Pump Fault

c) Pump Emergency Stop Activated

e. Refer to CS-04 for Sodium Hypochlorite Dosing for Channel No. 1 and Channel No. 2.

C. TI-010 – Diversion Chamber No. 5 Disinfection (CS-02):

1. Reference Drawing(s): I-201.00

2. Process Overview:

a. Combined Sewer enters DC-5 from DC-3 via three sewer barrels. Sluice gates at the inlet of DC-5 in each barrel shall control the flow passing through. Each barrel has a motor actuated gate which open and close based on level conditions from a separate control panel.

b. Flow passes through DC-5 through three barrels. Two of the barrels pass flow through Avery Avenue and into the downstream Mixing Chamber. One of the barrels passes flow through Fowler Avenue and into the downstream Mixing Chamber. Flow diverted from

Diversion Chamber No. 4 (DC-4) and Diversion Chamber No. 2 (DC-2), will also combine in the Fowler Avenue barrel prior to the Mixing Chamber.

3. Control:

a. Non-contact area-velocity flow meter shall be installed in each of the three sewer barrels, at DC-5. The sensor shall measure level, velocity and surcharge level, surcharge velocity, and master flow. A CSO event shall be determined based on the level signal obtained from the non-contact flow meter(s) (FIT-220/FIT-240/FIT-260). The operator shall select the level from either of the flowmeters, an average of two flowmeters or an average of three flowmeters for the initiation of the CSO event. Initial setpoint shall be set to XX feet.

b. Three chemical feed lines shall be installed in each of the three (3) barrels downstream of the gates. When a CSO event is initiated, based on the level signal mentioned above, the chemical metering pumps shall be requested to start dosing. The sluice gates may open and close in sequence based on signal from a separate, existing control panel. The CSO wet-weather event trigger shall be removed once the level signal drops to XX feet.

c. Flow passing through each sewer conduit shall be used for chemical dosing as described in CS-4.

1) In the event one of the flowmeters fail, the flow through the barrels shall be assumed to be uniform and the flow reading recorded by the flowmeter in operation shall be used for the dosing calculations in the three barrels. Transmitters shall provide a loss of signal alarm to the DC5-CP PLC.

d. Refer to CS-04 for Sodium Hypochlorite Dosing at DC-5.

D. TI-010 – Dechlorination (CS-03):

1. Reference Drawing(s): I-301.00

2. Process Overview:

a. Process flow passes from the FB CSO Facility and/or from DC-5, DC-4, or DC-2 sewer barrels into the Mixing Chamber. From the Mixing Chamber the three sewer barrels flow through a Tide Gates Structure where three tipping gates allow the CSO flow to pass through the downstream barrels and to the TI-010 outfall. The CSO flow is dechlorinated at the Tide Gate Structure prior to discharge to the TI-010 outfall.

3. Control:

a. When a CSO wet weather event is activated at FBCSO and/or DC5, flow through the mixing chamber shall be calculated as a sum of the CSO flow over the Storage cells at FBCSO, and flow out of DC5

(FIT-101/FIT-103 and FIT-240/260/280). This combined flow value shall be used to calculate sodium bisulfite dosing, downstream of the tide gates. Chemical feed lines dose sodium bisulfite at each of the three barrels.

b. Sample Pumps (TI-010-SMP-1 and TI-010-SMP-2) shall draw flow upstream and downstream of the Tide Gates Structure to its respective Total Chlorine Residual (TCR) Analyzer (AE/AIT-305 and AE/AIT-311) for monitoring Total Chlorine Residual, pre and post sodium bisulfite dosing.

1) The pump controls will be designed with a Local/Off/Remote (L/O/R) selector switch at the Local Control Station (LCS) provided under Division 26. When the L/O/R selector switch is in local mode, start/stop control of the pump will be accomplished from the pushbuttons located at the LCS. When the L/O/R selector switch is in remote mode, pump control will be based on the control signals received from the SBS-CP-10 PLC.

2) When in remote mode, the operator shall have provisions at the SBS-CP-10 OIT for Automatic/Manual (A/M) control of the pump via soft selector switch. When A/M switch is in manual mode, start/stop control of the pump will be accomplished from the start/stop soft pushbuttons from the OIT screen. When the A/M switch is in automatic mode, pump will be controlled based on the following logic:

a) When a CSO wet weather event is activated adjust the pump discharge three-way valve to close the feed line from service water and open the feed line from the sample feed line to allow sample flow to pass through the automatic strainer and then to the Total Chlorine Residual (TCR) Analyzers (AE/AIT-305 & AE/AIT-311).

b) When a CSO wet weather event has ended and the system is deactivated, adjust the pump discharge three-way valve to open the feed line from service water and close the feed line from the sample feed line to allow service water flow to pass through the TCR Analyzers.

c) SBS-CP-10 PLC shall send a pump start signal to the pump starter and confirm pump running status. A high discharge pressure switch shall be used for pump protection such that at high pressure, after a user adjustable time delay, the pump shall automatically stop and display an alarm condition. A low flow switch shall be installed on the discharge of

the automatic strainer to alarm if no flow is detected through the strainer.

3) Configure interlocks to trip the sample pump regardless of local or remote pump operation:

a) High discharge pressure

b) Pump Fault

c) Pump Emergency Stop Activated

4) The piping between the two TCR Analyzers shall be such that either Sample Pump can pump to either of the two TCR Analyzers based on the position of the interconnection pipe solenoid actuated valve. In normal operation interconnection sample line valves shall be closed and the sample pump will pump flow to its respective TCR Analyzer. If a TCR Analyzer fails, the respective sample pump shall pump flow to the alternate analyzer by first opening the respective solenoid actuated valve.

4. Refer to CS-05 for Sodium Bisulfite Dosing for the three barrels prior to discharge to TI-010 Outfall.

E. TI-010 Sodium Hypochlorite System (CS-04)

1. Reference Drawing(s): I-102.00, I-103.00, I-104.00

2. Process Overview:

a. The sodium hypochlorite storage and feed system are designed to store and dose sodium hypochlorite to the CSO at the FB CSO and Diversion Chamber-5.

b. The sodium hypochlorite tanks (3) are provided with level transducers for continuous level measurement.

c. A Fill Station is provided for the three tanks. Manual valves are located on the fill lines to each of the tanks.

d. Two transfer pumps (duty/standby) are provided to recirculate/ transfer the tank contents. Motorized valves are provided on the recirculation suction line and discharge line to the tanks.

e. There are two sets of three chemical metering pumps (Duty/Standby 1 /Standby 2). Each set is dedicated for the two dosing locations – FB CSO and DC-5.

f. A Sump Pump Control System with pumps and floats will be provided under Section 43 23 31.3 - Vertical Centrifugal Pumping Units to pump chemical that flows into the chemical containment sump.

g. A reed level switch will be provided under Section 40 79 91 – PMCS Field Instruments to alarm of a high level in the containment sump.

3. Control Descriptions:

a. Sodium Hypochlorite Fill Station:

1) PLC shall be programmed to provide tank high level and tank available indications at the fill station. The level transmitters will be provided with two 4-20 mA outputs. One shall be input directly to the MCP-10 PLC, and the second shall be input directly to the Fill Station Panel for display on the local indicator on the face of the panel.

2) Programming shall be provided to place each tank to be In-Service or Out-of-Service. If a tank is Out-of-Service, all alarms associated with the tank shall be suppressed.

3) A tank shall be considered "Available" if the tank is selected to be "In- Service" and level is below the "Tank Low / Ready for Filling" setpoint.

4) The high tank level alarm and shall annunciate the horn and strobe light at the fill station. A silence push button shall be provided to reset these alarms.

b. Valve Pit:

1) A new motorized valve will be installed in the valve pit and will interface with the Sodium Hypochlorite Fill Station Panel (HYPO-FP-10) for valve opened and closed feedback signals, as well as open and close commands. Relay logic shall be provided at the Fill Station panel such that based on the selection of a FP/SCADA selector switch on the face of the Fill Station panel. When in FP mode, the Fill Station panel shall have open/close control provisions for the drain valve. When in SCADA mode, the control of the valves shall be from the MCP-10 PLC.

c. Sodium Hypochlorite Transfer Pumps:

1) Local Control:

a) A LOCAL/OFF/REMOTE (L/O/R) selection is available at the Local Control Station of each pump. When in Local, the pump shall be controlled by the start/stop buttons at the LCS. When the LOCAL/REMOTE selector switch is in Remote, the pump shall receive a remote Start/Stop command from the PLC. Normally the L/O/R switch is set to Remote position.

2) Remote Control:

a) While in remote, the transfer pumps and its associated Motorized Valves shall be programmed to

run in three basic modes of operation: Manual, Automatic Transfer and Recirculation.

b) Transfer pumps shall operate in Duty/Standby configuration, such that only one pump will be used for the operation.

3) In Remote-Manual Mode:

a) Operators shall be able to control (start/stop) the duty pump manually. Operator shall place the suction and discharge motorized valves on each of the tanks in Open / Close position based on the tank desired to be recirculated.

b) Safety interlocks shall prevent the operation of the pump if a clear flow path is not established (based on the associated motorized valves limit switch position). An indication on the HMI shall inform the operator of an instance of this type is preventing the start of a pump.

c) Manual controls and position indications shall be provided to visualize and manually operate the motorized valves at will from the HMI.

4) In Remote-Automatic Transfer Mode:

a) Operator shall assign the Duty/Standby configuration for the pumps. Operator shall also select the tank that needs to transfer chemical to a subsequent tank. Upon initiation of the mode, the Duty pump shall transfer the stored chemical from one tank to the subsequent tank. The respective discharge and recirculation valve of the tank(s) shall open and close to allow chemical to be pumped in and out as per the selection.

(1) Interlocks shall be configured at the PLC at the receiving tank for a high level alarm based on the tank level transmitter, which shall prevent any more chemical from being transferred to it.

(2) In addition, an interlock shall be configured at the sending tank for a low level alarm based on the tank level transmitter, which shall prevent any more chemical from being transferred from it.

b) Once the transfer cycle has completed, a prompt shall alert the operator of the completion to allow a change to the operation mode.

5) In Remote-Recirculation Mode:

a) Operator shall assign the Duty/Standby configuration for the pumps. Operator shall also select the tank / the order of the tanks to be placed in the recirculation mode. Upon initiation of the mode, the Duty pump shall recirculate/mix the stored chemical in the selected tank. The respective The PLC and HMI shall be configured, such as operators can set the pump operating frequency and duration (based on pump runtime, or on tank volume).

b) Runtime Based: Recirculation duration shall be initially set for 60 min (adjustable).

c) Tank Volume Based: Pump flowrate shall be manually entered and stored in the PLC. There are three tank turnover scenarios that the operator can select at the HMI (half volume, full volume and twice volume). The PLC shall be programmed to calculate the runtime of the pump based on the pump flowrate (manually entered), and the calculated volume of chemical in the tank (as measured by respective level instruments) and the operator selected turnover scenario.

d) Frequency operation shall initially be set to reoccur every 24 hours (adjustable). A visual indication on the HMI shall be configured to display the time that has passed since the last recirculation cycle.

e) PLC shall be configured to automatically open the suction and discharge valves of the tank being selected for recirculation. Recirc valves of the tanks not in operation shall remain closed. If multiple tanks are selected for the recirc operation, the valves shall be sequentially opened and closed such that only one tank is in operation at a time.

f) Logic in the PLC shall be configured to prevent the automatic recirculation of the duty pump in any case where the LSH is active or where level in the tank is below an operator configurable capacity, initially set to 10% (configurable).

g) If the Duty pump fails, Standby pump shall take over operation from the next cycle.

h) PLC shall send a pump start signal to the pump starter and confirm pump running status. A high discharge pressure switch shall be used for pump protection such that at high pressure, after a user adjustable time delay, the pump shall automatically stop and display an alarm condition.

6) Configure interlocks to trip the pump regardless of local or remote pump operation:

a) High discharge pressure

b) Pump Fault

c) Hose Leak Detected

d. Sodium Hypochlorite Metering Pumps:

1) Local Control:

a) A LOCAL/REMOTE (L/O/R) selection is available at the local control station of each pump. When in Local, the pump shall be controlled by the start/stop buttons at the LCS. Speed shall be controlled from the local control station. When the LOCAL/REMOTE selector switch is in Remote, the pump shall receive a remote Start/Stop command and Speed control signal from the PLC. Normally the L/O/R switch is set to Remote position.

2) PLC and HMI Control:

a) In Remote- Manual mode, control is governed by the soft On/Off switch. The operator shall have the ability to run the pumps from the HMI. Operators shall be able to control the Pump Speed via manual speed setpoint input from the HMI.

b) In Remote-Auto, pumps shall run in the Duty/Standby configuration. Metering Pumps 1A-1B are dedicated to the dosing locations in FBCSO, and 2A-2B are dedicated to dosing location in DC5.

c) When a pump is called to run in either Remote-Manual or Remote- Auto mode, the pump's suction valve shall be confirmed fulled opened prior to start the pump. If suction valve does not open after an operator adjustable time delay, generate an alarm and remove the pump call to run.

d) When the pump is called to stop, the pump shall stop. Then, the suction valve should close. If the valve

does not close after an operator adjustable time delay, generate an alarm.

e) Sodium hypochlorite pumps can only be operated in remote/auto mode when a CSO wet weather event has been activated at the Flushing Bay CSO and all permissives are met as described in Article CS-01.

f) When the CSO wet weather event is deactivated, the sodium hypochlorite system shall continue to run for a period of time that ensure the pipe volume is completely flushed. The following is the flushing sequence:

(1) Stop the duty pump.

(2) Close all tank outlet valves.

(3) Open service water valve.

(4) Start all pumps at 35% speed (operator adjustable) and run them for a period of time that ensure the pipe volume is completely flushed. Totalize the pump flow rate as measured by its flow meter until the "Flushing Volume" setpoint is reached (initially 150 gallons to FBCSO and 270 gallons to DC-5).

3) Metering Pumps 1A and 1B Remote-Auto Operation:

a) The pump shall operate in either of the flow control modes specified.

(1) Flow Mode – Operator shall enter a desired flow setpoint for the pump, and the pump speed shall be modulated to achieve the setpoint.

(2) Flow with closed loop - Operator shall enter a desired flow setpoint for the pump. The flow meter on the pumps combined discharge line shall be used to adjust the pump speed to maintain setpoint.

(3) Flow pace with closed loop Option 1 – Duty pump shall start at a speed corresponding to a preset dosing rate (Operator adjustable) and shall be paced as a linear function of flow in the storage cells. Flow to be used shall be based on an operator selection of either the

Flowmeter of Channel No. 1, the Flowmeter of Channel No. 2, or the average of the two Flowmeter readings. An option shall also be configured to use the Level signal available from the Flowmeter instead. Flow corresponding to the level shall be obtained from a historical flow hydraulic table, that shall be made available to the Contractor by the Engineer / Owner.

The flow meter on the pumps combined discharge shall be used as a pump closed loop confirmation.

(4) Flow pace with closed loop Option 2 – Volumetric flow in the storage cells, shall be calculated either from the level in the storage cells (for level above 16 ft -23 ft) and surface area, or inputted into the PLC from the Storage Cells volumetric gallons hydraulic table available. The flow meter on the pumps combined discharge line shall be used as a pump closed loop confirmation.

(5) Flow pace with trim and closed loop mode Option 1 - Duty pump shall start at a preset dosing rate. Flow in the two Channels shall be based on an operator selection of either the Flowmeter of Channel No. 1, the Flowmeter of Channel No. 2, or the average of the two Flowmeter readings. An option shall also be configured to use the Level signal available from the Flowmeter, and correlating with a hydraulic table that shall be made available to correlate a level reading with a historical flow rate. Operator shall enter the chlorine residual setpoint expected at the Effluent. Average TRC value between the two analyzers at the storage cells 7 & 15 shall be used feedback, for trimming. Provisions shall also be made to manually enter the residual chlorine value, based on grab samples, or manually enter trim factor to be used in the chemical feed rate

calculation. If the analyzer fails, the calculation shall use the manually entered trim value if available or fallback to the last set trim factor.

The flow meter on the pumps combined discharge line shall be used as a pump closed loop confirmation.

(6) Flow pace with trim and closed loop mode Option 2 – Volumetric flow in the storage cells, shall be calculated either from the level in the storage cells (for level above 16 ft – 23 ft) and surface area, or inputted into the PLC from the Storage Cells volumetric gallons hydraulic table available.

4) Metering Pumps 2A and 2B Remote-Auto Operation:

a) Request for duty pump to run shall be initiated when a CSO event has been detected at the Diversion Chamber-5 as described in Article CS-02.

b) Various flow control modes shall be programmed. Operator shall choose to run the system in any of the modes.

(1) Flow Mode – Operator shall enter a desired flow setpoint, and the speed of the pump shall be modulated to achieve the setpoint.

(2) Flow with closed loop - Operator shall enter a desired flow setpoint. The flow meter on the pumps combined discharge line shall be used to adjust the pump speed to maintain setpoint.

(3) Flow pace with closed loop – Duty pump shall start at an operator adjustable dosing rate and shall be paced as a linear function of flow. Flow shall be calculated as a combined flow as read by the 3 flow meters (FIT-211,212,213) at DC5. The flow meter on the pumps combined discharge line shall be used as a pump closed loop confirmation.

(4) Flow pace with trim and closed loop mode - Duty pump shall start at an operator adjustable dosing rate.

Combined flow shall be calculated as read by the 3 flowmeters (FIT-220,240,260) at DC5. Operator shall enter the chlorine residual setpoint expected at the Pre-bisulfite analyzer (AIT-305). Trim factor to be used in the chemical feed dosing shall be calculated from TRC value read at FBCSO effluent and Pre-bisulfite dosing location i.e. (delta of (Average TRC value calculated from AIT-114 and 119) and AIT-305). Provisions shall also be made to manually enter the residual chlorine value, based on grab samples, or manually enter trim factor to be used in the chemical feed rate calculation. If the analyzer fails, the calculation shall use the manually entered trim value if available or fallback to the last set trim factor. The flow meter on the pumps combined discharge line shall be used as a pump closed loop confirmation.

c) PLC shall send a pump start signal to the pump starter and confirm pump running status. A high discharge pressure switch shall be used for pump protection such that at high pressure, after a user adjustable time delay, the pump shall automatically stop and display an alarm condition.

5) Configure interlocks to trip the pump regardless of local or remote pump operation:

a) High discharge pressure

b) Pump Fault

c) Hose Leak Detected

F. TI-010 Sodium Bisulfite System (CS-05)

1. Reference Drawing(s): I-302.00, I-303.00

2. Process Overview:

a. The sodium bisulfite storage and feed system are designed to store and dose sodium bisulfite to the CSO at the TI-010 outfall.

b. The sodium bisulfite tanks (2) are provided with level transducers for continuous level measurement.

c. A Fill Station is provided for the two tanks. Manual valves are located on the fill lines to each of the tanks.

d. Two transfer pumps (duty/standby) are provided to recirculate/transfer the tank contents. Motorized valves are provided on the recirculation suction line and discharge line to the tanks.

e. There are three chemical metering pumps (Duty/Standby 1 /Standby 2), to provide dosing at the TI-010 outfall.

f. A reed level switch will be provided under Section 40 79 91 – PMCS Field Instruments to alarm of a high level in the containment sump.

3. Control Descriptions:

a. Sodium Bisulfite Fill Station:

1) PLC shall be programmed to provide tank high level and tank available indications at the fill station. The level transmitters will be provided with two 4-20 mA outputs. One shall be input directly to the SBS-CP PLC, and the second shall be input directly to the Fill Station Panel for display on the local indicator on the face of the panel.

2) Programming shall be provided to place each tank to be In-Service or Out-of-Service. If a tank is Out-of-Service, all alarms associated with the tank shall be suppressed.

3) A tank shall be considered "Available" if the tank is selected to be "In- Service" and level is below the "Tank Low / Ready for Filling" setpoint.

4) The high tank level alarm shall annunciate the horn and strobe light at the fill station. A silence push button shall be provided to reset these alarms.

b. Sodium Bisulfite Transfer Pumps:

1) Local Control:

a) A LOCAL/OFF/REMOTE (L/O/R) selection is available at the Local Control Station of each pump. When in Local, the pump shall be controlled by the start/stop buttons at the LCS. When the LOCAL/REMOTE selector switch is in Remote, the pump shall receive a remote Start/Stop command from the PLC. Normally the L/O/R switch is set to Remote position.

2) Remote Control:

a) While in remote, the transfer pumps and its associated Motorized Valves shall be programmed to run in three basic modes of operation: Manual, Automatic Transfer and Recirculation.

b) Transfer pumps shall operate in Duty/Standby configuration, such that only one pump will be used for the operation.

3) In Remote-Manual Mode:

a) Operators shall be able to control (start/stop) the duty pump manually. Operator shall place the suction and discharge motorized valves on each of the tanks in Open / Close position based on the tank desired to be recirculated.

b) Safety interlocks shall prevent the operation of the pump if a clear flow path is not established (based on the associated motorized valves limit switch position). An indication on the HMI shall inform the operator of an instance of this type is preventing the start of a pump.

c) Manual controls and position indications shall be provided to visualize and manually operate the motorized valves at will from the HMI.

4) In Remote-Automatic Transfer Mode:

a) Operator shall assign the Duty/Standby configuration for the pumps. Operator shall also select the tank that needs to transfer chemical to a subsequent tank. Upon initiation of the mode, the Duty pump shall transfer the stored chemical from one tank to the subsequent tank. The respective discharge and recirculation valve of the tank(s) shall open and close to allow chemical to be pumped in and out as per the selection.

(1) Interlocks shall be configured at the PLC at the receiving tank for a high level alarm based on the tank level transmitter, which shall prevent any more chemical from being transferred to it.

(2) In addition, an interlock shall be configured at the sending tank for a low level alarm based on the tank level transmitter, which shall prevent any more chemical from being transferred from it.

b) Once the transfer cycle has completed, a prompt shall alert the operator of the completion to allow a change to the operation mode.

5) In Remote-Recirculation Mode:

a) Operator shall assign the Duty/Standby configuration for the pumps. Operator shall also select the tank / the order of the tanks to be placed in the recirculation mode. Upon initiation of the mode, the Duty pump shall recirculate/mix the stored chemical in the selected tank. The PLC and HMI shall be configured, such as operators can set the pump operating frequency and duration (based on pump runtime, or on tank volume).

b) Runtime Based: Recirculation duration shall be initially set for 60 min (adjustable).

c) Tank Volume Based: Pump flowrate shall be manually entered and stored in the PLC. There are three tank turnover scenarios that the operator can select at the HMI (half volume, full volume and twice volume). The PLC shall be programmed to calculate the runtime of the pump based on the pump flowrate (manually entered), the calculated volume of chemical in each tank (as measured by respective level instruments) and the operator selected turnover scenario.

d) Frequency operation shall initially be set to reoccur every 24 hours (adjustable). A visual indication on the HMI shall be configured to display the time that has passed since the last recirculation cycle

e) PLC shall be configured to automatically open the suction and discharge valves of the tank being selected for recirculation. Recirc valves of the tanks not in operation shall remain closed. If multiple tanks are selected for the recirc operation, the valves shall be sequentially opened and closed such that only one tank is in operation at a time

f) Logic in the PLC shall be configured to prevent the automatic recirculation of the duty pump in any case where the LSH is active or where level in the tank is below an operator configurable capacity, initially set to 10% (configurable)

g) If the Duty pump fails, Standby pump shall take over operation from the next cycle.

h) PLC shall send a pump start signal to the pump starter and confirm pump running status. A high discharge pressure switch shall be used for pump protection such that at high pressure, after a user

adjustable time delay, the pump shall automatically stop and display an alarm condition.

6) Configure interlocks to trip the pump regardless of local or remote pump operation:

a) High discharge pressure

b) Pump Fault

c) Hose Leak Detected

c. Sodium Bisulfite Metering Pumps:

1) Local Control:

a) A LOCAL/REMOTE (L/O/R) selection is available at the local control station of each pump. When in Local, the pump shall be controlled by the start/stop buttons at the LCS. Speed shall be controlled from the local control station. When the LOCAL/REMOTE selector switch is in Remote, the pump shall receive a remote Start/Stop command and Speed control signal from the PLC. Normally the L/O/R switch is set to Remote position.

2) PLC and HMI Control:

a) In Remote- Manual mode, control is governed by the soft On/Off switch. The operator shall have the ability to run the pumps from the HMI. Operators shall be able to control the Pump Speed via software manual speed setpoint input from the HMI.

b) In Remote-Auto, pumps shall run in the Duty/Standby 1/Standby 2 configuration. Metering Pumps 1-3 are dedicated to the dosing locations before TI-010 outfall.

c) When a pump is called to run in either Remote-Manual or Remote-Auto mode, the pump's suction valve shall be confirmed fully opened prior to start the pump. If suction valve does not open after an operator adjustable time delay, generate an alarm and remove the pump call to run.

d) When the pump is called to stop, the pump shall stop. Then, the suction valve should close. If the valve does not close after an operator adjustable time delay, generate an alarm.

3) Remote-Auto Mode:

a) Upon activation of the CSO wet weather event either at the FB CSO or Diversion Chamber-5, the duty pump shall run at minimum speed for a period of time (operator adjustable) to ensure proper functionality of the Sodium Bisulfite system. This is a permissive to start the sodium hypochlorite system. Then, the pumps shall stop and a time delay start. The time delay shall be an estimate of the combined flows to reach the bisulfite dosing area from Flushing Bay CSO / DC-5. This time delay shall either be manually entered or estimated based on the surface velocity readings recorded by the upstream flowmeters. Once the timer has lapsed, duty pump shall run. Manual initiation of the dosing pumps shall also be made available. This shall override the timer delay.

b) When the CSO wet weather event is deactivated, the sodium hypochlorite system shall continue to run for a period of time that ensure the pipe volume is completely flushed. The following is the flushing sequence:

(1) Stop the duty pump.

(2) Close all tank outlet valves.

(3) Open service water valve.

(4) Start all pumps at 35% speed (operator adjustable) and run them for a period of time that ensure the pipe volume is completely flushed. Totalize the pump flow rate as measured by its flow flow meter until the “Flushing Volume” setpoint is reached (initially 37 gallons).

c) Various flow control modes shall be programmed. Operator shall choose to run the system in any of the modes.

(1) Flow Mode – Operator shall enter a desired flow setpoint, and the speed of the pump shall be modulated to achieve the setpoint.

(2) Flow with closed loop - Operator shall enter a desired flow setpoint. The flow meter on the pumps combined discharge line shall be used to adjust the pump speed to maintain setpoint.

(3) Flow pace with closed loop – Duty pump shall start at an operator adjustable dosing rate and shall be paced as a linear function of flow. Flow shall be calculated as a combined flow as read by the 3 flow meters (FIT-220,240,260) at DC5. The flow meter on the pumps combined discharge line shall be used as a pump closed loop confirmation.

(4) Flow pace with trim and closed loop mode - Duty pump shall start at an operator adjustable dosing rate. Combined flow shall be calculated as read by the 3 flowmeters (FIT-240,260,280) at DC5. Operator shall enter the chlorine residual setpoint expected at the Pre-bisulfite analyzer (AIT-305) and post-bisulfite analyzer (AIT-311), which shall be used as a trim setpoint. Provisions shall also be made to manually enter the residual chlorine value, based on grab samples, or manually enter trim factor to be used in the chemical feed rate calculation. If the analyzer fails, the calculation shall use the manually entered trim value if available or fallback to the last set trim factor. The flow meter on the pumps combined discharge line shall be used as a pump closed loop confirmation.

d) PLC shall send a pump start signal to the pump starter and confirm pump running status. A high discharge pressure switch shall be used for pump protection such that at high pressure, after a user adjustable time delay, the pump shall automatically stop and display an alarm condition.

4) Configure interlocks to trip the pump regardless of local or remote pump operation:

a) High discharge pressure

b) Pump Fault

c) Hose Leak Detected

G. TI-011 – Disinfection and Dechlorination (CS-06):

1. Reference Drawing(s): I-401.00

2. Process Overview:

   a. Combined Sewer enters Regulator TI-R09 and passes through diversion chamber and into an overflow chamber. Two separate barrels leave Regulator TI-R09 and discharges to TI-011 Outfall; the barrels are hydraulically connected with various cross-connections between the two. Flow from a separate sewer line shall also merge with the two separate barrels.

3. Control:

   a. A level sensor with transmitter shall measure the level in the Overflow Chamber. Level transmitter shall be provided with a loss of echo alarm to the MCP-11 PLC.

   b. A chemical feed line shall feed a chemical diffuser that shall be installed in each of the two barrels downstream of Regulator TI-R09, to dose sodium hypochlorite.

   c. When the level in the Overflow Chamber is reading above an operator adjustable “Wet Weather Level Activation” setpoint, and after an operator adjustable time delay (initial 10 seconds), the CSO wet weather event is activated. When the level in the Overload Chamber drops below the “Wet Weather Level Deactivation” setpoint, and after an operator adjustable time delay (initial 10 seconds), the CSO wet weather event is deactivated.

   d. Upon CSO wet weather event activation, the facility shall not initiate sodium hypochlorite dosing until the following permissives have been met:

      1) At least one Sodium Bisulfite pump is in Ready mode: A pump is running at minimum speed and flow meter (FIT-476) is detecting flow based on the operator adjustable “Low Flow” setpoint.

      2) Sample Pump TI-011-SMP-2 is running, flow switch (FSL-414) is detecting flow, and Total Chlorine Residual (TRC) analyzer (AIT-416) is online with no faults.

   e. reaches the “Wet Start dosing setpoint in the overflow chamber, a CSO event shall be triggered. The sodium hypo metering pumps shall be requested to start hypo dosing. CSO wet-weather event trigger shall be removed once the level gets below Stop Dosing setpoint.

   f. Non-contact area-velocity flow meter shall be installed in each of the two sewer barrels, downstream of Regulator TI-R09, upstream of the chemical diffusers. The sensor shall measure level, velocity and surcharge level, surcharge velocity, and master flow. The associated flow transmitter shall calculate the flow passing through

each sewer conduit. Flow meter reading shall be used for chemical dosing as described in CS-7 and CS-8.

1) In the event one of the flowmeters fail, the flow through the pipes shall be assumed to be uniform and the flow reading recorded by the flowmeter in operation shall be used for the dosing calculations in the three pipes. Transmitters shall provide a loss of signal alarm to the PLC.

g. A chemical feed line shall feed a chemical diffuser that shall be installed in each of the two barrels downstream of Regulator TI-R09, closer to the TI-011 outfall to dose sodium bisulfite.

h. Sample Pumps (TI-011-SMP-1 and TI-011-SMP-2) shall draw downstream of Regulator 09 to a Total Chlorine Residual (TCR) Analyzer (AIT-410 & AIT-416) for monitoring of Total Chlorine Residual Pre and Post Bisulfite dosing.

1) The pump controls will be designed with a Local/Off/Remote (L/O/R) selector switch. When the L/O/R selector switch is in local mode, start/stop control of the pump will be accomplished from the pushbuttons located at the Local Control Station (LCS) provided under Division 26. When the L/O/R selector switch is in remote mode, pump control will be based on the control signals received from the PLC.

2) When in remote mode, the operator shall have provisions at the OIT for Automatic/Manual (A/M) control of the pump via soft selector switch. When A/M switch is in manual mode, the pump will be operated from the start/stop soft pushbuttons from the OIT screen. When the A/M switch is in automatic mode, pump will be controlled based on the following logic:

a) When a CSO wet weather event is activated at Regulator 09, the control systems shall energize the pump discharge three-way valve to close the feed line from service water, and open the feed line from the storage cells to allow sample flow to pass through the automatic strainer and then to the TCR Analyzer (AE/AIT-410 & AE/AIT-416).

b) When a CSO wet weather event is deactivated, stop the sample pumps and de-energize, the pump discharge three-way valve to open the feed line from service water and close the feed line from the storage cells to allow service water flow to pass through the TCR Analyzers.

c) PLC shall send a pump start signal to the pump starter and confirm pump running status. A high discharge pressure switch shall be used for pump protection such that at high pressure, after a user adjustable time delay the pump shall automatically stop and display an alarm condition. A low flow switch shall be installed on the discharge of the automatic strainer to alarm if no flow is detected through the strainer while the sample pump is running.

3) Configure interlocks to trip the sample pump regardless of local or remote pump operation:

a) High discharge pressure

b) Pump Fault

c) Pump Emergency Stop Activated

4) The piping between the two TCR Analyzers shall be such that either Sample Pump can pump to either of the two TCR Analyzers based on the position of the interconnection pipe solenoid actuated valve. In normal operation interconnection sample line valves shall be closed and the sample pump will pump flow to its respective TCR Analyzer. If a TCR Analyzer fails, the respective sample pump shall pump flow to the alternate analyzer by first opening the respective solenoid actuated valve.

4. Refer to CS-07 for Sodium Hypochlorite Dosing for the Overflow Chamber.

5. Refer to CS-08 for Sodium Bisulfite Dosing for the two pipes prior to discharge to TI-011 Outfall.

H. TI-011 Sodium Hypochlorite System (CS-07)

1. Reference Drawing(s): I-402.00, I-403.00

2. Process Overview:

a. The sodium hypo storage and feed system are designed to store and dose sodium hypochlorite to the CSO at a location within the sewer barrels downstream of Regulator-09.

b. The sodium hypo tanks (2) are provided with level transducers for continuous level measurement.

c. A Fill Station is provided for the two tanks. Manual valves are located on the fill lines to each of the tanks.

d. Two transfer pumps (duty/standby) are provided to recirculate the tank contents. Motorized valves are provided on the recirculation suction line and discharge line to the tanks.

e. Three chemical metering pumps (Duty/Standby 1 /Standby 2) are used to dose at Regulator-09.

f. A reed level switch will be provided under Section 40 79 91 – PMCS Field Instruments to alarm of a high level in the containment sump.

3. Control Descriptions:

a. Sodium Hypochlorite Fill Station:

1) PLC shall be programmed to provide tank high level and tank available indications at the fill station. The level transmitters will be provided with two 4-20 mA outputs. One shall be input directly to the MCP-11 PLC, and the second shall be input directly to the Fill Station Panel for display on the local indicator on the face of the panel.

2) Programming shall be provided to place each tank to be In-Service or Out-of-Service. If a tank is Out-of-Service, all alarms associated with the tank shall be suppressed.

3) A tank shall be considered “Available” if the tank is selected to be “In- Service” and level is below the “Tank Low / Ready for Filling” setpoint.

4) The high tank level alarm shall annunciate the horn and strobe light at the fill station. A silence push button shall be provided to reset these alarms.

b. Sodium Hypochlorite Transfer Pumps:

1) Local Control:

a) A LOCAL/OFF/REMOTE (L/O/R) selection is available at the Local Control Station of each pump. When in Local, the pump shall be controlled by the start/stop buttons at the LCS. When the LOCAL/REMOTE selector switch is in Remote, the pump shall receive a remote Start/Stop command from the PLC. Normally the L/O/R switch is set to Remote position.

(1) The Operator shall ensure that all isolation valves, and motorized valves on the tanks are in the proper position for the intended operation.

2) Remote Control:

a) While in remote, the transfer pumps and its associated Motorized Valves shall be programmed to run in three basic modes of operation: Manual, Automatic Transfer and Recirculation.

b) Transfer pumps shall operate in Duty/Standby configuration, such that only one pump will be used for the operation.

3) In Remote-Manual Mode:

a) Operators shall be able to control (start/stop) the duty pump manually. Operator shall place the suction and discharge motorized valves on each of the tanks in Open / Close position based on the tank desired to be recirculated.

b) Safety interlocks shall prevent the operation of the pump if a clear flow path is not established (based on the associated motorized valves limit switch position). An indication on the HMI shall inform the operator of an instance of this type is preventing the start of a pump.

c) Manual controls and position indications shall be provided to visualize and manually operate the motorized valves at will from the HMI.

4) In Remote-Automatic Transfer Mode:

a) Operator shall assign the Duty/Standby configuration for the pumps. Operator shall also select the tank that needs to transfer chemical to a subsequent tank. Upon initiation of the mode, the Duty pump shall transfer the stored chemical from one tank to the subsequent tank. The respective discharge and recirculation valve of the tank(s) shall open and close to allow chemical to be pumped in and out as per the selection.

(1) Interlocks shall be configured at the PLC at the receiving tank for a high level alarm based on the tank level transmitter, which shall prevent any more chemical from being transferred to it.

(2) In addition, an interlock shall be configured at the sending tank for a low level alarm based on the tank level transmitter, which shall prevent any more chemical from being transferred from it.

b) Once the transfer cycle has completed, a prompt shall alert the operator of the completion to allow a change to the operation mode.

5) In Remote-Recirculation Mode:

a) Operator shall assign the Duty/Standby configuration for the pumps. Operator shall also select the tank / the order of the tanks to be placed in the recirculation mode. Upon initiation of the mode, the Duty pump shall recirculate/mix the stored chemical in the selected tank. The PLC and HMI shall be configured, such as operators can set the pump operating frequency and duration (based on pump runtime, or on tank volume).

(1) Runtime Based: Recirculation duration shall be initially set for 60 min (adjustable).

(2) Tank Volume Based: Pump flowrate manually shall be entered and stored in the PLC. There are three tank turnover scenarios that the operator can select at the HMI (half volume, full volume and twice volume). The PLC shall be programmed to calculate the runtime of the pump based open the pump based on flowrate (manually entered), the calculated volume of chemical in each tank (as measured by respective level instruments) and the operator selected turnover scenario.

(3) Frequency operation shall initially be set to reoccur every 24 hours (adjustable). A visual indication on the HMI shall be configured to display the time that has passed since the last recirculation cycle.

b) PLC shall be configured to automatically open the suction and discharge valves of the tank being selected for recirculation. Recirc valves of the tanks not in operation shall remain closed. If multiple tanks are selected for the recirc operation, the valves shall be sequentially opened and closed such that only one tank is in operation at a time.

c) Logic in the PLC shall be configured to prevent the automatic recirculation of the duty pump in any case

where the LSH is active or where level in the tank is below an operator configurable capacity, initially set to 10% (configurable).

d) If the Duty pump fails, Standby pump shall take over operation from the next cycle.

e) PLC shall send a pump start signal to the pump starter and confirm pump running status. A high discharge pressure switch shall be used for pump protection such that at high pressure, after a user adjustable time delay, the pump shall automatically stop and display an alarm condition.

6) Configure interlocks to trip the pump regardless of local or remote pump operation:

a) High discharge pressure

b) Pump Fault

c) Hose Leak Detected

c. Sodium Hypochlorite Metering Pumps:

1) Local Control:

a) A LOCAL/REMOTE (L/O/R) selection is available at the local control station of each pump. When in Local, the pump shall be controlled by the start/stop buttons at the LCS. Speed shall be controlled from local control station. When the LOCAL/REMOTE selector switch is in Remote, the pump shall receive a remote Start/Stop command and Speed control signal from the PLC. Normally the L/O/R switch is set to Remote position.

2) PLC and HMI Control:

a) In Remote- Manual mode, control is governed by the soft On/Off switch. The operator shall have the ability to run the pumps from the HMI. Operators shall be able to control the Pump Speed via software manual speed setpoint input from the HMI.

b) In Remote-Auto, pumps shall run in the Duty/Standby 1/Standby 2 configuration. Metering Pumps 1-3 are dedicated to the dosing locations in Regulator 09.

c) When a pump is called to run in either Remote-Manual or Remote-Auto mode, the pump's suction valve shall be confirmed fully opened prior to start the pump. If suction valve does not open after an

operator adjustable time delay, generate an alarm and remove the pump call to run.

d) When the pump is called to stop, the pump shall stop. Then, the suction valve should close. If the valve does not close after an operator adjustable time delay, generate an alarm.

e) Sodium hypochlorite pumps can only be operated in remote/auto mode when a CSO wet weather event has been activated at Regulator 09 and all permissives are met as described in Article CS-06.

f) When the CSO wet weather event is deactivated, the sodium hypochlorite system shall continue to run for a period of time that ensure the pipe volume is completely flushed. The following is the flushing sequence:

(1) Stop the duty pump.

(2) Close all tank outlet valves.

(3) Open service water valve.

(4) Start all pumps at 35% speed (operator adjustable) and run them for a period of time that ensures the pipe volume is completely flushed. Totalize the pump flow rate as measured by its flow meter until the "Flushing Volume" setpoint is reached (Initially 473 gallons).

3) Metering Pumps Remote-Auto Operation:

a) The pump shall operate in either of the flow control modes specified.

(1) Flow Mode – Operator shall enter a desired flow setpoint, and pump speed shall be modulated to achieve the setpoint

(2) Flow with closed loop - Operator shall enter a desired flow setpoint. The flow meter on the pumps combined discharge line shall be used to adjust the pump speed to maintain setpoint.

(3) Flow pace with closed loop – Duty pump shall start at an operator adjustable dosing rate and shall be paced as a linear function of flow. Flow shall be calculated as a combined flow as read by the 2 flow

meters (FIT-404,405) at Regulator 09. The flow meter on the pumps combined discharge line shall be used as a pump closed loop confirmation

(4) Flow pace with trim and closed loop mode - Duty pump shall start at an operator adjustable dosing rate. Combined flow shall be calculated as read by the read by the two flow meters (FIT-405,406) at Regulator 09. Operator shall enter the chlorine residual setpoint expected at the Pre-bisulfite analyzer (AIT-408). Trim factor to be used in the chemical feed dosing shall be calculated from TRC value read at AIT-408. Provisions shall also be made to manually enter the residual chlorine value, based on grab samples, or manually enter trim factor to be used in the chemical feed rate calculation. If the analyzer fails, the calculation shall use the manually entered trim value if available or fallback to the last set trim factor. The flow meter on the pumps combined discharge line shall be used as a pump closed loop confirmation.

b) PLC shall send a pump start signal to the pump starter and confirm pump running status. A high discharge pressure switch shall be used for pump protection such that at high pressure, after a user adjustable time delay, the pump shall automatically stop and display an alarm condition.

4) Configure interlocks to trip the pump regardless of local or remote pump operation:

a) High discharge pressure

b) Pump Fault

c) Hose Leak Detected

I. TI-011 Sodium Bisulfite System (CS-08)

1. Reference Drawing(s): I-501.00, I-502.00

2. Process Overview:

a. The sodium bisulfite storage and feed system are designed to store and dose sodium bisulfite to the CSO at a location in the sewer barrels upstream of the TI-011 outfall.

b. The sodium bisulfite tanks (2) are provided with level transducers for continuous level measurement.

c. A Fill Station is provided for the two tanks. Manual valves are located on the fill lines to each of the tanks.

d. Two transfer pumps (duty/standby) are provided to recirculate the tank contents. Motorized valves are provided on the recirculation suction line and discharge line to the tanks.

e. There are three chemical metering pumps (Duty/Standby 1 /Standby 2), to provide dosing at the TI-011 outfall.

f. A reed level switch will be provided under Section 40 79 91 – PMCS Field Instruments to alarm of a high level in the containment sump.

3. Control Descriptions:

a. Sodium Bisulfite Fill Station:

1) PLC shall be programmed to provide tank level, tank high level and tank available indications at the fill station.

2) Programming shall be provided to place each tank to be In-Service or Out-of-Service. If a tank is Out-of-Service, all alarms associated with the tank shall be suppressed.

3) A tank shall be considered “Available” if the tank is selected to be “In- Service” and level is below the “Tank Low / Ready for Filling” setpoint.

4) The high tank level alarm and chemical leak alarm shall annunciate the horn and strobe light at the fill station. A silence push button shall be provided to reset these alarms.

b. Sodium Bisulfite Transfer Pumps:

1) Local Control:

a) A LOCAL/OFF/REMOTE (L/O/R) selection is available at the Local Control Station of each pump. When in Local, the pump shall be controlled by the start/stop buttons at the LCS. When the LOCAL/REMOTE selector switch is in Remote, the pump shall receive a remote Start/Stop command from the PLC. Normally the L/O/R switch is set to Remote position.

(1) The Operator shall ensure that all isolation valves, and motorized valves on the tanks are in the proper position for the intended operation.

2) Remote Control:

a) While in remote, the transfer pumps and its associated Motorized Valves shall be programmed to run in three basic modes of operation: Manual, Automatic Transfer and Recirculation.

b) Transfer pumps shall operate in Duty/Standby configuration, such that only one pump will be used for the operation.

3) In Remote-Manual Mode:

a) Operators shall be able to control (start/stop) the duty pump manually. Operator shall place the suction and discharge motorized valves on each of the tanks in Open / Close position based on the tank desired to be recirculated.

b) Safety interlocks shall prevent the operation of the pump if a clear flow path is not established (based on the associated motorized valves limit switch position). An indication on the HMI shall inform the operator of an instance of this type is preventing the start of a pump.

c) Manual controls and position indications shall be provided to visualize and manually operate the motorized valves at will from the HMI.

4) In Remote-Automatic Transfer Mode:

a) Operator shall assign the Duty/Standby configuration for the pumps. Operator shall also select the tank that needs to transfer chemical to a subsequent tank. Upon initiation of the mode, the Duty pump shall transfer the stored chemical from one tank to the subsequent tank. The respective discharge and recirculation valve of the tank(s) shall open and close to allow chemical to be pumped in and out as per the selection.

(1) Interlocks shall be configured at the PLC at the receiving tank for a high level alarm based on the tank level transmitter, which shall prevent any more chemical from being transferred to it.

(2) In addition, an interlock shall be configured at the sending tank for a low level alarm based on the tank level transmitter, which shall prevent any more chemical from being transferred from it.

b) Once the transfer cycle has completed, a prompt shall alert the operator of the completion to allow a change to the operation mode.

5) In Remote-Recirculation Mode:

a) Operator shall assign the Duty/Standby configuration for the pumps. Operator shall also select the tank / the order of the tanks to be placed in the recirculation mode. Upon initiation of the mode, the Duty pump shall recirculate/mix the stored chemical in the selected tank. The PLC and HMI shall be configured, such as operators can set the pump operating frequency and duration (based on pump runtime, or on tank volume).

(1) Runtime Based: Recirculation duration shall be initially set for 60 min (adjustable).

(2) Tank Volume Based: Pump flowrate manually entered and stored in the PLC. There are three tank turnover scenarios that the operator can select at the HMI (half volume, full volume and twice volume). The PLC shall be programmed to calculate the runtime of the pump based on the pump flowrate (manually entered), the calculated volume of chemical in the tank (as measured by respective level instruments) and the operator selected turnover scenario.

b) Frequency operation shall initially be set to reoccur every 24 hours (adjustable). A visual indication on the HMI shall be configured to display the time that has passed since the last recirculation cycle.

c) PLC shall be configured to automatically open the suction and discharge valves of the tank being selected for recirculation. Recirculation valves of the tanks not in operation shall remain closed. If multiple tanks are selected for the recirc operation, the valves shall be sequentially opened and closed such that only one tank is in operation at a time.

d) Logic in the PLC shall be configured to prevent the automatic recirculation of the duty pump in any case where the LSH is active or where level in the tank is

below an operator configurable capacity, initially set to 10% (configurable).

e) If the Duty pump fails, Standby pump shall take over operation from the next cycle.

f) PLC shall send a pump start signal to the pump starter and confirm pump running status. A high discharge pressure switch shall be used for pump protection such that at high pressure, after a user adjustable time delay, the pump shall automatically stop and display an alarm condition.

6) Configure interlocks to trip the pump regardless of local or remote pump operation:

a) High discharge pressure

b) Pump Fault

c) Hose Leak Detected

c. Sodium Bisulfite Metering Pumps:

1) Local Control:

a) The pumps can be run locally either from the integral controller at the pump or from the VFD. The operator shall ensure that all valves are in proper position for the intended operation.

2) PLC and HMI Control:

a) In Remote- Manual mode, control is governed by the soft On/Off switch. The operator shall have the ability to run the pumps from the HMI. Operators shall be able to control the Pump Speed via software manual speed setpoint input from the HMI.

b) In Remote-Auto, pumps shall run in the Duty/Standby 1/Standby 2 configuration. Metering Pumps 1-3 are dedicated to the dosing locations before TI-011 outfall.

c) When a pump is called to run in either Remote-Manual or Remote-Auto mode, the pump's suction valve shall be confirmed fully opened prior to start of the pump. If suction valve does not open after an operator adjustable time delay, generate an alarm and remove the pump call to run.

d) When the pump is called to stop, the pump shall stop. Then the suction valve should close. If the valve does

not close after an operator adjustable time delay, generate an alarm.

3) Metering Pumps Remote-Auto Operation:

a) Upon activation of the CSO event at the Regulator-09, the duty pump shall run at minimum speed for a period of time (operator adjustable) to ensure proper functionality of the Sodium Bisulfite system. This is a permissive to start the sodium hypochlorite system. Then the pumps shall stop and a time delay start.. The time delay shall be an estimate of the combined flows to reach the bisulfite dosing area from Regulator-09. This time delay shall either be manually entered or estimated based on the surface velocity readings recorded by the upstream flowmeters. Once the timer has lapsed, duty pump shall run. Manual initiation of the dosing pumps shall also be made available. This shall override the timer delay.

b) When the CSO wet weather event is deactivated, the sodium hypochlorite system shall continue to run for a period of time that ensures the pipe volume is completely flushed. The following is the flushing sequence:

(1) Stop the duty pump.

(2) Close all tank outlet valves.

(3) Open service water valve.

(4) Start all pumps at 35% speed (operator adjustable) and run them for a period of time that ensure the pipe volume is completely flushed. Totalize the pump flow rate as measure by its flow meter until the “Flushing Volume” setpoint is reached (initially 17 gallons).

c) Various flow control modes shall be programmed. Operator shall choose to run the system in any of the modes.

(1) Flow Mode – Operator shall enter a desired flow setpoint, and the speed of the pump shall be modulated to achieve the setpoint.

(2) Flow with closed loop - Operator shall enter a desired flow setpoint. The flow meter on the pumps combined discharge

line shall be used to adjust the pump speed to maintain setpoint.

(3) Flow pace with closed loop – Duty pump shall start at an operator adjustable dosing rate and shall be paced as a linear function of flow. Flow shall be calculated as a combined flow as read by the 2 flow meters (FIT-404,405) at Regulator 09. The flow meter on the pumps combined discharge line shall be used as a pump closed loop confirmation.

(4) Flow pace with trim and closed loop mode - Duty pump shall start at an operator adjustable dosing rate. Combined flow shall be calculated as read by 2 flow meters (FIT-404,406) at Regulator 09. Operator shall enter the chlorine residual setpoint expected at the Pre-bisulfite analyzer (AIT-410) and post-bisulfite analyzer (AIT-416), which shall be used as a trim setpoint. Provisions shall also be made to manually enter the residual chlorine value, based on grab samples, or manually enter trim factor to be used in the chemical feed rate calculation. If the analyzer fails, the calculation shall use the manually entered trim value if available or fallback to the last set trim factor. The flow meter on the pumps combined discharge line shall be used as a pump closed loop confirmation.

d) PLC shall send a pump start signal to the pump starter and confirm pump running status. A high discharge pressure switch shall be used for pump protection such that at high pressure, after a user adjustable time delay, the pump shall automatically stop and display an alarm condition.

4) Configure interlocks to trip the pump regardless of local or remote pump operation:

a) High discharge pressure

b) Pump Fault

c) Hose Leak Detected

J. TI-010 – Auxiliary Systems (CS-09):

1. Reference Drawings: I-304.00
2. Process Overview: N/A
3. Containment Piping Leak Detection and Gas Monitoring:
    a. Low Point Leak Detection for FBCSO TI-011C Containment Piping, and Continuous Leak Detection for DC5, and TI-011D Containment Piping, provided under Section 40 05 32 – Double Containment Chemical Piping shall include a Leak Detection Panel each system. All sensors and transmitters will be included as a packaged system, with a discrete output sent to the respective control panel PLC for a Leak Detected Alarm:
        1) FBCSO Leak Detection Panel shall provide Leak Detected Alarm to MCP-10 PLC.
        2) DC-5 Leak Detection Panel shall provide Leak Detected Alarm to DC5-CP PLC.
        3) TI-010D Leak Detection Panel shall provide Leak Detected Alarm to SBS-CP PLC.
    b. Sulfur Dioxide (SO2) Gas shall be monitored in the TI-010 Sodium Bisulfite Room with dual gas sensors installed in the room, and an analyzer/transmitter located outside of the room which shall output two (2) 4-20 mADC signals to the SBS-CP for the SO2 gas concentration.
    c. A leak detection alarm at TI-010D, or a high gas level alarm shall output a discrete signal to the TI-010 HMCS Panel provided under Section 23 09 00 – Instrumentation and Control for HVAC, which shall trigger the HVAC fan system.
4. Emergency Eyewash/Shower System (Provided under Section 22 11 16 – Domestic Water Piping):
    a. A flow switch provided with each emergency eyewash/shower system, shall be triggered when the respective emergency eyewash system is activated, and shall output a discrete signal to the respective control panel PLC where the eyewash activated. The following locations shall apply:
        1) Five (5) Eyewash/Shower Stations at the TI-010C Chemical Storage Area, which when activated shall send a signal to the MCP-10 PLC.
        2) One (1) Eyewash/Shower Station at the TI-010C Sodium Hypochlorite Fill Station, which when activated shall send a signal to the MCP-10 PLC.
        3) Two (2) Eyewash/Shower Stations at the TI-010D Chemical Room, which when activated shall send a signal to the SBS-CP PLC.

4) One (1) Eyewash/Shower Stations at the Sodium Bisulfite Fill Station, which when activated shall send a signal to the SBS-CP PLC.

5. ATS System:

a. The TI-010C ATS Panel provided under Section 26 36 23 – Automatic Transfer Switches shall provide five (5) discrete signals to the MCP-10 PLC for Utility Source Available, Utility Source Failure, Utility Source Power On, Generator Source Power On, and Generator Source Failure.

b. The TI-010D ATS Panel provided under Section 26 36 23 – Automatic Transfer Switches shall provide five (5) discrete signals to the SBS-CP PLC for Utility Source Available, Utility Source Failure, Utility Source Power On, Generator Source Power On, and Generator Source Failure.

K. TI-011 – Auxiliary Systems (CS-10):

1. Reference Drawings: I-406.00

2. Process Overview: N/A

3. Containment Piping Leak Detection and Gas Monitoring:

a. Containment Piping Continuous Leak Detection System provided under Section 40 05 32 – Double Containment Chemical Piping shall include a Leak Detection Panel for TI-011C and TI-011D. All sensors and transmitters will be included as a packaged system, with a discrete output sent from each panel to the MCP-11 PLC as a discrete input for a Leak Detected Alarm.

b. Chlorine (CL2) Gas shall be monitored in the TI-011 Sodium Hypochlorite Room with dual gas sensors installed in the room, and an analyzer/transmitter located outside of the room which shall output two (2) 4-20 mADC signals to the MCP-11 for the CL2 gas concentration.

c. Sulfur Dioxide (SO2) Gas shall be monitored in the TI-011 Sodium Bisulfite Room with dual gas sensors installed in the room, and an analyzer/transmitter located outside of the room which shall output two (2) 4-20 mADC signals to the MCP-11 for the SO2 gas concentration.

d. A leak detection alarm, or a high gas level alarm shall output a discrete signal to the TI-011 HMCS Panel provided under Section 23 09 00 – Instrumentation and Control for HVAC, which shall trigger the HVAC fan system.

4. Emergency Eyewash/Shower System (Provided under Section 22 11 16):

a. A flow switch provided with each emergency eyewash/shower system, shall be triggered when the respective emergency eyewash

system is activated, and shall output a discrete signal to the MCP-11 for eyewash activated. The following locations shall apply:

1) Two (2) Eyewash/Shower Stations at the TI-011C Chlorination Chemical Room (B04).

2) One (1) Eyewash/Shower Station at the TI-011C Sodium Hypochlorite Fill Station.

3) Two (2) Eyewash/Shower Stations at the TI-011D Dechlorination Chemical Room (B03).

4) One (1) Eyewash/Shower Stations at the Sodium Bisulfite Fill Station.

5. ATS System:

a. The ATS Panel provided under Section 26 36 23 – Automatic Transfer Switches shall provide five (5) discrete signals to the MCP-11 PLC for Utility Source Available, Utility Source Failure, Utility Source Power On, Generator Source Power On, and Generator Source Failure.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Shop Tests

1. Shop Testing shall conform to the requirements of Section 40 80 81 – PMCS Factory Testing.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Testing

1. Field Testing shall conform to the requirements of Section 40 80 82 – PMCS Startup and Field Testing.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 40 63 43 – PMCS PROGRAMMABLE LOGIC CONTROLLERS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish, install, calibrate, test, startup, and place into satisfactory operation PMCS Programmable Logic Controllers (PLCs).

B. The PMCS Supplier shall provide on behalf of the Contractor all configuration and documentation of all PMCS PLCs.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 40 61 13 - PMCS General Requirements

B. Section 40 61 26 - PMCS Training

C. Section 40 61 93 - PMCS Input Output List
D. Section 40 61 94 - PMCS Instrument Index
E. Section 40 61 95 - PMCS Monitoring and Control Criteria
F. Section 40 61 96 - PMCS Control Strategies
G. Section 40 63 53 - PMCS Network Equipment
H. Section 40 67 16 - PMCS Panels and Enclosures
I. Section 40 70 01 - Measurement
J. Section 40 78 90 - PMCS Panel Mounted Instruments and Devices
K. Section 40 79 91 - PMCS Field Instruments
L. Section 40 80 81 - PMCS Factory Testing
M. Section 40 80 82 - PMCS Startup and Field Testing

1.04 REFERENCES

A. Definitions

1. Peer-to-Peer - Communication between devices connected to a common channel where each device can control the communication exchange.
2. PID – Proportional, Integral and Derivative, a description of controller action which modifies the response to an input signal and a set point such that the output rapidly and optimally achieves the set point.
3. Section 40 61 13 – PMCS General Requirements defines the terms and abbreviations used in this Section and the PMCS.

B. Reference Standards

1. Section 40 61 13 – PMCS General Requirements lists the standards applicable to this Section and the PMCS.
2. IEEE 37.90.1 – IEEE Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus.
3. NEMA ICS 61131-1 – Programmable Controllers Part 1: General Information.
4. NEMA ICS 61131-4 – Programmable Controllers Part 4: User Guidelines.

5. IEC 61131 – Programmable Controllers

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. The Contractor shall comply with the Quality Assurance requirements listed in Section 40 61 13 – PMCS General Requirements, this Section and the Specifications.

B. All materials and equipment furnished shall be new, free from defects, and of first quality, produced by manufacturers who have been regularly engaged in the manufacture of PLCs.

C. Manufacturers shall have produced PLCs for a minimum of 20 years.

D. Where there is more than one item of similar equipment required under the Contract, all such similar equipment shall be the product of one manufacturer.

E. All material furnished under this Contract shall be determined safe by either Underwriters Laboratories, Inc., or Factory Mutual Engineering Corporation and all material shall be labeled, certified, or listed by the testing agency.

F. Custom made equipment or related installation which are constructed specially for this Project will not be acceptable.

G. Equipment furnished within this Contract shall be standard products furnished by a supplier regularly engaged in the manufacture of such products.

H. The PMCS Supplier shall utilize System and Software engineers who have been factory trained and certified on the respective software packages, to perform all programming functions, develop control strategies, create graphic displays, customize applications, document all work and coordinate the software interface.

I. System and Software engineers shall be intimately familiar with the details of this Plant, instrumentation and control in general and the Contract goals and requirements.

J. System and Software engineers shall have a minimum of 10 years' experience in the PMCS development work required under this Contract.

1.07 SUBMITTALS

A. The Contractor shall comply with submittal requirements listed in Section 40 61 13 – PMCS General Requirements, this Section and the Specifications.

B. The PMCS Supplier shall submit, through the Contractor, the following information for approval prior to beginning of the actual work of developing software for this Contract:

1. Qualifications and certifications of system software engineers.

2. A listing of all proposed software packages indicating quantities and where they will be installed.

3. Preliminary ladder logic for all PLC(s) and general methods of implementing the various control strategies.
4. Preliminary database and I/O listing showing system tag names and references.
5. Preliminary screen display count with general system structure.
6. Preliminary screen display development, general display organization and common components.

C. The PMCS Supplier shall submit all completed items to the Engineer for review and approval. As a minimum, the items to be submitted shall include, but shall not be limited to:

1. PLC ladder logic with full documentation and annotation
2. Full Color copies of all unique Graphic display screens
3. Screen animation and control
4. Databases
5. Alarm and event log lists, formats and messages
6. Working Drawings and Fabrication Drawings which shall include:
    a. Equipment specifications and data sheets identifying all equipment and materials used and methods of fabrication.
    b. Complete assembly and layout drawings with clearly marked dimensions.
    c. Equipment cross sections and mounting details.
    d. Weights of all component parts assembled weight of units and approximate total shipping weights.
    e. Interconnecting wiring diagrams.
    f. List of spare parts.
7. The Control Panel Fabrication Drawings shall include:
    a. Panel layouts
    b. Component placement
    c. Wiring details
    d. Labeling
    e. Assembly instructions
8. Vendor documentation including:
    a. Datasheets
    b. Technical specifications
    c. Certifications

d. Warranties

e. Product manuals

9. Software Documentation including:

a. PLC program code

b. Configuration files

c. Databases

d. Software licenses

e. Network configurations

D. Submittals shall be made at least 60 days in advance of any proposed use by the PMCS Supplier.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall comply with delivery, storage and handling requirements listed in Section 40 61 13 – PMCS General Requirements.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall comply with spare parts, special tools and supplies listed in Section 40 61 13 – PMCS General Requirements, this Section and the Specifications.

B. Spare parts and tools shall be as recommended by the manufacturer and shall as a minimum include the following:

1. Four (4) I/O modules for each type furnished.

2. Two (2) communication modules (Ethernet, Remote I/O, PLC LAN) for each type furnished.

3. Two (2) CPUs of each size and type furnished.

4. One (1) PLC rack of each type and size furnished.

5. Two (2) power supplies of each size furnished.

6. One (1) PLC for each type furnished.

7. All spare parts recommended by manufacturer and listed as recommended spare parts in the manufacturer's submitted O&M Manual.

8. Tools

a. Furnish all tools necessary to service, disassemble, repair, and adjust the equipment.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. PMCS Programmable Logic Controllers shall be as manufactured by Schneider Electric, Model Modicon M340 Series. No alternate manufacturers or products will be accepted:

Control Panel Designation	PLC Type
TI-010 Main Control Panel (MCP-10)	Modicon M340 Series X80 Form Factor IO. Use processor Ethernet port for Modbus TCP/IP connection to SCADA network. Separate communication card required for Modbus TCP/IP connection to OIT network.
DC-5 Control Panel (DC5-CP-10)	Modicon M340 Series X80 Form Factor IO
TI-010 Dechlorination Control Panel (SBS-CP-10)	Modicon M340 Series X80 Form Factor IO
TI-011 Main Control Panel (MCP-11)	Modicon M340 Series X80 Form Factor IO. Use processor Ethernet port for Modbus TCP/IP connection to SCADA network. Separate communication card required for Modbus TCP/IP connection to OIT network.

B. PMCS Industrial PC for OITs shall be as manufactured by:

1. Schneider Electric Harmony P6, El Paso, Texas.
2. Arista Panel PC, Fremont, California.
3. AIS Panel PC, Leominster, MA.
4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. General

1. The PMCS PLCs shall implement and provide the Control Strategies specified in Section 40 61 96 – PMCS Control Strategies.
2. Where shown on the Contract Drawings redundant PLCs configured in hot standby arrangements shall be provided.
3. The PLC shall be configured by the Contractor to perform functions shown and specified. The Contractor shall coordinate and obtain from all equipment suppliers PLC systems of the same manufacturer and series.
4. Functions to be performed by the PLC include but are not necessarily limited to the following:

a. Alarm and status indication.

b. PID control and arithmetic functions.

c. Interlock and sequential logic control of processes and equipment operations.

d. Collection and transmission of data and control parameters to and from other PLCs.

e. Provide a dry contact rated 2 amperes at 120-volt a-c for remote indication of processor failure.

5. The PLC shall be microprocessor type furnished with all necessary relays, timers, counters, and latches as data manipulative functions and arranged into the format required to accomplish the functions shown and specified.

6. The PLC shall be designed and constructed for the demanding requirements of real-time process management and control on a continuous basis for use in a CSO Facility.

7. The manipulative functions shall have the capability of being rearranged into any desired format while the controller is performing other control tasks.

8. Expansion of the controller by the Input/Output points, internal data manipulative functions, and relays, timers and counters shall be accomplished by reprogramming.

9. The control programs and applications memory of the PLC shall be capable of being remotely (off-line) and locally (on-line) monitored, programmed, modified and displayed by use of a personal computer and documentation software which shall be provided as part of this Contract.

10. In addition, the PLC shall be capable of being programmed by an external PC compatible host device via an Ethernet communication port. The host communication interface shall allow controlled access for authorized users via password protection to all registers, I/O system fault status and I/O override.

11. The logic shall be entered and displayed in ladder diagram format.

12. The ladder diagram format shall contain a complete cross reference with each coil referred to in logic and identified as normally open or normally closed.

13. Mnemonic information shall be added to each coil and to both real and internal I/O points. Alphanumeric titles and descriptions shall appear on the screen.

14. Any restructuring of the control logic shall be done at the PLC installation and shall not necessitate any removal components of the PLC to another location.

15. The PLC construction shall be that of a modular type design.
16. All inputs, outputs, and logic control interface units shall be easily removed for ease in replacement or restructuring the hardware arrangement.
17. Shut down of the processor control logic (halting of program scan) shall not occur if I/O or Remote I/O modules are removed.
18. In the event of a power failure or malfunction of the logic hardware, the controller shall provide dry, Form C contact closures for remote and local indication and alarming.
19. A self-diagnostics package to determine proper processor operation shall be included. Diagnostic LED shall be provided in clear view on the front of the PLC enclosure.
20. Changing an on-line control logic process operation shall not necessitate the halting of the processor.
21. Burn-in for all printed circuit boards and modules shall be performed at the factory.
22. Programmable Logic Controllers shall conform to NEMA ICS 61131 – 1 and NEMA ICS 61131 – 4
23. The primary interface to the process equipment and field devices shall be provided by the Input/Output system consisting of I/O modules installed in the PLC backplane, chassis or remote mounting racks.
24. The Input/Output system hardware shall be designed with the following features:
    a. Noise immunity and filtering.
    b. IEEE surge-withstand rating to IEEE 37.90.1
    c. Optical isolation for all inputs and outputs to provide controller logic protection.
    d. No on board pots requiring adjustment or maintenance.
    e. Any card, any slot, plug-in packaging, with locking bars and/or screws to hold I/O modules in place.
    f. 600 volt, screw type, field wiring terminal strips sized to accommodate a minimum of two # 14 AWG wires per terminal within control panels and MCCs.
    g. Terminal strip design shall allow I/O module removal and replacement without disturbing wiring connections.
    h. Front-of-module LED status indicators for each individual I/O point to indicate when power is applied at I/O terminals.
    i. Individually fused output circuits for all output modules.

j. Output fuses shall be capable of being inspected without removal of and replaced without disassembly of the output module.

k. Individually isolated output modules shall be provided with front-of-module blown fuse LED status indicators for each output point.

l. Non-isolated (common output power source) output modules shall be provided with common blown fuse LED status indicators for a maximum of every four points.

m. All outputs for contactors and relays shall be rated for a minimum of 2.0 amps continuous at 120 VAC.

n. Where higher rated outputs are required, interposing relays located inside control panels shall be provided in order to assure that ratings of the PLC output contacts are not exceeded.

o. For outputs to motor contactors and other equipment type load relays, provide transient and inrush surge suppressor connected across the output contact terminal and the neutral common terminal inside the control panel to suppress the switching surge transient to lower than the continuous rating of the output contacts.

p. The maximum number of points per I/O module shall be as follows:

1) Discrete: 16.

2) Analog: 8.

q. The following types of I/O modules shall be provided for use with the supplied PLC System:

1) Analog Inputs (12 bits minimum):

a) 4-20 mA DC (250 ohms maximum impedance).

2) Analog Outputs (12 bits minimum):

a) 4-20 mA DC (load of750 ohms minimum).

3) Register Inputs and Outputs (16 bit):

a) Single BCD.

b) Multiplexed BCD.

4) Discrete Inputs:

a) 24 VDC, in both isolated and common circuit types.

b) TTL Logic.

5) Discrete Outputs:

a) 120 VAC in both isolated and common circuit types.

b) 24 VDC

c) Form C Relay Contacts.

d) TTL Logic.

25. Signal and control circuitry to individual I/O boards shall be arranged such that a board failure shall not disable more than one half of the control loops within any group of controlled equipment (e.g., one pump out of a group of three pumps, two pumps out of four, etc.).

26. Where possible, individual control loops and equipment shall be assigned to individual boards such that failure of the board will disable only one loop or piece of equipment.

B. Required PLC Features:

1. Construction

a. Modular printed circuit boards.

2. Type

a. Electronic components with central processing unit and software reprogramming capabilities.

3. Memory

a. System Memory

1) Electrically Erasable Non-volatile type (EEPROM) or Lithium battery-backed RAM with minimum retention time of 2 years under worst case conditions.

b. Application Memory:

1) Type, Lithium Battery-backed RAM with minimum retention time of 2 years under worst case conditions, or RAM with EEPROM or NOVRAM backup modules.

2) Size, as required for present and dedicated future I/O capacity and for performance of the specified functional requirements plus 25 percent spare capacity as a minimum.

4. Language Format

a. Ladder type diagrams and functional blocks.

5. Provide type and quantity of I/O as required to perform the operational and functional requirements plus 20 percent spare (minimum of one module) for each type of I/O module used.

6. Spare I/O points shall be mounted and wired ready for use and shall require only field wiring connections and software configuration to place the point in service.

7. Internal Functions

a. Relays, timers, counters, latches, internal storage registers, and other functions as required to perform specified functional requirements plus 25 percent spare capacity.

8. Report Generation

   a. Processor shall have the capability to store and automatically communicate up to 198 ASCII status/alarm/diagnostic type messages to a peripheral display device via the RS-232C output port at rates up to 19.2 K bits/second.

9. Security Features

   a. Key switch interlock on PLC and/or security password protection through system programmer terminal to prevent tampering of logic sequences and unauthorized programming.

10. Processor Scan Time

   a. 0.3 to 2 ms per kbytes of memory typical.

   b. No more than one word shall be required for each contact or coil including address, no more than one word for a branch, no words for spaces or connects, and no words shall be required to begin a new rung.

   c. Scan time refers to nominal memory scan time of words of relay ladder logic, with an "immediate I/O" command to operate on instantaneous alarm information.

   d. Unprogrammed memory shall not be scanned.

11. Operating Temperature

   a. 32-degree F to 140-degree F.

12. Storage Temperature

   a. Minus 40-degree F to 160-degree F.

13. Power Supply

   a. 120 VAC, with circuit breaker protection.

   b. Supplies shall be sized for a minimum of 130 percent of maximum simultaneous current draw.

   c. Comply with requirements specified in with Section 40 61 13 – PMCS General Requirements.

14. Data Communications

   a. The PLCs provided shall be capable of Peer-to-Peer communications with other PLCs of the same and different types by means of manufacturer standard data highway system.

   b. Highway system design shall be a token-passing, master less, high-throughput serial communication bus which connects the PLCs by means of intelligent network interface modules at highway drops.

c. Minimum local highway speed shall be 50 Kbaud and highway system design shall be upwardly compatible with the MAP standard.

d. All PLCs shall be provided with Ethernet networking capability using TCP/IP protocol. All modules required shall be supplied.

15. Clock

a. Battery-backed clock with typical variation of ±20 sec. per month.

16. Programming/Documentation Software

a. Provide PLC programming/documentation software package which shall be fully menu-driven and self-prompting.

b. Package shall provide fully integrated ladder diagram programming and documentation.

c. The package shall allow 3 lines of mnemonics per ladder element with 6 characters per line minimum. The package shall also provide for the inclusion of the following documentation information for ladder diagram contacts and coils:

1) Panel I/O wiring list.

2) Rack number.

3) Module position slot number.

4) I/O module type.

5) Terminal number and wire number.

6) Electrical and Mechanical Drawing Reference Number.

7) Description of up to 240 characters in length for each element.

d. The programming/ documentation software displays shall allow the user to flip between documentation and the uncommented rung as it resides in the controller.

e. Software shall also allow selection of single rung and continuous ladder diagram printouts.

17. PLC Configuration

a. PLC types shall be as designated on the PMCS Block Diagram and this Section.

b. Memory and processor shall be adequate for all control functions specified.

18. PLC Minimum Performance Requirements

a. The table below lists the minimum requirements for various sizes of PLC.

PLC Type	Micro	Small	Mid-Size	Large
I/O Discrete Points	14	960	4096	12000
I/O Analog Points	3	96	2048	8000
Memory	3 kB	6 kB	96 kB	440 kB
Scan time	3 ms/kB	2.5 ms/kB	0.3 ms/kB	0.3 ms/k

19. Industrial PC for OITs

a. General: Provide a Panel Mount Industrial PC which shall be utilized as the human machine interface as indicated on the System Architecture. PC shall be password protected for system security and user identification.

b. The Industrial PC shall be a flat screen touchscreen panel.

c. The following features must be met at a minimum:

1) NEMA 4X front panel mounted.

2) 5-wire resistive touch screen technology.

3) CPU: Intel i7-6700T.

4) 32 GB DDR4 Memory.

5) 1 x 2.5” SATA SSD Storage.

6) Aspect Ratio: 4:3.

7) Network (LAN): 2 RJ-45 Ports.

8) Operating System: Latest version of Microsoft Windows Professional (64-Bit).

9) Power: 24 VDC.

10) Display Type: 15” Active Matrix TFT LCD.

11) Resolution: 1024 x 768.

12) Programming software for HMI application shall be loaded into this Panel PC, and shall match the SCADA HMI Software used in the existing Citywide Collection Facilities Integrated SCADA System (CCFISS) network. Contractor shall provide all software and licenses required for OIT.

13) OIT graphic guidelines shall comply with the requirements of Section 40 61 95 – PMCS Monitoring and Control Criteria.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. PMCS PLCs shall confirm to the requirements of Section 40 80 81 – PMCS Factory Testing.

B. PMCS PLC monitoring and control criteria specified under this Section shall be functionally verified during PMCS Factory Testing.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 IMPLEMENTATION

A. Install each item in accordance with manufacturers recommendations and in accordance with the Contract Documents.

B. Configure PLC to prevent erroneous and nuisance alarms by using techniques including time delays and logic such as

1. Inhibit initiation of a seal water failure alarm when pump is not running

2. Provide a time delay on high discharge pressure alarm.

C. Arrange PLC data table. Repeat all status and alarm bits and analog values (including timer and counter presets) into a separate, contiguous block of memory, grouped by type. Provide 25% space in each group to allow for future expansion.

D. Configure operator interface unit using function keys and instructional prompts so that the operators can modify set-points and presets without any special training or knowledge of the PLC program.

E. A modular and structured approach to PLC program development shall be implemented.

F. The programs shall be broken up in logical segments to allow easy debugging in the field.

G. All real world outputs/inputs shall be grouped such that their addresses can be mapped in contiguous registers to allow use of matrix functions for troubleshooting, debugging, and alarming.

H. An alarm segment shall be developed for all real world outputs.

I. The alarm segment shall be separate from the rung logic for real world outputs.

J. For open/close valves, the associated limit switch positions shall be compared with the PLC output.

1. If the output calls for an open valve, the open limit switch should be made and the closed switch should not and vice versa.

2. Any combination other than these two shall cause an alarm.

K. The PLC shall monitor limit switch positions for valves in transition.

1. Valves in transition (between open and close position) shall be displayed on the operator interface with message "In Transition".
2. The Contractor shall submit limit switch development for all valves.

L. For motors, the run output shall be compared to the run status with the appropriate time delays.

1. Any mismatch between RUN output and RUN status shall cause an alarm.

M. Unless waived in writing by the engineer, application programs written for PLCs shall be written using ladder logic, showing discrete references in individual ladder rungs.

N. Each output shall have its own complete set of logic to aid in startup and trouble shooting.

O. Where duplicate or repetitive logic is required, subroutines shall be used to reduce program memory requirements and scan time.

P. The program shall be written in a logical sequence with associated rungs grouped together in a manner to make the system logic clearly evident.

Q. Where multiple rungs use the same constants for associated presets or reference, the constant shall be in the form of a register location and shall be loaded in the beginning of the program each time it is run.

R. All preset register values shall be part of the program and load each time the program is run.

S. Where possible, constants that must be calculated shall have this done in the program.

T. Where values must be input, whether in the program or during operation, software "traps" shall be used to prevent input of values out of range or that will cause improper operation of the system.

3.03 FIELD TESTING / QUALITY CONTROL

A. PMCS PLCs filed testing shall conform to the requirements of Section 40 80 82 – PMCS Startup and Field Testing.

B. PMCS PLCs monitoring and control criteria specified under this Section shall be verified during PMCS Startup and Field Testing.

3.04 STARTUP / DEMONSTRATION

A. Section 40 80 82 – PMCS Startup and Field Testing details the requirements for OAD and PMCS Upset and Recovery Testing.

B. The OAD and the PMCS Upset and Recovery Testing shall serve as the final verification of the correct implementation of the PMCS PLCs specified under this Section.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 28 00 00 - Closed Circuit Television Surveillance System

B. Section 40 61 13 - PMCS General Requirements

C. Section 40 61 26 - PMCS Training

D. Section 40 61 93 - PMCS Input Output List

E. Section 40 61 94 - PMCS Instrument Index

F. Section 40 61 95 - PMCS Monitoring and Control Criteria

G. Section 40 61 96 - PMCS Control Strategies

H. Section 40 63 43 - PMCS Programmable Logic Controllers

I. Section 40 67 16 - PMCS Panels and Enclosures

J. Section 40 70 01 - Measurement

K. Section 40 78 90 - PMCS Panel Mounted Instruments and Devices

L. Section 40 79 91 - PMCS Field Instruments

M. Section 40 80 81 - PMCS Factory Test

N. Section 40 80 82 - PMCS Startup and Field Testing

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install, calibrate, test, adjust and place into satisfactory operation the Network Hardware required for Process Monitoring and Control System (PMCS).

B. Provide PMCS network hardware quantities as shown on PMCS network Architecture block diagram, and as required for an implementing a fully functional network.

C. Provide copper Cat6A Ethernet cables with RJ-45 connectors as required to interconnect the network hardware as shown and specified.

D. Provide Fiber Optic patch cables with connectors compatible with network equipment as required to interconnect the network hardware as shown and specified.

E. Coordination:

1. Comply with the requirements of Section 40 61 13, PMCS General Requirements, and the following:

a. Contractor shall be responsible for coordinating installation of all hardware in the network cabinets to ensure that all equipment is installed correctly and in accordance with the manufacturer's recommendations. Actual rack unit size of equipment shown on drawings may vary from equipment furnished.

b. Contractor shall be responsible for coordinating the hardware components of the rack mount servers and workstations interface to provide compatibility with all SCADA hardware as shown and specified.

1.06 QUALITY ASSURANCE

A. Comply with the requirements of Section 40 61 13, PMCS General Requirements.

B. Training:

1. Provide training to City's personnel in the operation, programming and maintenance of the equipment.

2. Comply with the requirements of Section 40 61 26, PMCS Training.

1.07 SUBMITTALS

A. Comply with the requirements of Section 40 61 13, Process Monitoring and Controls System (PMCS) General Requirements, 40 61 26, PMCS Training, and the following:

1. Manufacturer's Certificates of Compliance and Site Visit Reports.

1.08 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be delivered, stored and handled in accordance with Section 40 61 13, PMCS General Requirements, the manufacturer's instructions, and the following:

1. All equipment shall be inspected for shipping damage or loose parts when received. Evidence of water, which may have entered equipment during transit, shall be checked.

2. Equipment shall be stored in a clean, dry, climate-controlled location in which a uniform temperature is maintained. Equipment shall be protected with coverings and maintain air circulation.

3. Where dampness or condensation may be encountered, heaters shall be provided for equipment to prevent moisture damage.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Provide the following spare parts:

1. Panel Ethernet Switch:

a. One switch of each type for every five switches, or portion thereof, provided.

B. Provide special tools necessary for normal operation, maintenance and diagnostic aids.

C. Spare parts shall be packed in sturdy containers with clear indelible identification markings and shall be stored in a dry, warm location until transferred to the City at the conclusion of the Project.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

B. Comply with the requirements of the General Conditions and the following:

1. Contractor shall provide the following product warranties from the date of equipment acceptance by the City:
    a. For Ethernet Switches:
        1) Minimum 3 years warranty.
        2) For all Cisco Network Switches specified in this section, Warranty shall be exclusively through manufacturer, not from PMCS Sub-Contractor. Provide name of Cisco Representative to the City and coordinate the inclusion of the Network Switch under the service contract that the City holds with the manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide Managed Ethernet Net Switch by CISCO, Model Industrial Ethernet Switch 4000. No alternate manufacturer or product will be accepted.

B. Provide Cellular Router Model IR831 as manufactured by Cisco. No alternate manufacturer or product will be accepted.

2.02 MATERIALS /EQUIPMENT

A. MANAGED ETHERNET SWITCH:

1. General:
    a. Furnish and install modular, managed Ethernet switches for connecting devices on the network. The use of hubs will not be permitted.
    b. Managed type Ethernet switches shall have a full set of management features, including Command Line Interface, SNMP agent, and web interface. In addition, managed switches shall have features to manipulate configurations, such as the ability to display, modify, backup and restore configurations.
    c. Provide equipment to operate on 115 VAC, single phase, 60-hertz electrical service.
    d. Provide all necessary items for installation, including mounting brackets, interconnecting cables, hardware and appurtenances.
    e. Label each switch with the switch name as shown on the Contract Drawings. Label shall be clearly visible and shall be in accordance with Section 40 67 16, PMCS Panels and Enclosures.
    f. Quantities shall be as shown.
    g. Configure switch for Modbus TCP/IP Communication protocol.
2. Features:

a. 10/100/1000 base-T, auto-negotiation 802.3u.

b. Minimum Port count:

1) 4 RJ-45 ports, Fast Ethernet. In addition, provide four (4) ports labeled as spares. Provide POE ports as required to accommodate end devices.

2) 2 fiber Optic ports (Small Form-Factor Pluggable – SFP), (Fiber-Optic LC Connectors)

c. Minimum of two (2) fiber optic ports. Fiber optic ports shall be expanded as needed to interconnect all system components.

d. Layer 2 switching capability.

e. 256 MB Dram with ECC memory

f. IEEE 1588v2 FPGA

g. 64 MB on-board flash memory

h. 1GB removable SD flash memory card

i. Mini-USB connector

j. Alarm I/O: Two alarm inputs to detect dry contact open or close; one alarm output relay.

k. Support for the use of IGMP for multicast traffic.

l. Support for VLAN as defined in IEE802.1Q.

m. Support for the use of SNMP management.

n. LED for indicating port status.

o. Failsafe output relay to indicate malfunction with unit.

p. FCC Part 15, Class A compliant.

q. Provide management software for multilevel security, web-based configuration and remote monitoring.

r. Powered by circuit on Uninterruptible Power Supply.

s. Operating temperature of -20°C to 55 C.

t. Internal Panel mounting kit.

u. Configuration backup capability required.

3. Implementation

a. It is the PMCS Sub-Contractor's responsibility to coordinate with CISCO to ensure that the MODBUS TCP/IP protocol is correctly implemented to affect the communication specified herein and as

depicted on the drawings to provide a satisfactory operating network.

B. CELLULAR ROUTER:

1. General:
   a. Provide a cellular router for industrial applications.
   b. Provide all necessary items for installation, including mounting brackets, hardware, and appurtenances.
   c. Supports VPNs and traffic inspection advanced security features.
2. Features:
   a. Supports the following Protocols E-IGRP, MP-BGP, IPv4 and IPv6 on all interfaces including cellular, IPv4/IPv6 Multicast, Generic Routing Encapsulation (GRE) and multipoint GRE (MGRE), NAT, DNS Proxy and Spoofing, IP SLA and QoS.
3. Cellular Connectivity:
   a. 4G LTE, 3.7G, 3.5G or 3G Cellular WAN Link
   b. External, dual 4G antennas with main and receive diversity
   c. Dual SIM support
4. Ethernet Copper Ports: 4 x 10/100/1000 Mbps; 1 SFP port
5. Support advanced security features such as access control, threat detection & mitigation, device, and platform integrity.
6. Network Interfaces: 1Gbps Ethernet minimum with support for 10/100 Mbps connections.
7. Operating Temperature: -40 to 60C
8. Mounting: Panel/door mount
9. Router Management support:
   a. Web Services Management Agent (WSMA)
   b. Manufacturer Management Suite
   c. SNMPv3 and Syslog
10. Power Supply:
    a. Redundant 100-240 VAC power supplies. Load-sharing power supplies in a dual power supply configuration. The single power supply shall be capable of supporting a fully configured router.
    b. IEC power cord(s).
11. Display:

a. The switch shall have LED indication for: Power status, GE LAN, GE WAN, POE, WLAN, 3G/4G, VPN and Module status

b. The switch shall have LED indication per port for activity and transmission rate.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Contractor shall examine the conditions under which the Work is to be installed and notify the City, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Locate and install components as shown and in accordance with the manufacturer's recommendations. Components installed inside the panels shall not prohibit the panel doors from fully opening or closing.

3.03 FIELD TESTING / QUALITY CONTROL

A. Site Tests:

1. Comply with the requirements of Section 40 80 82, PMCS Startup and Field Testing.

B. Manufacturer's Services:

1. For each of the following equipment, furnish the services of a qualified factory-trained serviceman to assist in the installation of the equipment, check the installation before it is placed into operation, supervise initial operations and instruct plant operators in the care, operation and maintenance of the equipment.

a. Multi-Function Printer.

2. The serviceman shall make not less than one visit to the Site for a period of not less than 8-hours to assist in the installation of the equipment, check the completed installation, perform the required tests, and instruct plant operators in the proper care, operation and maintenance of the equipment.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 40 67 16 – PMCS PANELS AND ENCLOSURES
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, supervision, materials, equipment and incidentals as shown, as specified and required to furnish, install, calibrate, test, start up, commission, and place into satisfactory operation all control panels and/or equipment enclosures, termination cabinets and all associated equipment, as indicated on the Contract Drawings and as specified in this Section.

B. The following index of this Section is presented for convenience:

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C. A schedule of system panels is provided in at the end of this Section, for the convenience of the Contractor. The schedule may not indicate all panels and does not indicate all enclosures required for this Contract. The Contractor shall furnish and install all panels and enclosures as required.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A.	Section 03 30 10	-	Low Carbon Cast-in-Place Concrete
B.	Section 05 05 23.02	-	Miscellaneous Metal Fastenings
C.	Section 26 05 27	-	Grounding
D.	Section 26 05 53	-	Identification for Electrical Systems
E.	Section 26 29 13	-	Enclosed Controllers
F.	Section 26 43 13	-	Low-Voltage Surge Protective Devices
G.	Section 28 00 00	-	Closed Circuit Television Surveillance System
H.	Section 31 23 16	-	Excavation
I.	Section 31 23 23	-	Fill
J.	Section 40 61 13	-	PMCS General Requirements
K.	Section 40 61 26	-	PMCS Training
L.	Section 40 61 93	-	PMCS Input Output List
M.	Section 40 61 94	-	PMCS Instrument Index
N.	Section 40 61 95	-	PMCS Monitoring and Control Criteria
O.	Section 40 61 96	-	PMCS Control Strategies
P.	Section 40 63 43	-	PMCS Programmable Logic Controllers
Q.	Section 40 63 53	-	PMCS Network Equipment
R.	Section 40 70 01	-	Measurement
S.	Section 40 78 90	-	PMCS Panel Mounted Instruments and Devices
T.	Section 40 79 91	-	PMCS Field Instruments
U.	Section 40 80 81	-	PMCS Factory Testing
V.	Section 40 80 82	-	PMCS Startup and Field Testing

1.04 REFERENCES

A. Definitions

1. Section 40 61 13 – PMCS General Requirements defines the terms and abbreviations used in this Section and the PMCS

B. Reference Standards

1. Section 40 61 13 – PMCS General Requirements lists the standards applicable to this Section and the PMCS.

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. The Contractor shall comply with the Quality Assurance requirements listed in Section 40 61 13 – PMCS General Requirements.

B. All materials and equipment shall be new, and all panels shall be built in an Underwriters Laboratory (UL), Inc. approved panel shop and bear the UL label in accordance with the requirements of UL 508A, the standard for the construction of industrial control panels.

1.07 SUBMITTALS

A. The Contractor shall comply with submittal requirements listed in Section 40 61 13 – PMCS General Requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall comply with delivery, storage and handling requirements listed in Section 40 61 13 – PMCS General Requirements.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall provide spare parts for the equipment provided under this Section.

B. The spare parts shall be listed in an index and packed in containers suitable for long term storage, provided with labels clearly designating the manufacturer's part number with complete information for use and reordering.

C. The Contractor shall provide minimum the following:

1. Ten (10) percent (minimum of 1), spare space heaters of each type and rating.
2. Ten (10) percent (minimum of 1), spare heater thermostats of each type
3. One (1) spare lighting fixture and switch of each type provided.
4. Ten (10) percent (minimum of 2), spare power supply, regulator, power conditioner, etc., of each type and rating provided.
5. Ten (10) percent (minimum of 1), spare thermal control device (fan, air conditioner, heat exchanger, etc.) for each type and rating provided.
6. Ten (10) percent (minimum of 10), spare fuses, circuit breakers, equipment mounting (DIN) rails.
7. Twenty-five (25) percent (minimum of 100) spare terminals of each type provided for the entire project.
8. Spare parts as recommended by the individual equipment manufacturers.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. NEMA 4, 4X and 12 panels and enclosures shall be as manufactured by:
   1. Hoffman, Anoka, MN.
   2. B-Line, Highland, IL.
   3. Or approved equal.

B. Fiberglass or polycarbonate panels and enclosures shall be as manufactured by:
   1. Adalet, Cardington, OH.
   2. Crouse-Hinds, Syracuse, NY.
   3. Or approved equal.

C. Wire troughs and wire management shall be as manufactured by
   1. Panduit, Lockport, IL.
   2. Or approved equal.

D. Circuit breakers shall be as manufactured by:
   1. Siemens Industry, Inc., Washington, DC.
   2. Allen Bradley, by Rockwell Automation, Milwaukee, WI.
   3. Or approved equal.

E. Terminal blocks shall be as manufactured by:
   1. Entrelec, Montgomery AL.
   2. Or approved equal.

F. Fused Terminal blocks shall be as manufactured by:
   1. Allen-Bradley, by Rockwell Automation, Milwaukee, WI.
   2. Phoenix Contact, Middletown, PA.
   3. Or approved equal.

G. Panel or enclosure heaters shall be as manufactured by:
   1. Hoffman (DAH8001B), Anoka, MN.
   2. Or approved equal.

H. Panel or enclosure corrosion inhibitors shall be as manufactured by:
   1. Hoffman (HCI series), Anoka, MN.
   2. Or approved equal.

I. Panel or enclosure heat exchangers shall be as manufactured by:
   1. Hoffman (Spectracool), Anoka, MN.
   2. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. General Requirements:

1. Furnish and install panels, boxes and enclosures with a NEMA rating based on the table listed in Appendix A in this Section.
2. Panels and enclosures shall meet or exceed the NEMA and NYCEC requirements for the area in which they are installed.
3. Unless otherwise specified or indicated, panels and enclosures shall have a NEMA 4X rating and shall be fabricated of 316 stainless steel.
4. Panels provided as part of a packaged system, from an equipment vendor, (sump pumps, seal water pumps, VFDs, etc.) shall comply with all requirements specified in this Section.
5. The NEMA rating of panels, enclosure and devices shall be as required in their individual Sections if so specified.
6. The sizes of panels and enclosures shown on the Contract Drawings are estimates.
7. The Contractor shall furnish enclosures of the size required to house all equipment, instruments, front panel mounted devices, power supplies, power distribution panels, wiring, tubing, and other components installed in the enclosures while maintaining adequate free space within the enclosure.
8. Panel, box and enclosure doors shall be continuously hinged and shall be of pan construction. Clamp type closures shall be provided.
9. Adequately support and restrain all devices and components mounted on or within the panel to prevent any movement.
    a. Provide sub-panels for installation of all internally mounted components.
    b. Provide mounting strips for installation of all relays and other components where mounting strips are practical.
    c. Sub-panels shall be pan construction to prevent warping.
10. Devices shall be arranged to allow adequate wiring room for ease of connections and servicing.
11. All panel and enclosure components shall be identified both inside and out with engraved, laminated plastic name plates.
12. Panels shall be provided with an engraved laminated plastic sign inscribed "WARNING – This Device Is Connected to Multiple Sources of Power ". Letters shall be 1/2" high, white on a red background

13. Provide all electrical and/or pneumatic connections, components and devices, support hardware, fasteners, interconnecting wiring and/or piping required to make the control panels complete and operational units.

14. Provide bulkhead fittings for all gas, liquid piping and tubing leaving panels and enclosures.

15. Provide all panel-mounted pilot devices as shown and specified.

16. Locate and install all devices, wiring, and components so that connections can be easily made and there is ample room for servicing each item.

17. Components for installation on panel exterior shall be located as shown on the Contract Drawings or as directed by the engineer.

    a. Layouts shall be submitted for approval.

    b. All exterior panel mounted instruments shall have a NEMA rating equal to or greater than the enclosure.

    c. For panel mounted devices which cannot be obtained with the correct NEMA rating equal to the enclosure, the device shall be mounted behind a transparent viewing window or door, manufactured for the purpose that provides the proper rating.

    d. The viewing window or door shall maintain the NEMA rating of the enclosure and be easily opened for access to the instruments.

18. Where permitted by location and layout as shown on the Contract Drawings, all panels and enclosures shall have full height rear access doors, unless otherwise shown.

19. Where rear doors are not possible, panels shall have full height front access doors.

20. All wiring to panel connections from field instruments, devices, and other panels shall be terminated at master numbered terminal strips, unless otherwise specified.

21. Free standing control panel, enclosure or any panel with a dimension of 36 inches or more shall comply with the following:

    a. Provide at least one 120 VAC, 15 Amp duplex, grounding type receptacle.

    b. At least one 120 VAC LED light fixture complete with a protective plastic shield and capable of generating 25 foot candles on all the components within the enclosure.

    c. One 120 VAC, 15 Amp, snap switch in an outlet box with a cover to turn on the light. The switch shall be located so that it is easily accessible from the door.

    d. The service light with switch and duplex receptacle shall have their own circuit breaker.

e. The bottom 12 inches and top 6 inches of free-standing panels shall be free of all devices, including terminal strips, to provide ease of installation, wiring and testing.

f. In general, panel indication and control devices shall be mounted within a range of 40 to 72 inches above the operating floor but not less than 36 inches nor greater than 78 inches unless otherwise shown on the Contract Drawings.

g. Annunciators or alarm message display devices shall be mounted up to 84 inches above the operating floor.

h. All instrument read-outs and displays shall be in ENGINEERING UNITS of the desired process variable. Percent of scale or digital counts are not acceptable unless approved in writing by the Engineer.

i. Panels shall be constructed with an integral fully enclosed solid bottom section at least 6 inches in height from the bottom of the enclosure to the bottom edge of the enclosure door opening.

j. Free standing enclosures shall be mounted on concrete base pad.

k. Free standing panels installed in areas with raised computer type floors shall be provided with an adjustable, welded steel support frame to support the panel from the building structure.

1) The frame load rating shall have a 50 percent safety factor.

2) The frame shall be coordinated with the flooring being installed and shall be flush with the height of the raised floor.

B. Panel and Enclosure Fabrication:

1. Panels and enclosures shall be fabricated as indicated on the Contract Drawings and as specified in this Section.

a. Control panels and enclosures shall be assembled, wired, and tested in the PMCS Supplier's own or other City/Engineer approved facility.

b. All components and all necessary accessories such as power supplies, power conditioning equipment, mounting hardware, input and output terminal blocks, plug strips, relays, lighting, circuit breakers, fuses, and other components which may be required to complete the system shall be provided.

c. The Contractor is directed to review the area classifications with regards to hazardous atmospheres, as they are defined by the NYCEC and NFPA 820.

1) All equipment, controls, instruments, panels, enclosures, etc., for use in these areas, shall be constructed to meet the area requirements.

d. All control panels and enclosures shall be of formed or welded construction of steel or stainless steel, as required, unless otherwise noted.

e. Panels and enclosures shall be fabricated in accordance with the NEMA ratings as specified, shown, or required.

f. Panels and enclosures shall meet or exceed the requirements of the area in which they are located.

g. As a minimum, a NEMA 12 rating shall be required in all non-corrosive areas and NEMA 4X S/S in outdoor, process, and corrosive areas

h. Where enclosure size or weight requires, provide lifting eye bolts to facilitate handling of the enclosures.

1) All panels or enclosures with any dimension 72 inches or greater or with a weight in excess of 150 pounds, shall be equipped with lifting eyes.

2) Bolt lifting eyes directly through the enclosure structural members.

i. Continuously weld all exterior seams and grind smooth.

j. Reinforce sheet steel with steel angles where necessary to adequately support equipment, ensure rigidity, and preclude distortion and resonant vibrations.

k. Panels and enclosure surfaces shall be flat within 1/16 inch over a 24 inch by 24-inch area, or flat within 1/8 inch for a larger surface.

1) Flatness shall be checked by using a 72-inch-long straight edge.

2) Out-of-flatness shall be gradual, in one direction only, and shall not consist of obvious depressions or a series of wavy sections.

l. Use pan-type construction for doors.

1) Door widths shall not exceed 36 inches.

2) Mount doors with full-length heavy-duty continuous piano hinge with stainless steel hinge pins.

3) Provide handle-operated, oil-tight, key-lockable three-point stainless steel latching system with rollers on latch-rods for easy door closing.

4) Provide oil resistant continuous gasket completely around each door or opening.

m. Provide interior mounting panels and shelves constructed of minimum 12-gauge steel with a white enamel finish.

n. Provide steel print pocket with white enamel finish.

o. Use 304 stainless steel fasteners throughout.

p. Provide Type 316 stainless steel sun shielding for all outdoor panels.

q. Panels and enclosures shall have adequate wiring space provided on the top and bottom.

1) A minimum of six (6) inches of clear space shall be provided between enclosed equipment and the top and the bottom of the enclosure.

2) Additional space shall be provided when a large number of conduits or wires enter the enclosure.

r. Provide enclosure mounting supports or bases as required for floor, frame, or wall mounted enclosures, and for free standing enclosures.

1) For floor mounted enclosures, provide minimum 12-gauge stainless steel floor stand kits bolted to the bottom of the enclosure, sealed and gasketed to maintain the NEMA rating.

2) Floor stand heights shall be coordinated with enclosure sizes and base pads to comply with the general indication and control device mounting height requirements as specified in this Section or as shown on the Contract Drawings.

3) Floor stands shall be mounted on base pads using anchor bolts or expansion anchors.

s. All panels shall have solid bottoms.

1) Removable panels may be provided to ease punching of conduit entries.

2) Panels and enclosures mounted on raised floors may have open bottoms but shall comply with all codes.

t. Provide all necessary holes and cutouts for installation of equipment.

1) Openings shall be punched or saw cut without distorting the face of the panel.

2) Flame cutting is prohibited.

3) All openings shall be ground straight, square, level and smooth.

u. Provide space and clear area for entry of conduit and wire.

v. Cable and piping shall enter the enclosure through the bottom whenever possible.

w. All conduit and piping openings and all conduits shall be sealed watertight and maintain the NEMA rating of the panel.

x. Panels located inside air-conditioned control room areas shall be NEMA 12 rated stainless steel unless otherwise noted.

y. Fabricate enclosures using minimum 14-gauge stainless steel for wall or frame-mounted enclosures and minimum 12-gauge stainless steel for floor mounted and free standing enclosures. Steel shall be free of pitting and surface blemishes.

z. Standard prefabricated enclosures are preferred.

C. Environmental Controls

1. Outdoor Panels:

a. Provide thermostatically controlled heaters to maintain temperature inside each enclosure 10°F above the ambient temperature, above 40°F., or that required for component operation (whichever is greater), and to prevent interior condensation over an outside ambient temperature range of -20°F through 120°F.

b. Provide automatically controlled closed-loop heat exchangers or closed loop air conditioners with filtered air louvers when required to maintain temperature inside each enclosure below the maximum operating temperature rating of the components inside the enclosure.

c. Provide internal corrosion inhibitor devices for corrosion control inside of each enclosure.

d. Outdoor panels shall be designed to withstand wind driven rain and snow without any moisture entry. The panel shall not be damaged by the buildup of ice or snow.

D. Indoor Panels:

1. Provide automatically controlled heaters as required to maintain temperature approximately 10°F above ambient for condensation prevention inside panels.

a. Panel heaters shall be thermostatically controlled, fan-driven heaters, with all components mounted in an anodized aluminum housing for sub-panel mounting.

b. The heaters shall be powered from 115 VAC from a dedicated circuit breaker and separate panel power feed.

2. Provide automatically controlled closed loop heat exchangers or closed loop air conditioners with filtered air louvers if required to maintain temperature inside each enclosure below the maximum operating temperature rating of the components inside the enclosure.
    a. Heat exchangers and air conditioners shall be of a dual loop design to isolate panel interior air from exterior air.
    b. The units shall be thermostatically controlled and shall be powered at 115 VAC from a dedicated circuit breaker and separate panel power feed.
3. The NEMA Rating shall be maintained for all cooling and heating components.
4. Provide detailed calculations justifying the sizing of any heating or cooling device. This requirement includes providing panel heat rise calculations for cooling devices. Provide a minimum of 25% spare cooling capacity.
5. Provide documentation if any of the above is deemed unnecessary.
6. Air conditioning units shall not be powered from the UPSs. A separate power source shall be provided for each air conditioner unit.
7. Air conditioner shall be mounted in the side of the enclosure. Provisions shall be made to route condensate to the nearest drain, including all work required to implement.
8. Provide internal corrosion inhibitor devices, Hoffman HCI Series or equal, for corrosion control inside of each enclosure.

E. Electrical
1. General:
    a. Control panel power supply source type, voltage, number of circuits and circuit ratings shall be as shown on the Contract Drawings and as required by the equipment.
    b. Unless otherwise noted, power supply to all panels shall be 120VAC 60 Hz.
    c. Surge and lightning protection shall be provided for all electronic equipment. Surge and lightning protection shall comply with the requirements of Section 26 43 13 – Low-Voltage Surge Protective Devices.
    d. Uninterruptible Power Supply (UPS) units shall be provided to power panels as indicated on the Contract Drawings.
        1) As a minimum, a UPS shall be provided for all panels and enclosures containing network, PLC, etc. equipment. UPS units shall be furnished and installed as specified.

e. The panels and enclosures shall be provided with internal 120 VAC, 20-amp DIN rail mounted circuit breakers sized as required to distribute power to the panel components and field instruments.

f. Provide quantity of circuits shall include 25 percent spares.

g. Provide a durable legend mounted near the circuit breakers in each panel, which lists the circuit breaker numbers and circuit descriptions.

h. Provide circuit breakers to protect each circuit, with no more than six instruments on a single circuit.

i. Provide DC power supplies of quantities and sizes as required for powering DC signal and control loops.

j. Where wires pass through adjacent panel walls, provide suitable grommets or bushings to prevent cutting or damage of insulation.

k. When DC power and/or low voltage AC power is required, provide and install the necessary power supplies, transformers, regulators and fuses in the panel.

l. All spare field and panel wires, within each panel or enclosure, shall be tagged as spare and labeled and marked as per specifications with “As-Builts” showing their source and destination.

m. Provide complete approved schematic and wiring diagram including spare wiring, showing "As-Built" circuitry.

n. In addition to required submittals, the final approved "As-Built" diagram shall be enclosed in transparent plastic and placed in an easily accessible drawing pocket built in the panel or enclosure door.

2. Electrical Wiring and Accessories:

a. Unless otherwise specified, internal wiring shall be Type MTW stranded copper wire with thermoplastic insulation rated for 600 Volts at 85°C for single conductors.

b. Wiring shall be color coded and labeled with wire identification.

c. For DC signal wiring, use No. 16 minimum AWG twisted tinned copper pairs with overall braided copper shield and drain wire.

d. For AC power wiring, use No. 12 minimum AWG. For AC and DC control use No.14 AWG wiring. For wiring carrying 10 Amps or more, use sizes required by NEC and JIC standards.

e. Install wiring runs in ventilated wire troughs along horizontal or vertical routes to present a neat appearance.

1) Wire trough shall be filled to no more than 40 percent capacity. Angled runs are not acceptable.

2) Separate and shield DC signal wiring from power and control wiring by a minimum of 4 inches, using separate wire troughs.

3) Separate troughs shall be provided for field wiring.

4) Where practical, in the panels and enclosures, route the low voltage DC signal wiring along the left side of the enclosure sub-panel(s) and route the AC power and control wiring to the right side of the sub-panel(s), with the incoming power and distribution circuit breakers located to the upper right.

f. Group or bundle parallel runs of wire using covered troughs. Maximum bundle size to be 1 inch. Troughs shall have 60 percent spare capacity. Adequately support and restrain all wiring runs to prevent sagging or other movement.

g. In panels controlling and monitoring equipment operating or fed at voltages above 600, wiring used for AC or DC, control, control power, metering, indication, etc. shall be No.14 AWG type SIS (switchboard) wire.

h. Wiring for current transformer (C.T.) circuits shall be minimum #10 AWG type SIS and shall be color coded yellow. Connections shall be by ring type solderless compression terminals.

i. Where wiring runs across a door or panel hinge, the bundle shall be run along the hinge as far as possible and anchored at both ends to distribute the torque along the greatest wire length.

j. Wire bundles running within a panel or onto the door, shall have at least 20 percent spare wires included.

k. The Contractor shall provide circuit breakers to protect each circuit, with no more than six instruments on a single circuit.

l. The Contractor shall provide a complete wiring diagram showing "as-built" circuitry. Diagram shall be enclosed in transparent plastic and placed in easily accessible pocket built into panel door.

m. Wire Color Coding: Wires shall be color coded as follows:

DESCRIPTION	COLOR
110 VAC panel power before fuses or breakers	Black
Controlled 110 VAC power (e.g., after relay contacts, selector switch contacts, and similar equipment)	Red
110 VAC power source from devices external to panel	Yellow
110 VAC neutral	White
24 VDC positive power from power supplies	Brown
24 VDC negative power from power supplies	Brown and White Trace
Controlled 24 VDC power (e.g., after PLC output contacts, relay contacts, and similar)	Blue

24 VDC positive power from devices external to panel	Orange
24 VDC negative power from devices external to panel	Orange with White Trace
24 VDC 4-20 mADC signal cable	Grey with Red Positive, Clear – Negative
Grounding wire	Green

3. Power Conditioning and Surge Protection:

   a. General:

      1) Surge protection shall be provided to protect the electronic instrumentation system from surges propagating along the signal and power supply lines.

   b. Power Conditioners:

      1) Voltage Input: The unit shall accept single-phase input voltages of 120 volts alternating current (VAC), 208 VAC, or 240 VAC as shown on Contract Drawings.

      2) Line Regulation: Shall provide regulated voltage output within +/- 3% tolerance, even when input varies within +10% to -20% of nominal input rating.

      3) Output Harmonic Distortion: The total root mean square (RMS) content of harmonic distortion at full load is limited to a maximum of 3%.

      4) Voltage Tolerance: The unit shall tolerate a temporary voltage surge or sags within +20% to -35% of the input voltage.

      5) Noise Attenuation: Provide 120 decibels (dB) of common mode noise attenuation and 60 dB of transverse mode noise attenuation.

      6) Surge Suppression: Shall be tested to comply with ANSI/IEEE C63.41 Class A & B waveform standards with a let-through of less than 0.2%.

      7) UL Listing: The unit shall be UL Listed.

      8) Mean Time Between Failures (MTBF): The expected MTBF shall be 25 years.

      9) Efficiency: Shall achieve 90% efficiency at full load.

      10) Operating Temperature: -20 to 50 degrees C.

      11) Wiring Type: Hardwired.

      12) Overload Protection: Shall activate at 1.65 times the rated current at nominal input voltage.

      13) Audible Noise: Shall be maximum of 65 dB.

      14) Manufacturer/Model: Sola/Hevi-Duty MCR series or equal.

c. The protection systems shall be such that the protection level shall not interfere with normal operation but shall be lower than the instrument surge withstand level and be maintenance free and self-restoring.

d. Instruments shall be installed in suitable metallic cases, properly grounded. Ground wires for all surge protectors shall be connected to a good earth ground and where practical each ground wire run individually and insulated from each other. These protectors shall be mounted within the instrument enclosure, or a separate junction box coupled to the enclosure. Surge protectors shall be as manufactured by Sola/Hevi-duty, Joslyn or equal.

e. Indicating Lights: Lights shall be color coded as follows:

1) RED = ON or ENERGIZED

2) GREEN = STOPPED or DEENERGIZED

3) WHITE = POWER ON

4) AMBER = ALARM

5) BLUE = REMOTE or AUTOMATIC

4. Terminal Blocks:

a. Terminate all field wiring and internal panel wiring at 600 Volt barrier type terminal blocks.

b. Panel wiring shall be kept to one side of the strip leaving the other side for field wire termination.

c. Jumpers needed to provide common connections between terminals shall be provided on the panel side of the strip.

d. Terminal blocks shall be tubular screw type with pressure plate capable of accepting #22 through #8 wires and shall be mounted on rigid steel rail.

e. All wiring terminations, both field and panel shall be made with forked tongue solderless crimp type connectors. Field wiring terminals shall have a minimum of a # 8 screw or stud.

f. Heavy duty end anchors shall be provided on both ends of all terminal strips to firmly anchor the terminal blocks to the mounting rail and insulating end barriers shall be provided on one end of the terminal strip as necessary.

g. Terminal blocks shall have a unique identifier for each block and for each terminal on that block (i.e. TB7-25) where the terminal number shall be the unique wire number shown on the approved drawings.

h. No more than two wires shall be terminated at any single screw.

i. Provide jumpers as required to join adjacent terminal blocks for additional wiring connection points. Jumpers shall only be installed on the panel side of the terminal block.

j. All terminal blocks shall be labeled with permanently affixed numeric identifiers on each block.

k. Identifiers shall be self-stick plastic strips with permanent, machine printed numbers.

l. Provide a separate terminal block for landing analog signal cable shield, and separate terminal strips for DC signal and AC power wiring. A separate terminal shall be provided for landing shield wiring.

m. Provide separate terminal blocks for C.T wiring. Terminal blocks for C.T. wiring shall be equipped with shorting bars and screws to selectively short an individual C.T. circuit for maintenance purposes.

n. Provide spare terminal blocks equal in number to 20 percent of the terminals used for each type of wiring (i.e., DC signal and AC power).

o. Terminal blocks shall be copper-nickel alloy terminal strips and screws.

p. Terminal blocks shall have minimum clearance of 5 inch on each side of each strip.

5. Fused Terminal Blocks:

a. Provide fused terminal blocks for all wiring powered from within panels or enclosures to devices located outside the panel or enclosure, as required.

b. Fused terminal blocks shall be UL approved, 600 Volts, capable of accepting #22 through #10 wires, and shall be mounted on rigid steel rail. Fuses shall be dead front and shall have safety pull out feature.

c. Heavy-duty end anchors shall be provided on both ends of all terminal strips to firmly anchor the terminal blocks to the mounting rail and insulating end barriers shall be provided on one end of the terminal strip as necessary.

d. Provide fuses (sized as required) and fuse pullers for all fused terminal blocks.

e. Provide 20 percent spare fused terminal blocks rail mounted within each panel or enclosure.

f. Terminal blocks shall be copper-nickel alloy terminal strips and screws.

6. Wire Markers:
   a. All panel wires and field wires shall have an alphanumeric identification tag at each point of termination.
   b. Wire numbers shall be unique.
   c. Wire numbers shall be grouped and spaces allowed for additions to each group.
   d. Where wire numbers change, the appropriate drawings shall include both wire numbers, clearly indicated, at the point of transition.
   e. Each wire number shall be solid, machine printed, and not pieced from other single and/or double digit tags. Wire markers shall be heat, oil, water, tear and solvent resistant, vinyl, tube type markers.
   f. All wire labels shall be clearly visible and not hidden by wire duct or other components in the enclosures. All wiring shall be installed such that if wires are removed from any one device, power will not be disrupted to any other device.
7. Grounding / Bonding:
   a. All equipment and components mounted in or on control panels and enclosures, shall be bonded to the equipment grounding system.
   b. Provide 1-inch-wide by 1/4 inch thick copper grounding bar in each panel or enclosure containing equipment, instruments or controls.
   c. The bar shall be as long as needed for the required number of connections, plus 25% future connections (6 inch minimum).
   d. Ground bars shall be installed on insulated "standoffs" (1-inch clearance from grounded surfaces), and shall have a braided #6 AWG bonding jumper.
   e. Separate buses shall be provided for grounding of AC equipment and for shield grounds.
   f. The AC ground bus shall be bonded to the panel frame and system ground.
   g. Shield grounds shall be completely isolated from the enclosure and instrument power/equipment grounds.
   h. Insulated ground wires shall be run with all control power circuits within the panel to all equipment.
   i. Equipment mounting sub-panels (plates) shall be bonded to the frame of the enclosure with a No. 10 AWG braided bonding jumper.

8. Lighting and Convenience Receptacles:

   a. Provide lighting fixture with LED lamps in each panel for proper illumination to facilitate servicing. Include convenience receptacles not to be powered from the UPS.

F. Finishes

1. Steel Panels

   a. Panels located in control rooms, electrical equipment (switchgear, MCCs) rooms, and office areas, may be carbon steel with a finish as follows:

      1) Completely clean all interior and exterior surfaces so they are free of corrosive or oily residue, oil, grease, and dirt.

      2) All interior and exterior surfaces shall be phosphatized for corrosion protection for non-stainless steel enclosures.

      3) One coat of primer shall be applied to all interior and exterior surfaces immediately, except for stainless steel enclosures.

      4) Surfaces shall be electrostatically coated with a polyester urethane powder or epoxy powder coating.

      5) Exterior surfaces shall be ANSI- 61 gray, interior surfaces shall be ANSI-61 gray or gloss white.

      6) Equipment mounting sub-panels shall be given a gloss white melamine enamel coating. A Grade 1 finish shall be produced on the finish coat.

2. Stainless Steel Panels

   a. Panels and enclosures located outdoors, in damp or corrosive areas, tunnels or galleries or in any process areas shall be fabricated of type 316 or 304 Stainless Steel per the manufacturers published recommendations for chemical resistance and service.

   b. Stainless steel panel finish shall be brushed or satin and shall be free from blemishes and machine marks.

   c. All mounting, anchoring and accessory hardware shall be stainless steel.

3. PVC Coated Panels

   a. In hazardous areas, subject to frequent moisture and corrosive elements, panels shall be PVC coated.

   b. In areas where the conduit and raceway system, is required to be PVC coated, all panels, control stations and enclosures shall be PVC coated. Colors shall match the conduit system.

c. PVC coating shall be a minimum of 40 Mil. and shall cover all exposed surfaces.

d. All mounting and accessory hardware shall be type 316 stainless.

4. Panel in Highly Corrosive Areas

a. Unless otherwise noted, in areas designated as highly corrosive or where sodium hypochlorite is handled, pumped, metered or stored, panels and enclosures shall be fabricated of molded fiberglass, fiberglass reinforced polyester, or polycarbonate and recommended for the service.

b. Panels shall be finished smooth or finished with gel coat and epoxy.

c. Glass fiber strands shall be neither exposed nor visible.

d. Panels shall be chemical, sunlight and UV resistant.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Shop Tests

1. Shop and Testing shall conform to the requirements of Section 40 80 81 – PMCS Factory Testing.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used.

3.02 INSTALLATION

A. The Contractor shall install panels in conformance with National Electric Code (NEC) and the Contract Drawings.

B. All panels and enclosures shall be mounted straight, level and parallel to building surfaces.

C. Wall mounted panels and enclosures shall be securely mounted to walls or columns as required. They shall be spaced a minimum of 3/4" from the structure using strut or plates.

D. Stand mounted panels or stations shall be supported using 6-inch epoxy powder coated steel channel securely mounted to the floor with a minimum of three 1/2" stainless steel bolts and leveling nuts.

1. Stand bases shall be grouted for added rigidity.

2. Stands shall be secure and level, shall easily support the mounted equipment and shall hold the equipment rigidly. Multiple stands or fabricated frames shall be used for larger or heavy panels.

E. All freestanding control panels shall be installed on a 6-inch-wide and 4 inch high reinforced concrete curb or 4 inch pad.

1. Pad shall have 1-inch chamfer on all corners.
2. Pad shall extend one (1) inch minimum (plus chamfer) past panel exterior.

F. When panels or enclosures are installed on raised computer type floors, additional supports and bracing shall be provided under the floor as required to prevent the floor from being overloaded.

1. Large and/or heavy panels having any dimension larger than 36 inches or weighing 150 lbs. or more or where the weight of the completed panel exceeds 80% of the specified live load bearing capacity of the flooring, shall be supported from the structural sub floor independently of the raised floor.
2. Provide a welded steel, adjustable support framework the size of the unit footprint capable of rigidly supporting the weight of the entire panel with a 50% safety factor. The frame shall be installed flush and level with the floor.
3. Load and bracing calculations shall be submitted for review.
4. It shall be the responsibility of this Contractor to coordinate raised and finished floor installation requirements with the flooring supplier and installer.
5. In areas where floor modifications are required, and the floor has already been installed, the contractor shall retain the services of an approved flooring contractor to make the appropriate modifications at no additional cost to the City.

G. Panels, and the equipment enclosed, shall be protected from damage during and after installation. If in the opinion of the Contractor or the Engineer, the area is not suitable for electronic equipment or panels, the equipment shall be removed or protected until the area has been secured.

H. Unless otherwise noted, the Contractor shall install indoor panels on 4-inch concrete pad.

I. Extend concrete pad 4 inches beyond outside dimensions of the base, on all sides.

J. Lay grout after panel sills have been securely fastened down.

K. Unless otherwise noted, install outdoor NEMA 4X panels on a reinforced concrete pedestal:

1. Minimum thickness shall be 8 inches with No. 4 steel reinforcing bars at 12 inches on centers, each way.
2. Minimum size shall be 12 inches larger than outer dimensions of base, on all sides.
3. Lay grout after panel sills have been securely fastened down.

L. The Contractor shall provide excavation and backfill work in conformance with Section 31 23 16 – Excavation and Section 31 23 23 - Fill.

M. The Contractor shall provide concrete work in conformance with Section 03 30 00 – Cast-in-Place Concrete.

N. The Contractor shall install anchor bolts and anchor in accordance with Section 05 05 23.02 – Miscellaneous Metal Fastenings.

O. The Contractor shall install and interconnect all equipment, devices, electrical hardware, instrumentation and controls and process controller components into and out of and among the enclosures as indicated on the Contract Drawings.

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Testing

1. Field Testing shall conform to the requirements of Section 40 80 82 – PMCS Startup and Field Testing.

3.04 STARTUP / DEMONSTRATION

A. The Contractor shall perform system testing and make any necessary adjustments in accordance with this Section and the following Sections:

1. Section 40 61 13 – PMCS General Requirements.
2. Section 40 80 81 – PMCS Factory Testing.
3. Section 40 80 82 – PMCS Startup and Field Testing.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

PROCESS CONTROL PANELS					
NO.	**PANEL NAME**	**LOCATION**	**PANEL ACRONYM**	**NEMA RATING**	**PROVIDED UNDER**
1	TI-010 MAIN CONTROL PANEL	FBCSO FACILITY BASEMENT - OUTSIDE CHEMICAL STORAGE AREA	MCP-10	NEMA 4X	SECTION 40 67 16
2	FBCSO ANALYZER PANEL	FBCSO FACILITY - HALLWAY OUTSIDE CHEMICAL ROOM	FBCSO-AP-10	NEMA 4X	SECTION 40 67 16
3	TI-010C SODIUM HYPOCHLORITE FILL STATION PANEL	OUTDOORS	HYPO-FP-10	NEMA 4X	SECTION 40 67 16
4	TI-10C SODIUM HYPOCHLORITE SUMP PUMPS CONTROL PANEL	TI-010C SODIUM HYPOCHLORITE ROOM CHEMICAL CONTAINMENT SUMP	HYPO-SPCP-10	NEMA 4X	SECTION 43 23 31.3
5	DC-5 CONTROL PANEL	(OUTDOORS)	DC5-CP-10	NEMA 4X	SECTION 40 67 16
6	TI-010D SODIUM BISULFITE CONTROL PANEL	TI-010D BUILDING ELECTRICAL ROOM	SBS-CP-10	NEMA 12	SECTION 40 67 16
7	TI-010D SODIUM BISULFITE FILL STATION PANEL	OUTDOORS	SBS-FP-10	NEMA 4X	SECTION 40 67 16
8	TI-010D ANALYZER PANEL	TI-010D BUILDING - HALLWAY OUTSIDE CHEMICAL ROOM	AP-10D	NEMA 4X	SECTION 40 67 16
9	REGULATOR TI-09 CONTROL PANEL	EXACT LOCATION COORDINATED UNDER FLOATABLES REMOVAL CONTRACT BY OTHERS	R-TI-09	NEMA 4X	WILL BE EXISTING; FLOATABLES REMOVAL CONTRACT BY OTHERS
10	TI-011 MAIN CONTROL PANEL	TI-011 FACILITY ELECTRICAL ROOM	MCP-11	NEMA 12	SECTION 40 67 16
11	TI-011 ANALYZER PANEL	TI-011 FACILITY - HALLWAY OUTSIDE CHEMICAL ROOM	AP-11	NEMA 4X	SECTION 40 67 16
12	TI-011 SODIUM HYPOCHLORITE FILL STATION PANEL	OUTDOORS	HYPO-FP-11	NEMA 4X	SECTION 40 67 16
13	TI-011 SODIUM BISULFITE FILL STATION PANEL	OUTDOORS	SBS-FP-11	NEMA 4X	SECTION 40 67 16
14	TI-010D CCTV CONTROL PANEL	TI-010D BUILDING ELECTRICAL ROOM	CCTV-CP-10D	NEMA 12	SECTION 28 00 00
15	TI-011 CCTV CONTROL PANEL	TI-011 BUILDING ELECTRICAL ROOM	CCTV-CP-11	NEMA 12	SECTION 28 00 00

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required to furnish, install, and test all gages, complete and operational.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 40 05 31 - Thermoplastic Process Pipe

B. Section 40 61 13 - PMCS General Requirements

C. Section 40 61 26 - PMCS Training

D. Section 40 61 93 - PMCS Input Output List

E. Section 40 61 94 - PMCS Instrument Index
F. Section 40 61 95 - PMCS Monitoring and Control Criteria
G. Section 40 61 96 - PMCS Control Strategies
H. Section 40 63 43 - PMCS Programmable Logic Controllers
I. Section 40 63 53 - PMCS Network Equipment
J. Section 40 67 16 - PMCS Panels and Enclosures
K. Section 40 78 90 - PMCS Panel Mounted Instruments and Devices
L. Section 40 79 91 - PMCS Field Instruments
M. Section 40 80 81 - PMCS Factory Testing
N. Section 40 80 82 - PMCS Startup and Field Testing

1.04 REFERENCES

A. Abbreviations and Acronyms:

1. w.g. Water Gauge (Water Column)
2. PTFE Polytetrafluoroethylene

B. Definitions:

1. $NaHSO_3$ Sodium bisulfite
2. NaOCl Sodium hypochlorite

C. Reference Standards:

1. ANSI/ASME B40.1 Gages, Pressure Indicating Dial Type, Elastic Element.

1.05 DESCRIPTION

A. Gages as specified herein shall include pressure, vacuum, and compound gages.

1. Pressure gages shall be designed to indicate pressures above atmospheric pressure.
2. Vacuum gages shall be designed to indicate pressures below atmospheric pressure only.
3. Compound gages shall be designed to indicate pressures above and below atmospheric pressure.
4. The scale range shall be approximately twice the normal operating pressure of the equipment or process pipe line to which the gage is connected.

B. All gauges shall be of the dial-indicating helical bourdon tube type.

C. Small gages that are integral components of specified instrument and equipment assemblies are not included in this Section.

1.06 QUALITY ASSURANCE

A. Performance Requirements:

1. Grades of accuracy shall conform to the requirement of ANSI/ASME B40.1.

a. Pressure, vacuum, and compound gages shall have an accuracy meeting Grade '2A' standards, with an error not exceeding 0.5 % of full scale range.

b. Diaphragm protected gages shall have a combined accuracy (gage and seal) of Grade 'A' standards, with an error not exceeding 1% of scale range between 25% and 75% of scale and 2%for the remainder of the scale.

2. Each gage will require that laboratory tests be certified by an independent testing agency as to accuracy.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Catalogs, drawings, and reference materials.

b. Maintenance manuals.

c. Chemical compatibility for gauges with wetted surfaces in contact with chemical solutions or gasses other than air.

B. Information Submittals:

1. Independent testing agency certification indicating that the gages provided meet the specified accuracy requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall provide spare parts and special tools necessary to service, disassemble, repair, and adjust the equipment provided under this Section, as per the requirements of the Contract Documents and/or as recommended by the manufacturer. In addition:

1. For gages other than diaphragm protected gages, provide 20% spare gages (with a minimum of one) of each range used.

2. For diaphragm protected gages, provide 20% percent spare gages (with a minimum of one) of each range used, complete with diaphragm seals, filled and ready for use.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gages:

1. Pressure Gauges shall be as manufactured by:

a. Weiss, Holtsville, NY .

b. Ametek/U.S. Gauge, Feasterville-Tervose, PA .

c. Ashcroft, Stratford, CT

d. Or approved equal.

B. In-Line Diaphragm Seals:

1. In-Line Diaphragm seals for diaphragm protected gages and process isolation shall be as manufactured by:

a. 3D Instruments, LP, Anaheim, CA.

b. Ametek®, Inc., Berwyn, PA.

c. Ashcroft, Inc., Stratford, CT.

d. Helicoid

e. Red Valve, Carnegie, PA

f. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. General:

1. Pressure, vacuum and compound gages shall be of the indicating dial type utilizing a Bourdon tube for confining the pressure medium.

2. Where shown, specified, or where the possibility of clogging or contaminating the Bourdon tube exists, a flexible diaphragm seal shall be provided between the Bourdon tube and the medium to be measured.

3. Dials Size: 4½-in. nominal diameter.

B. Materials and Construction:

1. Gages shall be weatherproof.

2. Gages shall be designed and constructed to meet all requirements for satisfactory operation in the environment in which they are installed. Pressure, vacuum and compound gages shall be constructed of sound, durable material free from all defects and imperfections that in any way may affect the accuracy and serviceability of the gages.

3. Case:

   a. The gage cases shall be of the blow-out protected type where the rear plate is removable.

   b. The gage cases shall be free from warpage, checks and other defects with surfaces smooth and free from chips, cracks and blisters.

   c. Gage cases shall be constructed of phenolic or high impact polypropylene.

4. Connection: ¼-in. NPT male thread.

5. Dials and Appurtenances:

   a. Dials shall be white laminated plastic with standard graduations and numbers permanently marked on the dials in black.

   b. Scale:

      1) Scale shall extend over an arc not less than 270°.

      2) Subdivisions of the scale shall conform to the requirements of ANSI/ASME B40.1 for Grade '2A' gages.

      3) Units of measure shall be distinctly and permanently marked on the dial or on laminated plastic nameplates cemented to the dial.

   c. Glass windows shall be ⅛-in. thick clear glass tightly seated on durable gasket material so as to be fume proof and waterproof.

   d. Bourdon tubes shall be phosphor bronze silver-soldered or brazed to its brass socket; the assembly shall be tested carefully, over-pressured and stress relieved.

   e. Socket stem shall extend at least 1¼-in. below the gage case and shall have large wrench flats.

   f. Movement components for geared type gages shall be of stainless steel of the rotary gear or helical roller type, constructed so as to minimize wear and meet and maintain accuracy requirements specified. Movements shall have suitable corrosion-resistant bushings and wearing surfaces.

6. Glass: Clear, blemish free, shatter-proof

7. Bourdon tube:

   a. Helical Type: Inconel® X-750

8. Socket: Brass forging
9. Movement: Stainless steel

C. Adjustment:

1. Gages shall have provision for adjustment of the zero reading.
2. All calibration adjusting screws must be accessible from the rear without having to dismantle the gage.

D. Gage Gradations and Ranges:

1. Gages shall be graduated:
   a. Pressure gages shall be graduated in psig (unless ft w.g. are shown on the Contract Drawings or specified).
   b. Vacuum gages shall be graduated in inches Hg;
   c. Compound gages shall be graduated in inches of Hg to 0 to psig (unless ft w.g. are shown on the Contract Drawings or specified).
2. Gage Ranges:
   a. Vacuum gages shall have scale readings of 30 inches Hg to 0.
   b. Pressure gages for the equipment shall be provided as listed in Section 40 61 94 – PMCS Instrument Index.

E. Diaphragm Protected Gages:

1. General:
   a. The Contractor shall provide diaphragm seals or chemical gages as shown on the Contract Drawings, specified, or required to prevent the fluid to be measured from clogging or corroding the Bourdon tube of pressure, vacuum, and/or compound gages.
   b. Diaphragm seals shall be suitable for the gage furnished. Gages to be used with diaphragm seals shall be ANSI/ASME B40.1 Grade '2A' gages conforming to the requirements specified herein.
   c. Chemical gages shall have the diaphragm seal as an integral part and shall conform to the applicable requirements specified herein. Overall accuracy for chemical gages shall be ANSI/ASME B40.1 Grade 'A'.
   d. Diaphragm protected gages shall be factory filled and calibrated by the gage manufacturer. Diaphragm protected gages shall be provided with pulsation dampening. Integral or internal snubbers in the gage socket shall not be accepted.
   e. Required Features:
      1) Provide fill/bleed screw to permit filling of instrument and diaphragm seal.

2) Instrument Connection: 1/4-in. NPT

3) Process Connection: 1/2-in. NPT

4) Working Pressure Rating: Equal to or greater than the attached pressure sensing device operating pressure, or the pipeline working pressure rating where specified, whichever is greater.

5) Flushing connection: 1/4-in. NPT

6) Provide a clean-out ring which holds the diaphragm captive in the upper housing to allow the upper housing assembly to be removed for recalibration or cleaning of the process side housing without the loss of filling liquid or change in calibration.

2. Construction Materials:

a. Material Compatibility:

1) The components in contact with the fluid to be measured (i.e., the wetted materials) shall be fully compatible chemically with the fluid to be measured.

a) The material chemical compatibility shall be the highest (e.g., 'excellent', etc.) rating used by the chemical compatibility chart.

2) In the event of a conflict between the default gage materials specified in this Section and materials required to achieve the highest level of chemical compatibility (as described hereinabove), gages with materials that achieve the highest level of compatibility shall be furnished.

3) All bolts shall be corrosion-resistant to the process fluid as well.

b. Top and bottom housings, bolts, and interconnecting sensing lines shall be PVC or CPVC (as per Section 40 05 31, Thermoplastic Process Pipe) to match non-metallic piping, or as listed in Table 40 70 01-3, below.

Table 40 70 01-3
Top And Bottom Housings, Bolts, and Sensing Line Materials

Process Fluid:	Housing:	Bolts:	Lines:
$NaHSO_3$	Titanium	Titanium	Titanium
NaOCl	Titanium	Titanium	Titanium
All Other(s)	316SS	316SS	316SS

c. Diaphragms, O-rings and Gaskets shall be as listed in Table 40 70 01-4, below.

Table 40 70 01-3
Diaphragm, O-Ring, and Gasket Materials

Process Fluid:	Diaphragm:	O-Ring:	Gasket:
$NaHSO_3$	Titanium	Viton	PTFE
NaOCl	Titanium	Viton	PTFE
All Other(s)	316SS	Buna-N	Buna-S

d. Fill Fluid shall be as listed in Table 40 70 01-5, below.

Table 40 70 01-5
Fill Fluid

Process Fluid:	Fill Fluid:
$NaHSO_3$	Fluorolube®
NaOCl	Fluorolube®
All Other	Silicone

F. Gage Protection:

1. Pressure gages shall have under pressure protection and vacuum gages shall have overpressure protection.

   a. For helical roller type pressure gages, the gage shall have a left-hand movement for under pressure protection; for all other gages, under pressure protection stops shall be provided.

   b. For vacuum gages with helical roller movement, gages shall have right hand movement for overpressure protection; all other gages shall have suitable overpressure protection stops.

G. Gage Accessories:

1. Pulsation Dampeners:

   a. All pressure, vacuum, and compound gages shall be provided with pulsation dampeners suitable for the intended service and environment.

2. Brass Coil Pipe Siphons:

   a. All gages on steam lines shall be provided with suitable brass coil pipe siphons to prevent live steam from entering the gages.

3. Shutoff Cocks:

a. Gages (other than diaphragm protected gages) shall be provided with shut-off cocks furnished by the gage manufacturer.

b. Where shown or required, three-way cocks shall be provided at gage connections.

c. Shut-off cocks shall be suitable for the service and environment intended.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Manufacturer shall be responsible for assuring that fill volumes and sensitivities of the supplied seals and diaphragms are suitable to provide the required gage, switch or transmitter accuracy over the specified measurement range or at switch setpoints.

B. Diaphragm Assembly and Calibration:

1. The complete in-line diaphragm seal assembly, including gage, switch or transmitter, shall be factory assembled, filled and calibrated to the ranges and switch setpoints specified prior to shipment.

2. Field filling shall not be accepted.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Locations:

1. Gages shall be provided where shown on the Contract Drawings, specified, and/or as required for a complete installation.

a. Indicating Bourdon tube gages shall be provided downstream of each pressure regulating valve, on each hydro-pneumatic (air-water) or hydraulic fluid (air-oil) pressure tank, on each air and gas receiver tank, on the discharge of each air compressor and on both the suction and discharge of each pump or gas compressor.

b. Gages shall be located in a well-illuminated area clearly visible from work areas or operating stations.

2. Location and orientation of the gages, switches and seal assemblies shall be coordinated with the actual piping and equipment installations so that gages and indicators shall be easily read during operation, and easily accessed for maintenance by plant personnel.

3. Where field mounting and orientation conflicts arise due to incomplete coordination with field changes in the process piping and equipment

installation, assemblies shall be relocated, re-oriented, re-assembled and recalibrated as directed by Engineer.

B. Mounting and Connections:

1. Unless otherwise shown on the Contract Drawings or specified, pressure, vacuum, and compound gages shall have bottom 1/4-inch NPT male connections.

2. Gages shall be wall, pipe, or flush mounted as shown or specified.

3. Diaphragm protected gages shall be connected to equipment as shown on the Contract Drawings, specified, or as required for an approved installation.

a. Only one pressure sensing element shall be mounted to a diaphragm seal.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish, install calibrate, test, startup, and place into satisfactory operation PMCS Panel Mounted Instruments and Devices as described herein and as indicated on the Contract Drawings.

B. The provisions of this Section apply to instruments and devices provided as a part of packaged systems specified elsewhere in this Contract, including but not limited to, function, quality, spare parts, tools, testing, training, documentation and installation.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 28 00 00 - Closed Circuit Television Surveillance System
B. Section 40 61 13 - PMCS General Requirements
C. Section 40 61 26 - PMCS Training
D. Section 40 61 93 - PMCS Input Output List
E. Section 40 61 94 - PMCS Instrument Index
F. Section 40 61 95 - PMCS Monitoring and Control Criteria
G. Section 40 61 96 - PMCS Control Strategies
H. Section 40 63 43 - PMCS Programmable Logic Controllers
I. Section 40 63 53 - PMCS Network Equipment
J. Section 40 67 16 - PMCS Panels and Enclosures
K. Section 40 70 01 - Measurement
L. Section 40 79 91 - PMCS Field Instruments
M. Section 40 80 81 - PMCS Factory Testing
N. Section 40 80 82 - PMCS Startup and Field Testing

1.04 REFERENCES

A. Definitions

1. Section 40 61 13 – PMCS General Requirements defines the terms and abbreviations used in this Section and the PMCS.
2. PMID - Panel Mounted Instruments and Devices.

B. Reference Standards

1. Section 40 61 13 – PMCS General Requirements lists the standards applicable to this Section and the PMCS.

1.05 DESCRIPTION

A. PMIDs and controls shall be provided with all associated services and appurtenant equipment.

B. The Contract Drawings and Specifications illustrate and specify general functional, environmental and construction requirements of PMIDs, and do not necessarily show or specify all components, wiring, piping and accessories required by specific manufacturers, to provide a completely integrated system.

C. The Contractor shall provide all additional components, piping, wiring, accessories, services, labor, etc. required to furnish and install PMIDs and accessories to provide a complete and properly functioning integrated system.

D. The PMCS Supplier acting through the Contractor shall:

1. Provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install, calibrate, test, adjust and place into satisfactory operation, all PMIDs specified or required under this Section.
2. Retain the services of each equipment manufacturer to properly select, apply, size and locate each PMID they are to provide.
3. Also, the manufacturer's services shall be provided to setup, commission and fine tune all instruments provided.
4. Provide application and design engineering services to properly select, apply, and install; provide detailed design, location, and mounting drawings and to test, calibrate and commission, PMIDs provided herein.
5. Coordinate the installation of all items specified herein and required to ensure the complete and proper operation and interfacing of all the components and systems.

1.06 QUALITY ASSURANCE

A. The Contractor shall comply with the Quality Assurance requirements listed in Section 40 61 13 – PMCS General Requirements, this Section and the Specifications.

B. All materials and equipment furnished shall be new, free from defects, and of first quality, produced by manufacturers who have been regularly engaged in the manufacture of PMIDs.

C. Manufacturers shall have produced PMIDs for a minimum of 20 years

D. Where there is more than one item of similar equipment required under the Contract, all such similar equipment shall be the product of one manufacturer.

E. All material furnished under this Contract shall be determined safe by UL and all material shall be labeled, certified, or listed by the testing agency.

F. Custom made equipment or related installations which are constructed specially for this Contract will not be acceptable.

G. Equipment furnished within this Contract shall be standard products furnished by a supplier regularly engaged in the manufacture of such products.

1.07 SUBMITTALS

A. The Contractor shall comply with submittal requirements listed in Section 40 61 13 – PMCS General Requirements, this Section and the Specifications.

B. Contractor shall submit PMIDs and schedules for the approval of the Engineer.

C. The Contractor is solely responsible for the timing of PMID submittals to enable approval by the Engineer and subsequent use by the PMCS Supplier.

D. The Contractor shall create, maintain and submit for review, an updated index of PMIDs.

E. Submittals shall be made at least 60 days in advance of any proposed use by the PMCS Supplier.

F. The manufacturer's calculations, assumptions and application details, and recommendations shall be submitted to the Engineer for review and approval.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall comply with delivery, storage and handling requirements listed in Section 40 61 13 – PMCS General Requirements.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall comply with spare parts, special tools and supplies listed in Section 40 61 13 – PMCS General Requirements, this Section and the Specifications.

B. Spare parts and tools shall be as recommended by the manufacturer and shall as a minimum include the following:

1. One PMID for every five (5) PMID of a given model furnished, minimum of one.

2. One (1) communication card for every five (5) of each type furnished, minimum of one.

3. One (1) power supply for every (5) of each size furnished, minimum of one.

4. All spare parts recommended by the manufacturer and listed as recommended spare parts in the approved manufacturer's O&M Manual.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Loop Power Supplies shall be as manufactured by:

1. Acopian, Easton, PA.

2. Acromag Inc., Wixom, MI.

3. Or approved equal.

B. Signal Splitters shall be as manufactured by:

1. Phoenix Contact, Middletown, PA.

2. Moore Industries, North Hill, CA.

3. Or approved equal.

C. Control Relay shall be as manufactured by:
   1. Idec, East Dundee, IL.
   2. Square D, Andover, MA.
   3. Allen-Bradley, Milwaukee, WI.
   4. Siemens, Washington, DC.
   5. Or approved equal.

D. Control panel Pilot Devices shall be as manufactured by:
   1. Allen-Bradley, Milwaukee, WI.
   2. Square D, Andover, MA.
   3. Siemens, Washington, DC.
   4. Or approved equal.

E. Electronic Horn shall be as manufactured by:
   1. Panalarm, Berwyn, PA.
   2. Federal Signal, Oak Brook, IL.
   3. Or approved equal.

F. DC Power Supplies shall be as manufactured by:
   1. Weidmuller, Richmond, VA.
   2. Phoenix Contact, Middletown, PA.
   3. Allen-Bradley, Milwaukee, WI.
   4. Siemens, Washington, DC.
   5. Or approved equal.

G. Terminals shall be as manufactured by:
   1. Weidmuller, Richmond, VA.
   2. Phoenix Contact, Middletown, PA.

H. Panel Interior Light shall be as manufactured by:
   1. Hoffman, San Jose, CA.
   2. Hammond, Cheektowaga, NY.
   3. Or approved equal.

I. Transient Voltage Surge Suppressor for Control Power shall be as manufactured by:
   1. Cutler Hammer, Pittsburgh, PA.
   2. Siemens, Washington, DC.

3. Or approved equal.

J. Uninterruptible Power Supply (UPS) shall be as manufactured by:

1. Tripp Lite, Chicago, IL.
2. APC South Kingstown, RI.
3. Or approved equal.

K. Strobe Light shall be as manufactured by:

1. Federal Signal, Oak Brook, IL.
2. Edwards Signaling, Mebane, NC.
3. Eaton, Beachwood, OH.
4. Or approved equal.

L. Digital Indicator shall be as manufactured by:

1. Precision Digital, Hopkinton, MA.
2. Newport Electronics, Santa Ana, CA.
3. Or approved equal.

M. Panel Intrusion Switch / Door Contact shall be as manufactured by:

1. Security Equipment Supply (SES), Earth City, MO.
2. Newark Electronics, Irvine, CA.
3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Loop Power Supply (Single Loop)

1. Design:
    a. Provide DC power for 4-20 mA current loops and as shown on the Contract Drawing.
    b. Type: A single output, regulated, plug-in type 24 VDC power supply.
2. Construction Features:
    a. Housing: All components shall be enclosed.
    b. Mounting: Power supply to plug into the octagonal socket with numbered, screw-type terminals. Provide mounting bracket to secure power supply module in the octagonal base.
3. Performance:
    a. Temperature: Operational from -10 to 65 C.

b. Output: 24 VDC, 200 mA.

c. Power Requirements: 120 VAC, 60 Hz, single phase.

d. Regulations: ±0.5 percent.

e. Ripple: 0.5 mV RMS.

f. Protection: Overvoltage protection.

g. Approval: U.L. recognized.

B. SIGNAL SPLITTERS

1. General: The signal splitter shall be capable of accepting a voltage or amperage input and delivering two electrically isolated 4-20 mA DC outputs. Provide isolation according to European Standard EN 61010.

2. Performance Requirements:

a. Max. transmission error: less than 0.1% of final value.

b. Response delay setting: 0 to 10 sec, adjustable.

c. Signal input: accept 0-10 VDC or 0-20 mA signal, configurable range via software.

d. Isolation: Three-way isolation rated at 3 kV.

3. Construction Features:

a. Configuration: Configure device through DIP switches or software through a connection to a laptop. Provide all software and programming cables as necessary for configuration.

b. Pluggable screw connection terminals for ease of access to the terminations without removing device from DIN rail. Terminals accept 12 – 24 American Wire Gauge (AWG) wire.

c. Mounting: DIN-rail mountable.

d. Operating Temperature: -40°C to 70°C.

e. Power Supply: Nominal of 24 VDC, range of 9.6 VDC – 30 VDC. Device can be powered directly through screw connections on device or through a Power Terminal Block via DIN rail connector.

4. Accessories:

a. DIN rail connector for connecting devices. Provide one for every two devices in the panel.

b. Power Terminal Block for distributing power to the device through the DIN rail connector. Provide a minimum of one (1) per panel or as required for number of devices.

C. CONTROL RELAYS

1. Design:

a. Type: General purpose, plug-in type rated for continuous duty.

2. Construction Features:

a. Coil Voltage: 24 VDC or 120 VAC as required.

b. Contact Configuration: Number and arrangement as required to perform the intended functions, plus a minimum of one spare SPDT contact per relay function.

c. Contact Material and Rating:

1) General Use: Silver or silver cadmium oxide contacts rated for 10 Amps minimum at 120 VAC.

2) Low Power Switching: Fine silver, gold flashed contacts specifically designed for low power switching, rated for 2 Amps minimum at 30 VDC.

d. Mounting: Pin or blade mount in sockets for sub-panel mounting on DIN rail. Sockets shall have screw terminals for wiring connections, which shall accept a minimum of two #14 AWG wires.

e. Cover: Clear plastic dust cover.

f. Indication: Indicator light.

g. Accessories: Hold-down spring, push-button test.

h. Approvals: UL recognized.

D. CONTROL PANEL PILOT DEVICES

1. Design:

a. Provide selector switches, pushbuttons and indicating lights as specified and shown. All components shall be of the full size, heavy-duty, oil-tight, round type, with modular contacts and NEMA rating equal to that of the enclosure on which devices are installed.

b. Provide individual legend plates for indication of switch, push-button, and light functions (e.g. Open, Closed, Hand-Off-Auto). Legend plates shall conform to the requirements of this Section.

c. Start pushbuttons shall have a flush button, while stop pushbuttons shall have raised pushbuttons.

d. Where noted on the Contract Drawing, pushbuttons and selector switches shall be illuminated type and use the color code as shown.

e. Units shall be Heavy Duty, 30.5 mm, oil tight, and shall maintain the NEMA rating of the panel or enclosure. Corrosion resistant devices shall be provided on NEMA 4 and 4X panels and enclosures.

f. Extra-large, engraved, laminated name plates and function indicator escutcheon.

2. Construction Features:

a. Selector Switch:

1) Two (2), three (3), four (4) and (X) position as shown and required.

2) Maintained or spring return position; maintained contacts; number and arrangement as required to perform intended functions specified but not less than one double pole, double throw, double break contact per switch. Contact rating shall be compatible with AC or DC throughput current of devices simultaneously operated by the switch contacts but not less than 10 Amperes resistive at 120 Volts AC or DC continuous.

3) Heavy Duty, gloved hand operator, extra-large, engraved position indicator.

b. Push-button:

1) Maintained or momentary as required and as shown on the Contract Drawing.

2) Contacts shall comply with requirements specified for selector switches above.

3) Provide extended head push-button for all stop functions, two inch-push/pull the mushroom head and maintained contacts for emergency stop functions, and flush head pushbuttons for all other functions. Emergency stop push buttons shall have padlock attachment.

c. Indicating Lights:

1) Integral transformer type.

2) Low voltage, long life L.E.D. lamps (6 Volts).

3) 0.6 Watts maximum.

4) Integral push-to-test required.

5) Lens colors shall be as follows:

a) Run or Open: Red

b) Off or Closed: Green

c) Alarm or Malfunction: Amber

d) Electrical Control Power On: White

e) In Remote: Blue

E. ELECTRONIC HORN

1. General: The horn shall be of the multi-tone electronic audible type.

2. Required Features:

a. Internal volume control.

b. Field selection of up to 16 different tones.

c. Power: 120 VAC or 24 VDC (provide power supply as required).

d. Operating Temperature: 32 to 120°F.

e. Enclosure Rating: NEMA 4X.

F. DC POWER SUPPLIES

1. Provide 24 VDC power supplies in each control panel to power field instruments, panel devices etc., as required. Equip each power supply with a power on/off circuit breaker.

2. Where DC power sources are required, each shall be a system comprised of:

a. Two (2) identical supplies.

b. Each supply shall be able to supply at least 150% of the connected load.

c. Paralleling rated.

d. Each supply connected to 1 input of a redundancy module.

e. Redundancy module to have at least 1 status output to be monitored by the SCADA system. Output shall indicate the status of the redundancy.

f. Power supplies and redundancy modules all to be from the same manufacturer, and from the same product family from that manufacturer.

3. The 24 VDC power supply shall meet the following requirements:

a. Input Power: 120 VAC, +/-10%, 60 Hertz (Hz).

b. Output Voltage: 24 VDC

c. Output Voltage Adjustment: 5%

d. Line Regulation: 0.05 percent for 10 V line change.

e. Load regulation: 0.15% no load to full load.

f. Ripple: 3 millivolts (mV) root mean square (RMS).

g. Operating temperature: Full output current between -32 to 140 degrees Fahrenheit.

h. DIN rail mounting.

i. Integrated Selective Fused Breaking.

j. Local and remote (dry contact) fail indication.

4. Size the 24VDC power supply to accommodate the design load plus a minimum 30 percent spare capacity. Provide load calculation with control panel submittal.

5. Provide output overvoltage and overcurrent protective devices with the power supply to protect instruments from damage due to power supply failure and to protect the power supply from damage due to external failure.

6. Mount the 24 VDC power supply such that dissipated heat does not adversely affect other panel components.

7. Provide current blocking diodes built-in power supplies for redundancy.

G. TERMINALS

1. Fused Terminals complete with light indicator.

2. Double stack terminals will not be permitted unless written approval is obtained from the Engineer.

3. Provide tension clamp terminals.

a. Number indicated plus 20% spare.

b. Terminals to be rated for connected load.

H. PANEL INTERIOR LIGHT

1. 120 VAC supply.

2. Comes with fluorescent or LED light source.

3. Equipped with a diffuser to protect the light source.

4. Switch: Integral or door-actuated.

5. Width: Spans 75% or more of the width of the roof of the panel.

I. TRANSIENT VOLTAGE SURGE SUPPRESSOR – CONTROL POWER

1. UL1449 2nd Edition rated using metal oxide varistors.

2. 120 V, 15 A, 2-wire grounded input.
3. Maximum Continuous Operating Voltage: 150 V.
4. Surge Current: 45 kA per phase.
5. 3 modes of protection.
6. Filtering Bandwidth: 10 kHz to 100 MHz.
7. Noise Attenuation: Normal Mode 75 decibels (dB) at 100 kHz, Common mode 50 dB at 5 MHz.
8. Let Through Voltage: 6 V A3 Ringwave, 9.6 V B3 Ringwave, 70 V, B3/C1 impulse.

J. UNINTERRUPTIBLE POWER SUPPLY (UPS)

1. Free-Standing Uninterruptible Power Supply (UPS) shall be furnished and installed in all Control Panels as indicated on the System Architecture Drawings to provide a reliable source of uninterruptible power with no break in AC output power during a complete or partial interruption of incoming line power. UPS shall include audio/visual alarms. UPS shall be UL-Listed.
2. Rating: Provide uninterrupted conditioned power, fully loaded conditions for 75 minutes. Furnish all calculations supporting UPS sizing based on all connected loads.
3. Description: Smart Online single-phase input/output. Coordinate KVA with equipment supplied. Insulated-gate bipolar transistor (IGBT) technology and zero (0 ms) transfer time. Continuous operation through blackouts, voltage fluctuations and surges at zero transfer time shall be provided.
4. Required Features:
    a. Quantity: 1 for each panel specified above.
    b. Display: Multi-function LCD status, alarms and control console.
    c. Panel AC Input: 120 VAC.
    d. AC Output: 120 VAC.
    e. Output Power Capacity: Adequate Capacity based on load of each panel (with supporting calculations to be provided for review).
    f. Input / Output Connections: Hardwire.
    g. Frequency Compatibility: 60 Hz.
    h. Output AC Waveform (AC / Battery Mode): Pure sine wave.

i. Primary Form-Factor/Mounting: Free-Standing.

j. Bypass Switch: Functionality to include manual bypass switch integral with UPS and automatic bypass function ensuring 100% availability during UPS Maintenance.

k. Battery Access: Front panel internal battery.

l. Battery Replacement Property: Hot-swappable, replaceable batteries.

m. Battery Recharge Rate: 2-4 hours from 10% to 90%.

n. Operating Temperature: 32 deg F to 104 deg F.

o. Provide dry contact outputs for Remote Alarm of UPS Low Battery and UPS Fault as indicated in the I/O List.

p. Certifications: Compliance to UPS Certifications.

q. Product Warranty: Minimum 1-year limited warranty.

K. STROBE LIGHT

1. General: Strobe light shall be a pulsating, illuminating type. The light shall provide a visual warning in the area where a potential hazard may occur.

2. Features:

a. Strobe Light: Rotating 360 degrees; 300 effective candlepower, 80 flashes per minute.

b. Lens Color: Amber.

c. Enclosure Rating: NEMA 4X or NEMA7 in classified areas.

d. Power: 120 VAC.

L. DIGITAL INDICATOR

1. General: The digital indicator shall accept an analog input and convert it to scaled numerical characters for digital display and also provide up to two alarm outputs.

2. Required Features:

a. Display Height: 0.56-inch.

b. Display Capacity: Four digits with decimal point position jumper selectable.

c. Display Type: Seven segment, red LED.

d. Accuracy: ± 0.05 percent.

e. Analog Input: 4 to 20 mADC.

f. Excitation Output: 15 VDC for powering transmitter.

g. Analog Output: Proportional 4 to 20 mADC.

h. Alarm Output: Dual with two 2 A relays.

i. Temperature Range: 0°C to 60°C.

j. Power: 120 VAC, + 10 to -15 percent, 5 watts (W).

k. Enclosure: NEMA 4 splash proof.

M. PANEL INTRUSION SWITCH / DOOR CONTACT

1. General: The door contact shall provide a discrete output to the panel programmable logic controller (PLC) when the panel door is opened.

2. Contact Rating: SPDT Contacts rated for 0.5A at 50 VDC.

3. Rated for Control Panel installation.

4. UL Listed.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. PMCS PMIDs shall confirm to the requirements of Section 40 80 81 – PMCS Factory Testing.

B. PMCS OITs PLC monitoring and control criteria specified under this Section shall be functionally verified during PMCS Factory Testing.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Contractor shall install each PMID in accordance with manufacturer's recommendations, this Section and the Contract Documents.

B. Panels into which these PMIDs are to be mounted shall provide rigid structural support for the PMIDs and shall allow necessary access and working space to permit maintenance of the PMID while installed.

C. Additional strengthening and/or bracing required for a sound installation shall be provided as part of this contract.

D. Contractor shall provide all supports, bracing, wiring, and incidental hardware.

E. All software required for the PMIDs shall be loaded, configured and fully tested as part of this contract.

F. Contractor shall configure the OITs using function keys and instructional prompts so that operators can operate equipment, modify set points and presets and

monitor the system without any special training or knowledge of the PMIDs with which the OIT interfaces.

3.03 FIELD TESTING / QUALITY CONTROL

A. PMIDs Field Testing shall conform to the requirements of Section 40 80 82 – PMCS Startup and Field Testing.

B. Section 40 80 82 details how PMIDs specified under this Section shall be verified during Field Testing.

3.04 STARTUP / DEMONSTRATION

A. Section 40 80 82 – PMCS Startup and Field Testing details the requirements for OAD and PMCS Upset and Recovery Testing.

The OAD and the PMCS Upset and Recovery Testing shall serve as the final verification of the correct functioning of all PMIDs.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall retain the PMCS Supplier to provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish, install calibrate, test, adjust, startup, and place into satisfactory operation PMCS Field Mounted Instruments and Devices as described herein and as indicated on the Contract Drawings.

B. The provisions of this Section apply to PMCS Field Mounted Instruments and Devices provided as a part of packaged systems specified elsewhere in this Contract including but not limited to, function, quality, spare parts, tools, testing, training, documentation and installation.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 01 79 05 - Equipment Start-Up and Training
B. Section 40 61 13 - PMCS General Requirements
C. Section 40 61 26 - PMCS Training
D. Section 40 61 93 - PMCS Input Output List
E. Section 40 61 94 - PMCS Instrument Index
F. Section 40 61 95 - PMCS Monitoring and Control Criteria
G. Section 40 61 96 - PMCS Control Strategies
H. Section 40 63 43 - PMCS Programmable Logic Controllers
I. Section 40 63 53 - PMCS Network Equipment
J. Section 40 67 16 - PMCS Panels and Enclosures
K. Section 40 70 01 - Measurement
L. Section 40 78 90 - PMCS Panel Mounted Instruments and Devices
M. Section 40 80 81 - PMCS Factory Testing
N. Section 40 80 82 - PMCS Startup and Field Testing

1.04 REFERENCES

A. Definitions

1. Section 40 61 13 – PMCS General Requirements defines the terms and abbreviations used in this Section and the PMCS
2. FMID Field Mounted Instrument and Devices, including all field mounted primary sensors and transmitters.

B. Reference Standards

1. Section 40 61 13 – PMCS General Requirements lists the standards applicable to this Section and the PMCS.

1.05 DESCRIPTION

A. FMIDs and controls shall be provided with all associated services and accessory equipment.

B. The Contract Drawings and Specifications illustrate and specify general functional, environmental and construction requirements of FMIDs, and do not necessarily show or specify all components, wiring, piping and accessories required by specific FMIDs or specific manufacturers, to provide a completely integrated system.

C. The Contractor shall provide all additional components, piping, wiring, accessories, services, labor, etc. required to furnish and install FMIDs and accessories to provide a complete and properly functioning integrated system.

D. The PMCS Supplier acting through the Contractor shall:

1. Provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install, calibrate, test, adjust and place into satisfactory operation, all FMIDs specified or required under this Section.
2. Retain the services of each equipment manufacturer to properly select, apply, size and locate each FMID they are to provide.
3. Retain the manufacturer's services to setup, commission and fine tune all FMIDs provided.
4. Provide application and design, engineering and services to properly select, apply, and install, provide detailed design, location, and mounting drawings and to test, calibrate and commission, FMIDs provided herein.
5. Coordinate the installation of all items specified herein and required to ensure the complete and proper operation and interfacing of all the components and systems.

1.06 QUALITY ASSURANCE

A. The Contractor shall comply with the Quality Assurance requirements listed in Section 40 61 13 – PMCS General Requirements, this Section and the Specifications.

B. All materials and equipment furnished shall be new, free from defects, and of first quality, produced by manufacturers who have been regularly engaged in the manufacture of FMIDs.

C. Manufacturers

1. FMIDs of the named manufacturers shall be furnished.
2. Or equal FMIDS shall be approved by the Engineer before being furnished.
3. FMIDs that are specified in this Section have been selected to establish the standard of quality and performance of the equipment to be supplied.
4. Manufacturers shall have produced the required FMIDs for a minimum of 10 years.
5. Where there is more than one item of similar equipment required under the Contract, all such similar equipment shall be the product of one manufacturer.
6. Select and manufacture the primary process measurement devices in accordance with the applicable general design requirements specified in Section 40 61 13 – PMCS General Requirements.
7. Field supervision, inspection, startup, commissioning, and training shall be in accordance with the requirements of Section 01 79 05 – Equipment Start-Up and Training, Section 40 61 26 – PMCS Training, and Section 40 80 82 – PMCS Startup and Field Testing.

D. All FMIDs furnished under this Section shall UL listed.

E. Custom made equipment or related installation which are constructed specially for this Contract will not be acceptable.

1.07 SUBMITTALS

A. The Contractor shall comply with submittal requirements listed in Section 40 61 13 – PMCS General Requirements, this Section and the Specifications.

B. Contractor shall submit FMIDs and schedules for the approval of the Engineer.

C. The Contractor is solely responsible for the timing of FMID submittals to enable approval by the Engineer and subsequent use by the PMCS Supplier.

D. The Contractor shall create, maintain and submit for review, an updated index of FMIDs.

E. Submittals shall be made at least 90 days in advance of any proposed use by the PMCS Supplier.

F. The manufacturer's calculations, assumptions and application details, and recommendations shall be submitted to the Engineer for review and approval.

G. Reports

1. A Factory Certified Calibration certificate shall be furnished for each FMID furnished under this Contract.

   a. At least 60 days before the anticipated initiation of installation testing, the Contractor shall submit three copies to the Engineer of the detailed description of the installation tests to be conducted to demonstrate the correct operation of the FMIDs supplied under this Section.

   b. The Contractor shall submit proposal calibration sheets for various types of instruments for the Engineer's approval prior to the start of calibration.

   c. Calibration sheets shall include but be limited to date, instrument tag numbers, calibration data for the various procedures described herein, name of person performing the calibration, a listing of the published specified accuracy, permissible tolerance at each point of calibration, calibration reading as finally adjusted within tolerance, defect noted, corrective action required and corrections made.

H. O & M Manuals

1. O&M Manuals shall be submitted for each FMID

2. O&M Manuals shall comply with Section 40 61 13 – PMCS General Requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall comply with delivery, storage and handling requirements listed in Section 40 61 13 – PMCS General Requirements.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall comply with spare parts, special tools and supplies listed in Section 40 61 13 – PMCS General Requirements, this Section and the Specifications.

B. Spare Parts

1. The Contractor shall furnish and deliver the spare parts and test equipment as outlined below.

2. Spare parts shall be identical and directly interchangeable with similar parts of FMIDS furnished under this Section.

3. Spare parts shall be packed in containers suitable for long term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.

4. Spare parts and tools shall be as recommended by the manufacturer and shall as a minimum include the following:

a. One FMID for every five (5) FMID of a given model furnished, minimum of one.

b. One (1) communication card for every five (5) of each type furnished, minimum of one.

c. One (1) power supply for every (5) of each size furnished, minimum of one.

d. All spare parts recommended by manufacturer and listed as recommended spare parts in the manufacturer's submitted O&M Manual.

C. Special Tools

1. Special tools, other than those normally found in a Service Technician's toolbox, required to test, diagnose, calibrate, install, wire, connect, disconnect, assemble and disassemble any FMIDs, for service and maintenance shall be provided.

2. Tools and test equipment shall be provided, together with items such as instruction manuals, carrying/storage cases, unit battery charger where applicable, special tools, calibration fixtures, cord extenders, patch cords and test leads, which are not specified but are necessary for checking FMIDs under this Contract.

3. The following test equipment shall also be provided:

a. Portable Calibrators

1) Furnish Two (2) of Portable calibrators capable of measuring DC volts, mV, mA, ohms, frequency, T/C, RTD, peak detect and trip detect on its input and simultaneously generate on its output all of the preceding signals plus two-wire

simulation, ramp functions, up/down stepping and 10 point programmability.

2) Each calibrator shall be furnished complete with 24 VDC integral battery pack 120 VAC power adapter, spare battery pack, test leads, external charger, fuse pack, carrying case and appurtenances.

3) Basic accuracy for DC voltages and currents shall be

a) ±0.025%; Resistance

b) ±0.035% for input and ±0.05% for output

c) Frequency: ±0.01%.

d) Two (2) portable calibrators shall be furnished.

e) NIST traceable Certificates of Calibration shall be furnished for all calibrators.

4) Portable Calibrators shall be Rochester Instrument System Accupro Diamond or approved equal.

b. Portable Gage and Differential Pressure Calibrator

1) Furnish one portable microprocessor-based, with 8K of memory gage and differential pressure calibration system.

2) The calibration system shall include the following items:

a) Integral 115 VAC/DC battery power supply with charger, battery indicator and two sets of NI-CAD batteries

b) Two (2) Pump modules each with coarse and fine adjustment with the following ranges.

(1) 0-100 psig max air type

(2) 0-500 psi max hydraulic type

c) Four pressure modules with the following ranges capabilities:

(1) 0-10 inches WC

(2) 0-30 psi

(3) 0-100 psi

(4) 0-300 psi).

3) All accessories, including manuals, tubing connectors and appurtenances shall be furnished for the unit, complete with weather resistant carrying case.

4) Portable Gage and Differential Pressure Calibrator shall be BETA Model 320 (Dual Sensor) or approved equal.

c. Multimeter

1) One (1) Portable digital multimeter (DMM) with rechargeable battery and test leads, and carrying case.

2) Meter shall be furnished with NIST Traceable certificate of calibration

3) Multimeter shall be Fluke Model 8060A or approved equal.

d. Hand Tools

1) A complete set of standard hand tools shall be furnished with the equipment.

2) The set shall include approximately 100 tools and shall be supplied in a durable aluminum case.

3) Tool set shall be Jensen Model JTK-17 or approved equal.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Shut-off valves shall be as manufactured by:

1. Swagelok Company, Solon, OH.
2. Anderson Greenwood-Emerson, Anaheim, CA.
3. Tylok, Euclid, OH.
4. Or approved equal.

B. Heated enclosures for outdoor FMIDs shall be a manufactured by

1. O'Brien, St Louis, MO
2. Or approved Equal

C. Manifolds shall be as manufactured by:

1. Swagelok Company, Solon, OH.
2. Anderson Greenwood-Emerson, Anaheim, CA.
3. Tylok, Euclid, OH.
4. Or approved equal.

D. Signal Splitters shall be as manufactured by:

1. Moore Industries, North Hill, CA.

2. Or approved equal.

E. Colorimetric Chlorine Analyzer shall be as manufactured by:

1. Hach, Loveland, CO.
2. No substitution allowed..

F. Non-Contact Flow Sensor shall be as manufactured by:

1. Teledyne ISCO, Lincoln, NE.
2. Hach Flo-Dar, Loveland, CO.
3. Or approved equal.

G. Swinging Vane (Paddle-Type) Flow Switch shall be as manufactured by:

1. Dwyer, Michigan City, IN.
2. Kobold USA, Pittsburg, PA.
3. Or approved equal.

H. Rotameter shall be as manufactured by:

1. Evoqua (Wallace & Tiernan), Pittsburg, PA.
2. Yokogawa, Houston, TX.
3. Kobold USA, Pittsburg, PA.
4. Or approved equal.

I. Radar Level Transmitter shall be as manufactured by:

1. Rosemount, Shakopee, MN.
2. ABB, Cary, NC.
3. Vega, Mason, OH.
4. Or approved equal.

J. Ultrasonic Level Transmitter shall be as manufactured by:

1. Siemens, Saint Paul, MN.
2. Endress and Hauser, Greenwood, IN.
3. Or approved equal.

K. Float Level Switch shall be as manufactured by:

1. GEMS Sensors, Plainville, CT.
2. Xylem Flygt, Washington, DC.
3. WIKA, Columbus, OH.
4. Or approved equal.

L. Reed Level Switch shall be as manufactured by:

1. GEMS Sensors, Plainville, CT.

2. Kobold USA, Pittsburg, PA.
3. WIKA, Columbus, OH.
4. Or approved equal.

M. Pressure Switch shall be as manufactured by:
1. Ashcroft, Stratford, CT.
2. Automatic Switch Company (ASCO), Madison, NJ.
3. United Electric, Watertown, MA
4. Or approved equal.

N. Pressure (Level) Transmitter shall be as manufactured by:
1. Emerson Rosemount, Shakopee, MN.
2. ABB, Cary, NC.
3. Endress and Hauser, Greenwood, IN
4. Or approved equal.

O. Magnetic Flow Meter shall be as manufactured by:
1. Emerson Rosemount, Shakopee, MN.
2. ABB, Cary, NC.
3. Endress and Hauser, Greenwood, IN.
4. Or approved equal.

P. Gas Monitoring Analyzer shall be as manufactured by:
1. MSA Safety, North Reading, MA.
2. Sensidyne, St. Petersburg, FL.
3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. General Features
1. All FMIDs supplied shall be the manufacturer's latest design.
2. Unless otherwise specified, FMIDs shall be solid state, electronic, using enclosures to suit specified environmental conditions.
3. Microprocessor-based FMIDs equipment shall be supplied unless otherwise specified.
4. All FMIDs shall be provided with mounting hardware and floor stands, wall brackets, or instrument racks as shown on the Contract Drawings, or as required.
5. Equipment installed in a hazardous area shall meet Class, Group, and Division requirements as shown on the Contract Drawings.

6. All FMIDs for outdoor service shall be furnished in the specified enclosures and or installed in field panels in accordance with Section 40 67 16 – PMCS Panels and Enclosures.
7. It shall not be necessary to provide the manufacturer's NEMA 4 or 4X enclosures for FMIDs which will be subsequently mounted in separate in field panels.
8. All field mounted transmitters mounted outdoors shall be factory installed in thermostatically controlled electrically heated enclosures.
9. Heated enclosures shall be O'Brien VIPAK series or approved equal.
10. Unless otherwise shown or specified, local indicators shall be provided for all FMIDs
11. Where FMIDs are located in inaccessible locations, local indicators shall be provided and shall be mounted as specified in this Section.
12. All indicator readouts shall be linear in process units. Readouts of 0-100% shall not be acceptable (except for speed and valve position).
13. Unless otherwise specified, FMIDs and power supply enclosures shall be 316 stainless steel, fiberglass or PVC coated copper free cast aluminum NEMA 4X construction.
14. Where separate sensors and transmitters are required, they shall be fully matched, and unless otherwise noted, transmitters installed adjacent to the sensor.
    a. Special cables or equipment shall be supplied by the associated equipment manufacturer.
15. Electronic equipment shall utilize printed circuitry and shall be coated (tropicalized) to prevent contamination by dust, moisture and fungus.
16. Solid-state components shall be conservatively rated for long-term performance and dependability over ambient atmosphere fluctuations.
17. FMIDs and system components shall be designed for installation in dusty, humid, and corrosive service condition.
18. The PMCS shall contain products of a single manufacturer, insofar as possible, and shall consist of equipment models which are currently in production.
19. All equipment provided, where applicable, shall be of modular construction and shall be capable of field expansion.
20. All non-loop-powered instruments and equipment shall be designed to operate on a 60 Hz alternating current power source at a nominal 1115 V, plus or minus 10 percent, except where specifically noted.
21. All regulators and power supplies required for compliance with the above shall be provided.

22. Where equipment requires voltage regulation, power conditioners shall be supplied.

23. All analog transmitter and controller outputs shall be isolated, 4-20 milliamps into a load of 0-750 ohms, unless specifically noted otherwise.

B. Pressure Sensing Lines and Accessories for Flow and Pressure Transmitters

1. Construction:

a. Material: Type 316 stainless steel tubing; .035-inch wall thickness.

b. Pressure Rating: 150 psi.

c. Size: 1/2-inch outside diameter.

d. Connections: Type 316 stainless steel compression type. "Swagelok," provide isolation valves at process tap

C. Shut-off and Isolation Valves:

1. Construction:

a. Type: Ball.

b. Pressure Rating: 150 psi.

c. Body, Ball, and Stem: Type 316 stainless steel.

d. Packing: High Density TFE.

e. Handle Stainless Steel with metal travel stops.

f. Support Rings: Stainless steel.

g. End Connections: 1/2-inch NPTF (minimum) w/ Removable "Swagelok" connectors.

D. Manifolds:

1. Construction:

a. Type: 5-valve and 3-valve meter manifolds.

b. Materials: Type 316 stainless steel body, bonnets, stems, and hardware; Delrin seats; Teflon packing.

c. Connections: 1/2-inch NPTF with Type 316 stainless steel compression type. "Swagelok" connectors.

E. Pressure Tap Sensing Lines and Accessories for Pressure Gauges and Pressure Switches:

1. For Process Sensing Taps in Ductile Iron, Steel, and Stainless Steel Piping Systems:

a. Material and Fittings: Type 304 stainless steel pipe (ASTM A 312) shall be used, along with threaded fittings and adapters (ASTM A 403).

b. Sizes: The main sensing piping shall have a minimum size of 1-inch gauge and switch connections shall be a minimum of 3/4-inch.

c. Pressure Rating: Equal to or greater than the applicable system test pressure.

d. Accessories:

1) For applications not requiring diaphragm seals, provide separate Type 316 stainless steel threaded ball valve for each gauge and switch.

2) For applications requiring diaphragm seals, provide a separate threaded Type 316 stainless steel ball valve for seal process side shutoff.

2. For Process Sensing Taps in Copper and Thermoplastic Piping Systems:

a. Pipe Material and Fittings: Use same type of pipe material and fittings as used in the process piping system.

b. Sizes: The main process sensing piping shall have a minimum size of 3/4-inch, and gauge and switch connections shall be a minimum of 1/2-inch.

c. Pressure Rating: Equal to or greater than the applicable system test pressure.

d. Accessories:

1) For copper piping system taps with or without seals, provide a separate 3/4-inch minimum threaded brass or bronze ball valve for each gauge and switch.

2) For PVC piping systems with or without diaphragm seals, provide a separate 3/4-inch threaded ball valve for process sensing line shutoff.

F. Colorimetric Chlorine Analyzer:

1. General: Unit shall use colorimetric analysis to analyze and indicate total chlorine residual in a sample piped to the unit.

2. Performance Requirements:

a. Type: Colorimetric.

b. Output: 4 to 20 mA for Total Chlorine Residual via Hach SC4500 Controller.

c. Power: 120 VAC.

d. Range: 0 to 10 mg/L (ppm) Total Chlorine Residual.

e. Accuracy: +/- Five percent of reading or +/- 0.04 mg/L (ppm), whichever is greater from 0 to 5 mg/L as CL2; +/- 10% from 5 to 10 mg/L as CL2.

f. Precision: 5% of reading or +/- 0.01 mg/L (ppm), whichever is greater.

g. Lower Limit of Detection (LOD): 0.03 mg/L (ppm).

h. Resolution: 0.01 mg/L (ppm).

i. Repeatability: 5% of reading or 0.01 mg/L (ppm), whichever is greater.

j. Cycle Time: 2.5 minutes.

3. Construction Features:

a. Sensor/Analyzer:

1) Analyzer shall be housed in an IP66-rated enclosure.

2) Capable of measuring total chlorine residual by changing the tubing and indicator and buffer solutions.

3) Measurements are taken every 2.5 minutes and results are displayed on a controller display in the range of 0 to 10 mg/L.

4) Utilizes a built-in flow meter.

5) Real-time flow rate is measured when sample is flowing through the analyzer and results are displayed on a controller display in mL/min.

6) Connects to Hach SC4500 Controller, which controls and provides power to the analyzer.

7) Performs a blank reference measurement check between analysis points to compensate for sample color, turbidity, and changes in light intensity due to voltage fluctuations or light source aging.

8) Operates with an LED light source at a peak wavelength of 510 nm.

9) Capable of operating unattended for 30 days between chemical reagent changes and measurement cell cleaning.

10) Utilizes a three-color status light to indicate operating status.

11) Utilizes three measurement cycle indicator lights to display the phase of the measurement cycle being performed.

12) Has a colorimeter measurement cell window for viewing samples inside cells.

13) Provide step-by-step, on-screen instructions for all routine maintenance activities, including reagent changes, tubing changes, and cell cleanings.

b. Transmitter:

1) Microprocessor-based solid-state circuitry designed for measurement of free residual chlorine and transmission of proportional output signal linear to total chlorine residual.

2) Built-in simulator used in conjunction with front panel controls and display to verify calibration, proper internal functioning of the analog-to-digital conversion, processing, outputs, and setting up alarms.

3) Front of panel membrane sealed keypad for display control and transmitter function control testing and calibration. Front panel switch shall also allow alternate display of readouts for free residual chlorine, and mA outputs.

4) Built-in Self Diagnostics: Transmitter shall include capability to actively monitor all internal components and present diagnostics on the overall health of connected sensors and time to next required maintenance. Display shall notify of upcoming and past due maintenance.

5) Indicator: 3.5-inch TFT color display with capacitive touchpad.

6) Inputs: Dual-Channel (Two Digital Sensor Inputs)

7) Outputs:

a) One 4 to 20 mADC output. Individually programmable, insulated, direct acting into 0 to 600 ohms for output of free residual chlorine signal.

b) Alarm Outputs:

(1) Two Relays with SPDT Form C Contacts.

(2) Five Amps at 120 VAC

8) Housing: NEMA 4X metal enclosure with corrosion-resistant finish, mounting bracket, and brackets to allow for handrail, surface mounting, pipe stand mounting.

9) Power Supply: 120 VAC +/- 10 percent, 50/60 Hz, 10 Watts.

10) Memory Backup: All configuration data shall be stored in non-volatile EEPROM.

4. Environmental Requirements:

a. Operational Criteria:

1) Sample Flow Rate: 60 to 200 mL/minute through the analyzer.

2) Sample Filtration: Y-Strainer with 40-mesh screen or higher.

3) Inlet Pressure: 4.5 to 75 psig supplied to Y-Strainer; 1.5 to 5 psig supplied to analyzer.

4) Sample Temperature: 41 to 104 degrees F.

5) Operating Temperature: 41 to 104 degrees F.

6) Operating Humidity: 0 to 90% non-condensing relative humidity.

5. Accessories:

a. Instrument Options: Provide standpipe installation kit.

b. Provide appurtenances required by manufacturer for installation, including y-strainer, pressure regulator, valves, fittings, tubing, and standpipe installation kit. Provide rotameters as specified in this Section.

c. Provide all mounting hardware required for wall mount installation.

d. Include sufficient quantities of reagents and expendables for one year of operation.

e. Piping Connections:

1) 1/4-inch sample inlet, quick-disconnect fitting.

2) 1/2-inch sample outlet flexible tubing.

3) 1/2-inch overflow drain flexible tubing.

6. Installation, Start-Up and Training:

a. Contractor shall install the analyzer in strict accordance with the manufacturer's instructions and recommendation.

b. Manufacturer's representative shall include three (3), 8-hour days of services by a factory-trained technician for installation and start up each analyzer being installed.

c. Contractor shall include the manufacturer's services to perform startup on instrument to include basic operational training and certification of performance of the instrument. Refer to Section 01 79 05 – Equipment Start-Up and Training for additional requirements.

d. All manufacturer's services shall be performed by factory-trained service personnel. Field service and factory repair by personnel not trained or certified by the manufacturer is not allowed.

e. Use of the manufacturer's service parts and reagents is required. Third party parts and reagents are not approved for use.

G. Non-Contact Flow Sensor:

1. General: The unit shall remotely measure the flow in an open channel with non-contact laser or radar Velocity technology and non-contact Ultrasonic Level technology.

2. Performance Requirements:

a. Type: Laser / Radar Doppler Velocity Sensor and Ultrasonic Level Sensor.

b. Output: Six (6) 4-20 mA for Level, Master Flow, Surcharge Level, Velocity, and Surcharge Velocity via Transmitter. Provide required add-on cards for the required outputs.

c. Power: 120 VAC.

d. Laser Velocity Measurement Range: 0 to 15 ft/s (0 to 4.6 m/s).

e. Ultrasonic Level Measurement Range: 0 to 10 ft (0 to 3 m)

f. Ultrasonic Sensor Beam Angle: 10 degrees.

g. Accuracy: +/- 4% of reading.

h. Provide redundant flow measurement via submerged continuous wave ultrasonic Doppler Velocity measurement option.

i. Operating Temperature: 14 to 140 degrees F (-10 to 60 degrees C).

3. Construction Features:

a. Sensor:

1) Sensor shall be constructed of conductive carbon filled ABS plastic, SST, conductive Kynar (ultrasonic sensor), anodized aluminum (ultrasonic housing), and UV-rated PVC (cable jacket).

2) Enclosure shall be rated IP68, and certified Class 1, Division 1.

3) Provide cable length from sensor to transmitter with minimum 5 feet of slack.

4) Input voltage supplied by the transmitter shall be 24 VDC.

5) Provide stainless steel mounting hardware for physical installation.

6) Provide sensor retrieval tool with maximum extension of 23 feet.

7) Provide required intrinsically safe barrier for wiring from sensor located in the hazardous location to the transmitter located in the non-hazardous location. Follow all manufacturer requirements for barrier wiring interface with sensor and transmitter.

b. Transmitter:

1) Flow meter electronics and connections will be housed in a PPO Polyphenylene Oxide Noryl, NEMA 4X, lockable enclosure suitable for conduit connection.

2) Basic construction will consist of a two-piece electronics enclosure, front panel, and door.

3) The enclosure door will have a clear polycarbonate window for viewing the LCD, mechanical totalizer, and LED indicator without opening the door.

4) Flow meter shall include a stainless-steel bracket for wall mounting.

5) Flow meter will have a two-color LED indicator next to the display to indicate alarms/events.

6) Power: 120 VAC.

7) Communication and User Interface:

a) Primary programming will be directly through the tactile keypad and programming menus on the front panel of the flow meter.

b) Alarm status/events shall be indicated by the LED next to the display. Detailed information about the alarm/event(s) indicated will be accessed by pressing a key on the keypad.

c) Direct serial connection to a computer or USB flash drive will be through a micro A/B USB port located on the front panel of the flow meter.

4. The manufacturer shall be present for installation, and start-up of the instrument and shall provide support for field related issues up until Substantial Completion.

5. For DC-5 location, the transmitters shall be installed inside of the DC-5 Control Panel along with intrinsically safe barriers, following all manufacturer recommendations.

6. For Regulator 9, the transmitters shall be installed inside the existing Regulator 9 Control Panel, that is provided under the Floatables Contract. Contractor shall coordinate with the City to complete this installation along with the intrinsically safe barriers, following all manufacturer recommendations.

H. Swinging Vane (Paddle-Type) Flow Switch:

1. Type: The flow indicating switch shall be swinging vane, paddle-type suitable for the applications shown.

2. Required Features:

a. NEMA 4X housing and control box.

b. Type 316 stainless steel internal moving parts.

c. Line size and connection ends as shown.

d. Dual switches, each SPDT, minimum rating five amp at 120 VAC.

e. Field adjustable switch setting.

f. Switch accuracy and deadband shall be five percent of full range.

I. Rotameter:

1. Type: Low-Flow Variable-area Flow meter:

a. Provide fine control needle valve and check valve.

b. Range and Scale: Direct reading in ccm, gph or scfh as required.

c. Accuracy: ± Two percent of maximum capacity; ± ten percent of full scale for extra low capacity meters.

d. Construction:

1) Frame: Type 302 stainless steel.

2) End Fittings: Type 316 stainless steel.

3) Tube: Borosilicate Glass.

4) Float: Type 316 stainless steel, black glass or tantalum as required.

5) O-rings: Buna-N or Viton.

6) Tube Retainer: Kynar.

7) Tube Shield: Polycarbonate.

8) Check and Needle Valves: Type 316 stainless steel.

9) Adapters and Plugs: Type 316 stainless steel.

J. Radar Level Transmitter:

1. Type: Microprocessor based, non-contacting, radar type continuous liquid level measuring system consisting of an antenna with attached transmitter. The radar liquid level measuring system shall produce an output signal linear with level.

2. Performance Requirements:

a. Measuring Principle: Radar.

b. Measuring Range: As specified in the Instrument Index.

c. Accuracy: 0.1 percent of range.

d. Reaction Time: One second, minimum.

e. Power: 24 VDC loop power.

f. Output: 4 to 20 mADC.

3. Construction Features:

a. Enclosure: NEMA 4X, powder coated aluminum.

b. Electrical Connection: 1/2-inch NPT.

c. Mounting: Flange to match mating flange conditions at the Overflow Chamber.

4. Accessories:

a. Mounting Hardware: Six-inch flange with Type 316 stainless steel hardware.

b. Antenna Extension: Sized as required to allow antenna to clear the end of floor pipe or nozzle.

c. Weather shield/protective cover.

K. Level Transmitter Ultrasonic Type

1. Type:

a. Non-contact, ultrasonic level transducer.

b. Function/Performance

1) Measuring Range: Transducer range shall be suitable for the installation indicated on the Drawings, up to 50 ft. (15m).

2) Temperature Range: –20 to 60 degrees C.

3) Relative Humidity: Zero to 100 percent.

4) Temperature Compensation: Transducers shall be provided with integral temperature sensors for temperature compensation at temperature ranges from -50° to 150° C.

2. Physical:

a. Transducers shall be potted/encapsulated in a Kynar or other chemical and corrosion-resistant housing. Where indicated on the Drawings, transducers shall be approved for installation in Class I, Division 1, Groups C and D (Zone 0) environments.

b. The surface of transducers shall be Teflon-coated where mounted on chemical tanks and exposed to vapors in the tanks that are not compatible with the transducer material.

c. Transducers shall be capable of being completely submerged without damage.

d. Transducers shall be suitable for the surface, pipe, or flange mounting as indicated on the Drawings. Appropriate mounting hardwired shall be provided. Flange shall be six inches and be resistant to attack by the medium being metered or, where required, shall be protected by corrosion- resistant coatings and facings.

3. Options/Accessories Required:

a. Transducers located in areas where freezing condensation may occur shall be provided with special heaters or another type of transducer protection designed to prevent sensor icing.

b. A signal cable as recommended by the manufacturer, for installation between the transducer(s) and the transmitter. Length, up to 1200 feet, shall be as required by installation indicated on the Drawings.

4. Transmitter/Converter:

a. Type:

1) Microprocessor based compatible with the transducer(s) provided.

2) Functional/Performance:

a) Resolution (including transducer): Plus or minus 0.1 percent of range or 0.08 inches, whichever is greater.

b) Accuracy (including transducer): Plus or minus 0.25 percent of range or 0.24 inches.

c) Range: As required by installation indicated on the drawings and instrument index.

d) Temperature Range: -20 to 50 degrees C.

e) Output: Two isolated 4-20 mA output and one, three, or six alarm contacts adjustable to trip at any point in the instrument range. Output contacts shall be rated 5 A at 230 VAC.

f) Temperature Compensation: Compensation over the temperature range of the sensor.

g) Display: Digital indicator displaying level/differential level or volume in engineering units.

h) Diagnostics: On-screen instructions and display of self- diagnostics.

i) Loss of Signal: Transmitter shall ignore the momentary loss of echo signals and shall indicate loss of echo on the transmitter unit.

j) Configuration Protection: Programmable parameters shall be protected using E2PROM. Battery backup protection is not acceptable.

b. Physical:

1) The transmitter shall be suitable for surface or pipe stand mounting.

2) The enclosure shall be NEMA 4X.

c. Accessories Required:

1) Hand-held programmer where required for configuration and calibration of the instrument.

L. Float Level Switch:

1. Design:

a. Type: Direct acting, pear shaped, eccentrically weighted displacement type, liquid level sensor.

b. Float Body: Hollow hermetically sealed, rigidly molded of polypropylene containing switch and eccentric metal weight.

c. Switch: Hermetically Sealed SPDT switch rated 8 Amps AC, 5 Amps DC, cushioned and mounted along the main axis at about 65-degree inclination. No mercury permitted.

d. For multiple floats provide 316 stainless steel mounting rod and all required mounting hardware per manufacturer's recommendation.

e. Weight: Weight to cause the sensor to hang straight down from cable when not immersed and only allow the float to pivot when immersed in liquid.

f. Electrical Cable:

1) Heavy duty, three conductors, flexible and submersible cable, sheathed in PVC and connected to float and switch with a watertight seal.

2) Cable length shall be sufficient to extend to the control panel box.

M. Reed Level Switch:

1. Type: A magnetic float moves with liquid level to actuate a hermetically sealed, magnetic reed switch within the unit stem.

2. Required Features:

a. SPST control switch – open when level is detected. Electrical rating: 24 VDC, 0.3 amps.

b. Material to be compatible with Sodium Hypochlorite and Sodium Bisulfite.

c. Float Overtravel: 1/8-inch.

d. Operating Temperature: 0 to 180 degrees F.

e. Cable and packaging assembly shall withstand submergence. Cable length as required.

f. Provide mounting brackets.

N. Pressure Switch:

1. Type: Switch assembly with diaphragm/piston pressure sensor.
2. Function: Sense gauge or absolute pressure and open or close a contact when the pressure reaches the specified trip point.
3. Performance Requirements:
    a. Operating Range: As indicated in PMCS Instrument Index.
    b. Setpoint: As indicated in PMCS Instrument Index.
    c. Setpoint Repeatability: +/- One percent of range.
    d. Output: Snap action switch, SPDT rated not less than ten amp resistive at 120 VAC and 1/2-Amp resistive at 125 VDC.
    e. Switch and Reset Action: Adjustable Deadband.
    f. Ambient Temperature Limits: -4 degrees F to 140 degrees F.
4. Construction Features:
    a. Pressure Transducer Housing and Diaphragm Material shall be compatible with Sodium Hypochlorite and Sodium Bisulfite. Provide in-line flanged diaphragm seal.
    b. Set and Reset Point Adjustments: Adjustable external adjusting nuts and pressure setting scales in psi.
    c. Process Connection: 1/4-inch NPT.
    d. Housing: Copper-free die cast aluminum NEMA 4X.
    e. External Mounting Lugs.
    f. Adjusting Nuts Metal Cover with Gasket.
    g. Electrical Connection: 3/4-inch NPT.

O. Pressure (Level) Transmitter:

1. Type: Solid State two-wire differential capacitance or resonant wire type transmitter with remote pressure diaphragm seals for measurement of liquid level. For non-pressurized tanks, only one (high-side) remote seal shall be required with the low side open to atmospheric pressure.
2. Function: Measure level as shown and as specified in the Instrument Index. The transmitter shall display the monitored level value and shall output a 4 to 20 mADC signal proportional to the monitored level.
3. Performance Requirements:
    a. Range: As specified in the Instrument Index.
    b. Positive Over Range Protection: At least 1.25 times the maximum span limit.
    c. Local Indication: As specified in the Instrument Index.

d. Transmitter Accuracy (includes linearity, repeatability and hysteresis): ±0.25 percent of calibrated span.

e. Linearity: ±.1 percent of calibrated span.

f. Repeatability: 0.05 percent of calibrated span.

g. Hysteresis: 0.05 percent of calibrated span.

h. Stability over 6-month period: ±0.25 percent of maximum span.

i. Supply Voltage Effect: Output change of less than .005 percent of calibrated output span per one-volt change in supply voltage.

j. Combined Process and Ambient Temperature Effect: Less than 8-inches water change per 100 degrees F average (combined) temperature change, plus 2.5-inches water per additional five feet of capillary (when used with DC 200 silicone fill).

k. Output:

1) Isolated direct acting 4 to 20 mADC.

2) Digital process variable signal superimposed on 4 to 20 mADC signal without compromising loop integrity.

4. Construction Features:

a. Measuring elements protected by sealing diaphragm.

b. Calibration Adjustments:

1) Zero: Adjustable in electronics compartment.

2) Span: Coarse and fine adjustments in electronics compartment.

c. Zero Elevation and Suppression: The extent that the amount of suppression plus the calibrated span does no exceed the upper range limits of the sensor.

d. Damping: Internal adjustable.

e. Built-in electrical surge and RFI protection.

f. Remote Pressure Diaphragm Seals:

1) Size and Type: Three-inch ANSI Class 150 flanged with flush diaphragm.

2) Diaphragm Seal (Process Wetted) Materials: See Diaphragm Seal specification included in this Section.

3) Diaphragm Seal Housing, Flanges and Bolting (non-process wetted) Materials: See Diaphragm Seal specification included in this Section..

4) Capillary Tubing:

a) Material: Armored Type 316 stainless steel.

b) Length: As required to extend from remote seal to transmitter (five feet minimum; 25 feet maximum).

g. Fill Fluids:

1) Remote Seal and Capillary: See Article 1.8.

2) Transmitter Sensor Cell: See Article 1.8.

h. Transmitter Sensor Diaphragms and Process Wetted Parts: Type 316 stainless steel.

i. Transmitter Sensor Non-Process Wetted Parts:

1) Sensor Body and Bolting Materials: Type 316 stainless steel.

2) O-rings Seals: Viton.

j. Transmitter Electronics Housing: NEMA 4X rated and Buna-N O-rings sealed threaded cover constructed of die-cast, low-copper aluminum finished with an epoxy paint system.

k. Indicator: Provide integral indicator with range in engineering units.

l. Electrical Conduit Connection: 1/2-inch NPT.

m. Process Connections: 1/4-inch NPT with adapters for connection to remote seals via capillary tubing.

n. Type 316 stainless steel mounting bracket and fastening hardware suitable for mounting transmitter on flat vertical surface or 2-inch diameter pipe.

o. Hand held interface with keyboard and LED display capable for easily configuring and testing the transmitter.

P. Magnetic Flow Meter:

1. Type: Flowtube with pulsed DC Magnetic Flow Transmitter.

2. Function: Monitor liquid flows as shown. The transmitter shall display the monitored flow value and shall output a 4 to 20 mADC signal proportional to the monitored flow.

3. Performance Requirements:

a. Range: As indicated in PMCS Instrument Index.

b. Accuracy (with analog output):

1) ±0.5 percent of flow rate, or better, over a range from 1 fps to 31 fps.

2) ±0.005 fps, or better, at flows below 1 fps.

3) Accuracy unaffected by changes in fluid velocity, density, pressure, temperature, or conductivity (above minimum conductivity limits).

4) System accuracy shall be proven by submittal of flow test curves of the actual meters being furnished.

a) Test curves shall show a minimum of ten equally spaced flow points. Tests shall be performed using water and a weight or volume tank. A "master meter" used as a reference standard is not acceptable. The test setup shall be submitted and approved prior to testing.

c. Repeatability: ±0.15 percent of flow rate, or ±0.0015 fps, whichever is greater.

d. Drift: Complete zero stability.

e. Minimum Fluid Conductivity Limit: Five micro siemens per centimeter or less.

f. Minimum Pre-amp Input Impedance: 1012 ohms.

g. Power:

1) 120 VAC ± 10 percent, 60 Hz, ±3 Hz power supply.

2) Power Consumption shall not exceed 50 watts for flow tube and transmitter combined.

h. Output:

1) 4 to 20 mADC, direct acting and isolated, into 0 to 1000 ohms.

2) High accuracy, field adjustable scaled pulse output (0.1 to 10 Hz or greater) to drive local totalizer.

i. Operating Temperature: Suitable for operation with process fluid temperature from 0° to 140°F.

4. Construction Features

a. 1. Flow Tube:

1) Type: Lined metal flow tubes.

2) Interchangeability: Ratio of flow velocity to voltage reference signals generated identical for all meter sizes to permit interchangeability with transmitter without requiring circuit modifications.

3) Tube Material: Type 304 stainless steel.

4) Electrode:

a) Conical or elliptical shaped.

b) Material: To be compatible with Sodium Hypochlorite and Sodium Bisulfite.

5) Lining: To be compatible with Sodium Hypochlorite and Sodium Bisulfite.

b. Enclosure:

1) Materials and Rating:

a) Cast low-copper aluminum alloy or fabricated sheet steel.

b) NEMA 6 rated.

c) Capable of withstanding accidental submergence in 30 feet of water for 48 hours.

2) Finish: Finish exterior, except for flange faces, with a high build epoxy paint.

3) End Connections: ANSI Class 150 suitable for mating with pipe specified.

4) Electrical Connections: 3/4-inch NPT tapped holes for power conduit fitting and signal conduit fittings.

c. Pulsed DC Magnetic Flow Transmitter:

1) Materials and Rating:

a) Die cast, low-copper aluminum alloy.

b) NEMA 4X rated.

2) Solid state construction.

3) Local Indication:

a) 3-1/2-digit minimum LCD meter with field selectable engineering units.

b) Seven-digit electromechanical totalizer or eight digit electronic LCD totalizer with reset and lithium battery backup. Totalizer shall be integral with transmitter and visible through viewing window, or shall be externally mounted in a separate NEMA 4X enclosure or condulet with viewing window and installed adjacent to the transmitter.

4) Pulse and analog outputs galvanically isolated from input and earth ground.

5) Automatic zeroing feature making it unnecessary to zero the instrument before or after placing it in operation.

6) Pre-calibrated span adjustment providing continuous span adjustment over entire range.

7) Range Adjustment: Direct reading thumbwheel switches or calibrated potentiometer, continuously adjustable for full scale settings from 1 to 31 feet per second.

8) Signal Conditioning: Adjustable damping circuit with response times of 1 to 25 seconds minimum.

9) Low Flow Cutoff: Provide automatic low flow cutoff circuitry to stop pulse output and local totalization when flow drops below 0.5 percent ± 0.2 percent of the calibrated upper range valve.

5. Accessories:

a. Mounting:

1) Provide complete Type 316 stainless steel mounting hardware.

2) All transmitter and driver electronics shall be remotely mounted from the flow tubes at locations shown.

3) Type of mounting (wall, support frame or pipe stand) as required.

b. Shielded cable assemblies of sufficient length for connection between Flowtube and transmitter electronics.

c. Type 316 stainless steel grounding rings for flow tubes.

d. Type 316 stainless steel grounding straps.

e. NEMA 4X rated 120 VAC power on-off selector switch.

f. A spool piece for replacement of each different size flow tube where no bypass piping is provided.

g. One calibrator suitable to calibrate all flow tubes provided.

Q. Gas Monitoring Analyzer:

1. Type: Gas Monitoring System in a self-contained package that features audible and visible signaling. Dual sensing design shall enable remote sensing in a toxic environment, with monitoring system located outside of the toxic environment.

2. Provide CL2 Gas Monitoring System for the TI-011 Sodium Hypochlorite Room, and a SO2 Gas Monitoring System for the TI-010D Sodium Bisulfite Room and TI-011 Sodium Bisulfite Room. Gas Monitoring System shall include one analyzer/transmitter and dual sensors of the respective gas for each area, as indicated in the Instrument Index and Contract Drawings.

3. Performance Requirements:

a. Analyzer Output: One (1) 4-20 mADC.

b. Sensor Location: Two (2) remote sensors located inside of the chemical room (refer to electrical drawings).

c. Transmitter/Analyzer Location: One (1) transmitter/analyzer located outside of the chemical room paired with the dual sensors, for each system (refer to electrical drawings).

d. Relays: Two DPDT Contacts.

e. Transmitter Housing Material: General-purpose polycarbonate enclosure.

f. Power Input: 120 VAC.

g. Alarm Type: Piezo horn with horn silence button built-in to the analyzer.

h. Sensor for SO2 Gas: Total quantity of 4 sensors.

i. Sensor for CL2 Gas: Total quantity of 2 sensors.

j. Integrated alarm light on the analyzer front.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. FMIDs shall confirm to the requirements of Section 40 80 81 – PMCS Factory Testing.

B. FMIDs monitoring and control criteria specified under this Section shall be functionally verified during PMCS Factory Testing.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Contractor shall install each FMID in accordance with manufacturer's recommendations, this Section, and the Contract Documents.

B. Equipment shall be located so that it is accessible for operation and maintenance.

C. The PMCS Supplier shall examine the Contract Drawings and Shop Drawings for various items of equipment in order to determine the best arrangement for the work as a whole, and shall supervise the installation of process instrumentation supplied under this Section.

D. Electrical work shall be performed in compliance with NYCEC.

E. Equipment Mounting and Support

1. Field equipment shall be mounted on prefabricated pipe stands or metal framing unless shown adjacent to a wall or otherwise noted.

2. FMIDs attached directly to concrete shall be spaced from the mounting surface not less than 1/2-inch by use of phenolic spacers.

3. Expansion shields in walls shall be used for securing equipment or wall supports to concrete surfaces.

4. Unless otherwise noted, field instruments shall be mounted between 48 and 60 inches above the floor or work platform.

5. Embedded pipe supports and sleeves shall be schedule 40, 316 stainless steel pipes, with stainless steel blind flange for equipment mounting as shown on the Contract Drawings.

6. Materials for miscellaneous mounting brackets and supports shall be 316 stainless steel construction.

7. Pipe stands, miscellaneous mounting brackets and supports shall comply with the requirements of Division 5 and the Division 40 pipe support Sections of the specifications.

8. Where transmitters are supported from process piping, leveling saddles shall be provided.

9. Transmitters shall be oriented such that output indicators are readily visible.

F. Panels into which FMIDs are to be mounted shall provide rigid structural support for the FMIDs and shall allow necessary access and working space to permit maintenance of the FMID while installed.

G. Additional strengthening and/or bracing required for a sound installation shall be provided as part of this contract.

H. Contractor shall provide all supports, bracing, wiring, and incidental hardware.

I. All software required for the FMIDs shall be loaded, configured, and fully tested as part of this contract.

J. Contractor shall configure the FMIDs using function keys and instructional prompts so that operators can operate equipment, modify set points and presets, and monitor the FMIDs without any special training or knowledge of the controller with which the FMIDs interfaces.

K. Identification Tags

1. All FMIDs shall have an identification tag meeting the following requirements:

a. Tag numbers for FMIDs shall be as listed on the Contract Drawings and Instrument Index attached.

b. The six-digit prefix shall be included with the ISA tag number.

c. The identifying tag number shall be permanently etched or embossed onto a stainless-steel tag which shall be fastened to the device housing with stainless steel rivets or self-tapping screws of appropriate size.

d. Where neither of the above fastenings can be accomplished, tags shall be permanently attached to the device by a circlet of 1/16-inch diameter stainless steel wire rope.

e. All FMIDs mounted on or within panels shall have the stainless-steel identification tag installed so that the numbers are easily visible to service and maintenance personnel.

3.03 FIELD TESTING / QUALITY CONTROL

A. FMIDs Field Testing shall conform to the requirements of Section 40 80 82 – PMCS Startup and Field Testing.

B. Section 40 80 82 details how FMIDs specified under this Section shall be verified during Field Testing.

C. The Engineer, or his designated representative(s), reserve the right to witness any test, inspection, calibration or start-up activity.

D. Acceptance by the Engineer of any plan, report or documentation relating to any testing or commissioning activity specified herein shall not relieve the Contractor of his responsibility for meeting all specified requirements.

E. The PMCS Supplier shall provide the services of factory trained technicians, tools and equipment to field calibrate, test, inspect and adjust each instrument to its specified performance requirement in accordance with manufacturer's specifications and instructions.

F. Any instrument which fails to meet any contract requirements, or any published manufacturer performance specification for functional and operational parameters, shall be repaired or replaced, at the discretion of the Engineer, at no cost to the City.

G. The Contractor shall bear all costs and provide all personnel, equipment, and materials necessary to implement all installation tests and inspection activities for equipment specified herein.

H. Field Instrument Calibration Requirements:

1. Each FMID shall be calibrated at 0, 25, 50,75 and 100 percent of span using test instruments to simulate inputs and read outputs.

2. Test instruments shall be rated to an accuracy of at least five (5) times greater than the specified accuracy of the instrument being calibrated.

3. If doubt exists as to the correct method for calibrating or checking the calibration of an FMID, the manufacturer’s recommendations shall be used as an acceptable standard, subject to the approval of the Engineer.

4. Upon completion of calibration, FMIDs calibrated hereunder shall not be subjected to sudden movements, accelerations, or shocks, and shall be installed in permanent protected positions not subject to moisture, dirt, and excessive temperature variations.

5. Caution shall be exercised to prevent such FMIDs from being subjected to overvoltages, incorrect voltages, overpressure, or incorrect air.

6. Damaged FMIDs shall be replaced and recalibrated at no cost to the City.

7. After completion of FMID installation, the PMCS Supplier shall perform a loop check.

8. The Contractor shall submit final loop test results with all FMIDs listed in the loop.

9. Loop test results shall be signed by all Contractor representatives involved for each loop test.

10. Where applicable, test instruments shall have accuracies as set forth by NIST.

I. Calibration Reports

1. The PMCS Supplier shall provide a written calibration sheet to the Engineer for each instrument, certifying that it has been calibrated to its published specified accuracy.

3.04 STARTUP / DEMONSTRATION

A. Section 40 80 82 – PMCS Startup and Field Testing details the requirements for OAD and PMCS Upset and Recovery Testing.

B. The OAD and the PMCS Upset and Recovery Testing shall serve as the final verification of the correct functioning of all FMIDs.

C. Refer to Section 01 79 05 – Equipment Start-Up and Training for additional requirements.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 40 80 81 – PMCS FACTORY TESTING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified and required to perform Witnessed Factory Acceptance Testing of all equipment and components of the PMCS, at the manufacturer's facility.

B. Witnessed Factory Acceptance Testing shall verify that the PMCS, its components and associated equipment functions properly both as units and as an integrated system and that the functional and performance requirements of the Contract Documents are met.

C. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1. Costs under this Section shall include travel, transport, board and lodging for two representatives of the City or the Engineer to attend all PMCS

WFAT at the PMCS manufacturer's facility or approved test facility, in accordance with Section 01 43 15 – Witness Shop Testing.

2. If PMCS equipment and associated components or part thereof require retesting and witnessing is required the Contractor shall be responsible for the associated cost in addition to the travel, transport, board, lodging, and time cost of the witnesses.

1.03 RELATED SECTIONS

A. Section 01 43 15 - Witness Shop Testing
B. Section 28 00 00 - Closed Circuit Television Surveillance System
C. Section 40 61 13 - PMCS General Requirements
D. Section 40 61 26 - PMCS Training
E. Section 40 61 93 - PMCS Input Output List
F. Section 40 61 94 - PMCS Instrument Index
G. Section 40 61 95 - PMCS Monitoring and Control Criteria
H. Section 40 61 96 - PMCS Control Strategies
I. Section 40 63 43 - PMCS Programmable Logic Controllers
J. Section 40 63 53 - PMCS Network Equipment
K. Section 40 67 16 - PMCS Panels and Enclosures
L. Section 40 70 01 - Measurement
M. Section 40 78 90 - PMCS Panel Mounted Instruments and Devices
N. Section 40 79 91 - PMCS Field Instruments
O. Section 40 80 82 - PMCS Startup and Field Testing

1.04 REFERENCES

A. Definitions

1. WFAT - Witnessed Factory Acceptance Tests
2. Section 40 61 13 – PMCS General Requirements defines the terms and abbreviations used in this Section and the PMCS.

B. Reference Standards

1. Section 40 61 13 – PMCS General Requirements lists the standards applicable to this Section and the PMCS.

1.05 DESCRIPTION

A. General

1. The intent of the WFAT is to ensure that all equipment and components of the PMCS and peripherals to be supplied by the Contractor and intended for operation in the Contract Facility and as defined in the Contract documents

demonstrate their performance over their design ranges as individual units and an as integrated system.

2. All the Control Strategy submittals which have been approved for integration into the PMCS and associated equipment shall be demonstrated over the full range of their designed operation.

3. Every attempt shall be made during the WFAT to resolve any issues arising.

4. No issue observed during the WFAT shall be left for resolution during Field Testing unless approved by the Engineer.

5. The Contractor shall provide all necessary supervision, personnel, materials, fluids, facilities, temporary test setups, test fixtures, test equipment, and simulation where approved to perform satisfactory and complete testing.

6. The City representative, Engineer and the Contractor's representative shall be present for all WFATs.

7. Presence of the City and the Engineer at the WFAT does not relieve the Contractor from conforming to the requirements of the Contract Documents.

8. Presence of the City and the Engineer at the WFAT shall in no way imply Acceptance of the PMCS equipment or its components.

B. HMIs

1. Prior to the staging and testing of the system, all display environments shall have been configured per the agreed upon display structure, loaded and data base parameters linked to the specified fields.

C. Notifications and Scheduling

1. The WFAT shall not be scheduled or begun, until all related PMCS Shop Drawings, Test Procedures, Test Documentation and Schedules have been submitted and approved.

2. Integrated PMCS WFAT shall only be scheduled after the PMCS supplier has conducted a non-witnessed factory test and certified that the complete PMCS and associated equipment are ready for a WFAT.

3. The Contractor shall notify the Engineer in writing 90 days before expected initiation of the WFAT.

1.06 QUALITY ASSURANCE

A. The Contractor shall comply with the Quality Assurance requirements listed in Section 40 61 13 – PMCS General Requirements, this Section, and the Specifications.

B. All PMCS components and associated equipment shall be inspected.

1. Inspection shall include but not be limited to the following:

2. Nameplates and tags
3. Wire sizes and color coding
4. Annunciator and terminal block spares
5. Proper wiring practices and grounding
6. Enclosure flatness, finish and color.

1.07 SUBMITTALS

A. The Contractor shall comply with submittal requirements listed in Section 40 61 13 – PMCS General Requirements, this Section, and the Specifications.

B. Contractor shall submit information on factory testing procedures and schedules to verify that testing shall fulfill the requirements specified in this Section and the Specifications.

C. Submittal shall be made at least 90 days months in advance of any scheduled testing and shall include dates of scheduled tests.

D. All panels provided under this Division, and as referred to this Division from other sections shall be factory tested.

E. The procedures for WFATs detailed in this Section shall be submitted for approval by the Engineer.

F. The details of panel simulation software which will be used in conjunction with the PMCS equipment shall submitted for to the Engineer for approval.

G. Working Drawings: The Contractor shall submit for approval working drawings to substantiate conformance with the requirements set forth on the Contract Drawings and in these specifications. All working drawings shall include but not be limited to:

1. Equipment specifications and data sheets identifying all equipment and materials used.
2. Complete assembly and layout drawings with clearly marked dimensions.
3. Factory Acceptance Test (FAT) Procedure and Time Estimates for completion.
4. Interconnecting wiring diagrams.

H. Reports

1. A report on the WFATs completed shall be submitted to the Engineer for approval.
2. Factory test reports shall include the following information:
   a. List of tests performed.
   b. Certified check lists or documentation verifying all I/O has been tested, as specified in this Section.

c. Document verifying all panel wiring has been checked and conforms to the approved submittals with any correction made during the testing.

d. List of all modifications or corrections identified during the WFAT and corrective action taken.

e. Equipment shall not be shipped from the factory until certified factory test reports indicating satisfactory performance have been submitted and approved by the Engineer.

I. Include the following:

1. Calibration Certificates for sensors, instruments, and measurement devices used in the system.

2. Test Report submittals which also should include objective evidence of the system's compliance with specified requirements and performance standards; test procedures, outcomes, deviations, observations, and corrective actions taken.

3. Factory Inspections Records: To validate the manufacturing processes and ensure quality.

4. Certificate of Compliance with relevant industry standards, etc.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall comply with delivery, storage and handling requirements listed in Section 40 61 13 – PMCS General Requirements.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Factory Testing shall be as implemented by the PMCS Supplier.

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. HMIs and Printers

1. The overall display structure shall be demonstrated, including environment configurations, passwords, security, etc.

2. The display contents of memos shall be reviewed to demonstrate how an operator navigates within the overall display structure.

3. The assignment of displays to annunciator keys shall also be demonstrated.

4. Each graphic display shall be reviewed for correctness in terms of the layout, symbols, color scheme, etc.

5. The operation of standard alarm management displays (Current Alarm Display. Alarm History, etc.) shall also be demonstrated.

6. A demonstration of each type of report specified shall be performed.

   a. Printing shall be an integral part of the report demonstration.

B. PMCS Hardware Operational Testing

1. All Input/Output devices and components shall be tested to verify operability and basic calibration.

2. All PMCS hardware components and associated equipment shall be tested to verify proper operation of the equipment as standalone units. Test shall include, but not be limited to, the following:

   a. AC/DC power checks

   b. Power fail/restart tests

   c. Diagnostics checks

   d. Test demonstrating that all specified equipment functional capabilities are working properly.

3. All system components shall be tested to verify that communication between units is working properly.

4. An integrated PMCS test with all system equipment connected (excluding field sensors and instruments) shall be performed to verify that all equipment is performing properly as an integrated system.

5. All field sensors and instruments shall be simulated over their operating ranges inclusive of major set points.

C. PMCS Software Demonstration

1. Contractor shall demonstrate all system software utility and security programs incorporated into the PMCS to illustrate the various functions and capabilities specified.

2. Contractor shall demonstrate the operation and display of all software based on a simulation of 20 percent of total Input/Output count, both analog and discrete, as selected by the manufacturer.

3. The City/Engineer shall also randomly select, at the time of the test, additional Input/Output to be simulated in an amount approximately equal to 10 percent of total Input/Output count.

4. Demonstration shall show that the monitoring and control application software associated with the Input/Output points performs the functions intended, and as specified in Section 40 61 96, PMCS Control Strategies.

D. System performance shall be tested using a fully integrated system, including all software and hardware if applicable.

1. To achieve this, the entire control system, including all the peripheral devices and all interconnecting cables, shall be assembled on the factory test floor and simulated inputs applied.

2. Every device shall have nameplate with description and device's P&ID tag number.

3. Nameplates shall be removable and interchangeable for multiple use during the test.

4. Simulated inputs/outputs shall at minimum include:

a. Toggle switches to simulate field or other input contacts

b. Indicating lights to simulate outputs from tested panels

c. Control relays to simulate MCC coil inputs

d. Time relays to simulate position switches

e. Indications (mA) to indicate every 4-20 mA output from tested panel

f. Potentiometers to simulate 4-20 mA inputs to tested panel

5. The Contractor shall carry out a full system test, during which the entire system shall operate continuously without failure in accordance with the requirements of the Specifications and Drawings

6. Demonstration of communication between PLC's or to remote I/O's shall be included in the Test Procedure where applicable. At least one representative from the City and the Engineer shall be present for the PLC Function Testing. All Input/Output points shall be tested to ensure they are functional. The PLC test shall provide simulation of equipment to ensure that the System functions properly as programmed in order to avert unanticipated field test failures.

7. New Operator Interface Terminals: Prior to the staging and testing of the system, the display environments shall have been configured per the agreed upon display structure, loaded, and data base parameters linked to the specified fields. During this phase of the factory acceptance test, the overall display structure shall be demonstrated, including graphic configuration, passwords, security, etc. The memo display contents shall be reviewed to demonstrate how an operator navigates within the overall display structure. The assignment of displays to annunciator keys shall also be demonstrated. Each graphic display shall be reviewed for correctness in terms of the layout, symbols, color scheme, etc. The operation of standard alarm

management displays (Current Alarm Display, Alarm History, etc.) shall also be demonstrated.

E. Contractor Responsibilities:

1. For factory tests of equipment and systems, the Contractor shall furnish all labor, fuel, power, water, materials, plant and instrument air, instruments, equipment, hardware, and software etc., needed for the tests.

2. The Contractor shall furnish all labor necessary for supervision, adjustment and tuning of equipment as well as materials, instruments, equipment, etc., and any additional labor for testing not furnished by the City.

3. The Contractor shall include the costs for two representatives of the City and two representatives of the Engineer to witness factory test in the lump sum bid for this Contract. See Witness Shop Testing – 01 43 15.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Testing

1. Field Testing shall conform to the requirements of Section 40 80 82 – PMCS Startup and Field Testing.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 40 80 82 – PMCS STARTUP AND FIELD TESTING
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all supervision, labor, materials, equipment and incidentals as shown, specified and required to furnish and install all equipment and coordinate all activities necessary to perform check out, start up and field testing of the PMCS and all associated equipment.

B. The Contractor shall retain the services of the Supplier(s) to supervise and/or perform check-out and startup of all system components. As part of these services, the Supplier(s) shall include for those equipment items not manufactured by him or her the services of an authorized manufacturer's representative to check the equipment installation and place the equipment in operation. The manufacturer's representative shall be thoroughly knowledgeable about the installation, operation, and maintenance of the equipment.

C. The Contractor shall supply provisions for video recording of the training specified under this Section.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 28 00 00 - Closed Circuit Television Surveillance System
B. Section 40 61 13 - PMCS General Requirements
C. Section 40 61 26 - PMCS Training
D. Section 40 61 93 - PMCS Input Output List
E. Section 40 61 94 - PMCS Instrument Index
F. Section 40 61 95 - PMCS Monitoring and Control Criteria
G. Section 40 61 96 - PMCS Control Strategies
H. Section 40 63 43 - PMCS Programmable Logic Controllers
I. Section 40 63 53 - PMCS Network Equipment
J. Section 40 67 16 - PMCS Panels and Enclosures
K. Section 40 70 01 - Measurement
L. Section 40 78 90 - PMCS Panel Mounted Instruments and Devices
M. Section 40 79 91 - PMCS Field Instruments
N. Section 40 80 81 - PMCS Factory Testing

1.04 REFERENCES

A. Definitions

1. SFT – Start-up and Field Testing.
2. OAD – Operational Availability Demonstration.
3. URT – Upset and Recovery Testing.
4. WFAT – Witnessed Factory Acceptance Tests.
5. Section 40 61 13 – PMCS General Requirements defines the terms and abbreviations used in this Section and the PMCS

B. Reference Standards

1. Section 40 61 13 – PMCS General Requirements lists the standards applicable to this Section and the PMCS.

1.05 DESCRIPTION

A. Start-up and Field Testing of the PMCS and associated equipment shall include but not be limited to the following:

1. Check Out, Start up and Initial Operation of Equipment.
    a. Instrument calibration and operation
    b. Cable and wire testing
    c. Instrument Loop testing
    d. Control panel installation test
    e. Local control of equipment
    f. PLC and I/O operation
    g. I/O loop testing
2. Final Field-testing of Equipment
    a. Control panel operational testing
    b. Instrument full operation testing
    c. Verification of local and remote control of individual equipment
    d. Execution of control strategies for individual equipment
3. Check Out, Start up and Initial Operation of System Equipment
    a. Process control panel local system operation
    b. Preliminary loop tuning
    c. Remote control of systems
    d. Individual and system loop operation
    e. Network and communication link testing
    f. Network and communication performance testing
    g. Execution of local system logic and control
4. Final Field-testing of Systems
    a. Execution of control strategies for equipment systems
    b. Network and communication optimization

B. Integrated System Field Test

C. Operational Availability Demonstration

D. PMCS Upset Testing

1.06 QUALITY ASSURANCE

A. The Contractor shall comply with the Quality Assurance requirements listed in Section 40 61 13 – PMCS General Requirements, this Section and the Specifications.

B. The Contractor shall retain the services of the PMCS Supplier to supervise, coordinate and perform check-out and start-up of all PMCS components and associated equipment.

C. All I/O points, loops, and functions including spares shall be fully operational and undergo Start up and Field Testing.

D. Start up and Field Testing shall be conducted on all PMCS and associated equipment including those for which Factory Testing has been completed.

E. As part of these services, the PMCS Supplier shall include for those equipment items not manufactured by him, the services of an authorized manufacturer's representative to check and certify the equipment installation and place the equipment in operation.

F. Each manufacturer's representative shall be thoroughly knowledgeable about the specific installation, and factory certified in the installation, operation, and maintenance of the equipment.

G. Start-up and Field Testing shall include but not be limited to, field and panel devices, hardware, software, communications, and programming.

H. Simulators and test equipment may be used for the following test phases:

1. Check-out, Start-up and Initial Operation of all equipment and systems

I. Actual field conditions, process variables and process fluids shall be used for the following test phases:

1. Final Tests
2. Integrated System Field Test
3. Operational Availability Demonstration
4. PMCS URT

J. The PMCS Supplier's personnel shall be present for and participate in all phases of the testing of the entire PMCS including all process equipment and systems monitored and controlled by PMCS.

K. Strat-up and Field Testing shall only be considered complete upon the successful performance of all specified functions.

L. Acceptance of PMCS and all associated equipment by the City is contingent upon the approval by the Engineer of all Test Reports.

1.07 SUBMITTALS

A. The Contractor shall comply with submittal requirements listed in Section 40 61 13 – PMCS General Requirements, this Section and the Specifications.

B. Contractor shall submit information on all SFT procedures and schedules for the approval of the Engineer, to verify that testing shall fulfill the requirements specified in this Section and the Specifications.

C. Submittal shall be made at least 90 days in advance of any scheduled testing and shall include dates of scheduled tests.

D. The details of simulation panel and simulation software which will be used in conjunction with the PMCS equipment shall be submitted to the Engineer for approval

E. Complete and detailed information, shall include but not be limited to:

1. Test Flow Charts outlining both the testing and responsibilities of all parties.

2. Proposed log sheets showing what, when and how all test parameters will be recorded and by whom.

3. Proposed reporting formats listing all the information to be recorded for each test

F. Test Reports

1. A report on the each SFT activity completed shall be submitted to the Engineer for approval.

2. Reports shall include the following information:

a. List of tests performed.

b. All raw field test data, test personnel notes, witness comments

c. Certified check lists or documentation verifying all I/O has been tested, as specified in this Section.

d. Test documentation demonstrating that all digital and analog points of the PMCS residing in all controllers and databases have been conformed to be accurately linked to their respective instrument tag names, database tags and assigned names real or virtual.

e. Document verifying all panel wiring has been checked and conforms to the approved submittals with any correction made during the testing.

f. Confirmation that all modifications or corrections identified during the WFAT have been incorporated into the build of the PMCS an associated equipment tested.

g. Confirmation that all modifications or corrections identified during the SFT have been incorporated into the SFT documentation marked up corrective actions taken.

G. Each major phase of test, such as OAD, shall not commence until certified test reports indicating satisfactory performance of prior major phases have been submitted and approved by the Engineer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall comply with delivery, storage and handling requirements listed in Section 40 61 13 – PMCS General Requirements.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. PMCS Start-up and Field Testing shall be as implemented by the PMCS Supplier.

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. PMCS Factory Testing shall conform to the requirements of Section 40 80 81 – PMCS Factory Testing.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Not Used

3.03 FIELD TESTING / QUALITY CONTROL

A. Equipment/System Check Out, Start-up and Initial Operation

1. The Contractor, under the supervision of the PMCS supplier, and other instrument suppliers as applicable, shall perform the following:

   a. Check and approve the installation of all PMCS components and all cable and wiring connections between the various system components prior to testing the various processes and equipment.

   b. Conduct a visual inspection to verify that all components are properly installed, connected, and labeled as per the specifications.

   c. Conduct a complete system checkout and adjustment, including calibration of all instruments, tuning of control loops, checking operation functions, and testing of final control actions. Provide Instrument Calibration certificates for all instruments provided in the contract.

d. Communication Testing: Test communication links between PLCs, HMIs, field devices, etc. Ensure data transmission, network integrity, and protocol compatibility.

e. Loop Checks: Conduct loop checks to verify the integrity and performance of control loops; adjust tuning parameters as needed to optimize control response.

f. Conduct a Functional testing of individual components and subsystems, test of Input/Output signals, control logic, alarms, interlocks, and other functions.

g. Software Verification including Test logic sequences, alarm handling, setpoint adjustments, and operator interactions.

h. Where future operational functions are included in this work, they shall be included in the check-out.

i. All problems encountered shall be promptly corrected to prevent any delays in start-up of the various unit processes.

2. The Contractor shall provide all test equipment necessary to perform the testing during system checkout and start-up.

3. The Contractor and PMCS Supplier shall be responsible for initial operation of system and shall make any required changes, adjustments or replacements for operation, monitoring and control of the various processes and equipment necessary to perform the functions intended.

4. The Contractor shall furnish to the Engineer certified calibration reports for all field instruments and devices specified in Section 40 79 91 – PMCS Field Instruments and Section 40 78 90 - PMCS Panel Mounted Instruments and Devices, as soon as calibrations are completed.

5. The Contractor shall furnish the Engineer an installation inspection report certifying that all equipment has been installed correctly and is operating properly.

6. The report shall be signed by authorized representatives of both the Contractor and the PMCS Supplier.

B. Integrated System Field Test

1. Following the PMCS and associated equipment checkout and initial operation, the Contractor, under the supervision of the PMCS Supplier, shall perform a complete system test to verify that all equipment and programmed software is operating properly as a fully integrated system, and that the intended monitoring and control functions are fully implemented and operational.

2. Provide Functional Testing and Optimization (comprehensive functional testing, and optimization of control parameters, setpoints, and alarm thresholds for performance and efficiency.

3. Provide Performance Verification: Measure response times, accuracy, stability, and reliability under varying operating conditions.

4. Any defects or problems found during the test shall be corrected by the Contractor and then re-tested to demonstrate proper operation.

5. The PMCS including field sensors/transducers and instruments shall be running and fully operational for a continuous 72 hour period.

6. The City and the Engineer shall agree that the Integrated System Field Test has successfully concluded with no issues to be resolved at the end of the 72 hour period.

3.04 STARTUP / DEMONSTRATION

A. Operational Availability Demonstration

1. The OAD shall commence upon approval by the Engineer after the Integrated System Field Test has been accepted by the City and the Engineer.

2. The OAD shall run continuously from initiation, for 60 days, during which time the PMCS and all associated equipment (hardware and software) shall achieve a minimum of a 99.9% or better availability with no system failures.

3. Any system failures which occur after the initiation of the OAD shall cause the current 60 day period to be terminated and a new 60 day period started after the correction of the failure.

4. During the OAD the PMCS and associated equipment shall be available to plant operating personnel for use in normal operation of the Plant.

5. For the purpose of the OAD the system will be defined as consisting of the following systems and components:

   a. All operator interfaces

   b. All Local Control Panels

   c. All Local Control Stations

   d. All PLCs residing in equipment controlled by the PMCS.

6. The conditions listed below shall constitute system failures which count towards the termination of the OAD:

   a. Failure to repair a hardware or software problem within 120 consecutive hours from the time of notification of a system failure.

   b. If the same hardware or software problem occurs three times or more times.

   c. Software problem causing a processor to halt execution.

7. The following conditions shall constitute a system failure in determining the system availability based on the equation specified in this Section:

a. Failure of any non-redundant operator interface or PLC.

b. Loss of communications between devices on the communications network.

c. Failure of one or more Input/Output components.

d. Failure of any type affecting ten or more Input/Output points simultaneously.

e. Failure of any type affecting one or more regulatory control loops or sequential control strategies thereby causing a loss of the automatic control of the process variable or process sequence operation.

f. Failure of power supply. Where redundant power supplies are provided, failure of one power supply shall not constitute a system failure provided the backup power supply operates properly and maintains supply power.

g. Failure of the backup supply to operate properly and maintain supply power shall constitute a system failure.

h. Failure of three or more primary sensors/transducers or field instruments simultaneously.

B. The system availability shall be calculated based on the following equation:

1. A = ((TTO)/(TTO+TTR)) x 100% where

a. A = system availability in percent

b. TTO = total time in operation

c. TTR = total time to repair

d. Time to repair shall be the period between the time that Contractor is notified of a system failure and the time that the system has been restored to proper operation in terms of hours with an allowance for the following dead times which shall not be counted as part of the time to repair period.

1) Actual travel time for service personnel to get to the plant site up to 6 hours per incident from the time the Contractor is notified of a system failure.

2) Time for receipt of spare parts to the plant site once requested up to 24 hours per incident.

3) No work shall be done on the system while waiting for delivery of spare parts.

4) Dead time shall not be counted as part of the system available period.

5) The dead time shall be logged and the duration of the OAD extended for an amount of time equal to the total dead time.

C. All parts and maintenance materials required to repair the system prior to completion of the OAD shall be supplied by the Contractor at no additional cost to the City.

D. If parts are obtained from the required plant spare parts inventory, they shall be replaced to provide a full complement of parts as specified.

E. A Plant Monitoring and Control System Malfunction/Repair Reporting Form shall be completed by the plant personnel and the Engineer to document system failures, notifications to the Contractor, arrival and repair times and the Contractor repair actions. Format of the form shall be developed and agreed upon prior to the start of the OAD.

F. PMCS Upset and Recovery Testing.

1. The Contractor shall conduct Upset and Recovery Testing of the entire PMCS provided under this contract and all equipment monitored or controlled by the System.
2. URT shall prove the fault tolerance and failure response across the entire PMCS.
3. URT shall be performed after the OAD and shall be imitated from a steady state condition of the PMCS
4. URT shall continue for three consecutive workdays (24 hours).
5. URT shall consist of intentional, non-destructive shutdown and failure of portions of the PMCS equipment, and systems.
6. The Engineer and the City shall randomly pick individual pieces of operating equipment such as Pumps, valves, instruments, controls, etc. to be disabled or tripped and process variables and set points to be modified.
7. The PMCS and associated equipment shall respond as specified to the upset.
8. PMCS and associated equipment responses shall be monitored and recorded.
9. Various failure modes and conditions shall be tried on all equipment.
10. Failure modes to be tested shall include but not be limited to:
    a. closing valves
    b. stopping flows
    c. tripping pumps
    d. emergency stops
    e. set point changes
    f. simulated scenarios

g. the system bypasses, etc.

h. Multiple failure scenarios shall also be tried.

i. Full manual and semiautomatic back up modes shall also be tested

j. UPS run times shall be tested and several PMCS equipment "black starts" shall be attempted to test PMCS restart capability after a prolonged power outage.

k. OITs, PLCs, and software shall be stopped; portions of the entire network shall be disabled.

11. PMCS URT Responses

a. The PMCS must respond immediately by

b. generating the proper alarms

c. starting backup or sequential equipment

d. shutting down remaining affected equipment in accordance with the Control Strategies, programmed sequences, and safety and interlock logic.

e. All equipment and controls shall respond per design.

f. Each PLC must continue to control properly, monitor and alarm the equipment that it operates while disconnected from the PMCS.

g. Portions of the PMCS which have been stopped shall not cause usable portions of PMCS to stop running.

12. PMCS URT Recording

a. Status of the PMCS shall be recorded and monitored.

13. Unexpected or undesirable results, or failure of PMCS to correctly respond to an upset, shall result in stopping the test, making repairs or changes, retesting the changes and then restarting the test.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 41 22 23.19 – MONORAIL HOISTS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to furnish, install, and test all monorail hoisting equipment, complete and operational, including but not limited to: monorails, trolleys, hoists, motors, electrical supply and control systems.

B. The following index of this Section is presented for convenience:

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C. The following schedules, attached after the "End of Section" designation, are a part of this Section:

1. Schedule 41 22 33.19-1, Electric Monorail and Hoist Requirements.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 05 23.02 – Miscellaneous Metal Fastenings

B. Section 09 91 00 – Painting

C. Section 40 05 97 – Identification for Process Equipment

D. Section 40 61 95 – PMCS Monitoring and Control Criteria

E. Section 40 80 81 – PMCS Factory Testing

F. Section 26 05 91 – Low Voltage Electric Motors

1.04 REFERENCES

A. Definitions:

1. CMAA: The Crane Manufacturers' Association of America
2. HMI: Hoist Manufacturers Institute
3. MHI: Materials Handling Institute
4. MMA: Monorail Manufacturers Association
5. UL: Underwriters Laboratories

B. Reference Standards:

1.	AGMA	American Gear Manufacturers Association
2.	ASME B30.11	Monorails and Underhung Cranes
3.	ASME B30.16	Overhead Hoists (Underhung)
4.	ASME HST-4	Performance Standard for Overhead Electric Wire Rope Hoists
5.	CMAA	Crane Manufacturer's Association of America
6.	HMI 100	Electric Wire Rope Hoists
7.	MMA	Specifications for Overhead Track Systems
8.	NACM	National Association of Chain Manufacturers
9.	NEC	National Electric Code
10.	NEMA	National Electric Manufacturers Association
11.	NYCBC	New York City Building Code
12.	NYCEC	New York City Electrical Code

1.05 DESCRIPTION

A. The hoisting equipment systems shall consist essentially of hoist, trolley, motors and push-button control stations.

1. All equipment furnished under this Section shall be from a single hoisting equipment manufacturer or supplier.

B. The hoisting equipment manufacturer shall design, furnish, shop test, and supervise the installation of instrumentation and controls, coordinated to function as a system,

providing and accepting appropriate signals to start and stop the hoisting equipment as required for safe, trouble-free operation.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Manufacturer shall be a member of at least two (2) of the following institutions:

a. CMAA; or

b. The HMI; or

c. The MHI; or

d. The MMA; or

e. Approved equal.

2. The manufacturer shall have a minimum of five (5) years experience in the design and manufacture of equipment of the specified size and type.

B. Equipment furnished under this Section shall be a standard product of the manufacturer and shall conform to all recommendations of the HMI, unless otherwise specified.

C. All equipment provided under this Section shall be obtained from a supplier or manufacturer who shall assume full responsibility for the completeness of the system.

1. The supplier shall be the source of information on all equipment furnished regardless of the manufacturing source of that equipment.

D. See Section 2.04 for QA requirements.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Proof of membership in the HMI and MMA, or demonstration that the standards and experience required for membership are possessed.

b. Equipment specifications and data sheets identifying all operating information, materials used, and methods of fabrication.

c. Complete assembly, layout, and installation drawings with clearly marked dimensions, anchor bolts, and grouting requirements.

d. Weights of all component parts and assembled unit weights.

e. Operating loads.

f. Example equipment nameplate data sheet.

g. Schematic diagrams for electric and control systems showing wiring for individual equipment items and interconnecting wiring diagrams.

h. List of recommended lubricants and lubricant specifications.

i. Shop and field testing procedures.

j. Deviations from the Contract Documents.

k. Wiring diagrams with numbered terminal blocks for all external connections.

l. Description of control system.

m. Motor Tests and Data: For each motor submit a certified motor test data sheet or a certified motor data sheet from an electrically duplicate motor, in accordance with Section 26 05 91, Low Voltage Electric Motors.

n. Operation and Maintenance Manuals in accordance with the requirements of the Contract Documents.

o. Comprehensive schematic diagrams showing wiring for each individual item of electrical equipment and all interconnecting wiring; the latter to be clearly indicated as to be furnished and installed by others, if such is applicable.

2. Information Submittals:

a. Recommended spare parts other than those specified.

b. Recommendations for short and long term storage.

c. Reports:

1) All shop test and field test reports and certificates.

2) All manufacturer's site visit reports.

d. The manufacturer's instructions on installation procedures.

e. Calculations for sizing of all beams including supports, sealed and signed by a New York registered Professional Engineer.

f. Certification by a registered Professional Engineer stating that the design of each hoist system conforms to the applicable standards and codes and is as specified.

g. Approximate shipping weights.

h. Submit proof of manufacturer’s membership in the required associations or demonstrate that the standards and experience required for membership are possessed, all to the satisfaction of Engineer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. Deliver materials to the site to ensure uninterrupted progress of the Work.

2. Major structural components shall be prepared for shipment in accordance with the carrier's specifications. All other components, push-button control stations and loose pieces shall be skidded, crated, or palleted to the carrier's specifications.

3. All skids, carriers, and pallets shall be enclosed in water-tight plastic wrapping, 6 mil minimum thickness.

4. Master shipping list shall be supplied showing the quantity of each section, subassembly, or piece, the piece number and the drawing on which each subassembly or piece is detailed.

B. Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. All equipment shall be prominently marked for identification in assembly:

a. The part identification shall be stenciled conspicuously on large pieces of equipment.

b. Small parts shall have a metal tag wired in place with identification stamped or etched.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Contractor shall provide spare parts and special tools necessary to service, disassemble, repair and adjust the equipment provided under this Section, and as per the requirements of the Contract Documents.

B. In addition, provide the following spare parts for each monorail hoisting system:

1. One replacement parts kit and one operating coil for each monorail hoist installed.

2. One complete set of linings for each type and size of brake.

3. One replacement set of all collector shoes.

4. One complete replacement wire rope, complete with swaged end fittings for each hoist.

5. Pendant plus cable assembly for each hoist, packed in a portable and lockable steel or fiberglass container.

6. One complete set of push-button inserts for each push-button station.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hoists and Trolleys:

1. Yale Hoists, as manufactured by Columbus McKinnon Corp., Getzville NY.
2. ACCO Material Handling Solutions, York, PA.
3. Sissco Hoist & Crane, Division of Permadur Industries, Inc., Hillsborough, NJ.
4. Or approved equal.

B. Monorail Track:

1. TC/American Monorail, Inc., Saint Michael, MN.
2. Cleveland Tramrail, as manufactured by Gorbel, Inc., Fishers, NY.
3. Or approved equal.

C. Electrification:

1. Electromotive Systems Inc.- Magnetek Inc., Menomonee Falls, WI.
2. Conductix - Wampfler Inc., Omaha, NE.
3. Duct-O-Wire Company, Oconomowoc, WI.
4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. General:

1. Hoisting equipment shall comply with the safety and specification standards of ASME B30.11, ASME B30.16, and ASME HST-4.
2. Hoists and trolleys shall be specially designed, constructed and installed for the service intended. All features necessary for satisfactory operation and functioning of the hoisting equipment shall be provided, whether or not they are described in these Sections. Hoists and trolleys shall meet the specific requirements of Schedules 41 22 23.19-1, located after the "End of Section" designation.
3. All parts of the mechanisms shall be amply designed and constructed for the maximum stresses occurring during fabrication, installation and continuous operation. All materials shall be new. All parts of duplicate equipment shall be interchangeable without modification, and all parts subject to wear shall be of standard pattern and easily replaceable without the necessity of special cutting and fitting.
4. The equipment shall be designed and manufactured in accordance with the codes and standards listed herein. They shall be considered an integral part

of this Section and shall govern the design, fabrication, testing and inspection of equipment, except as otherwise shown or specified herein.

B. Motor Drives:

1. Motors shall conform to the requirements of Section 26 05 91, Low Voltage Electric Motors, and the following additional requirements:

a. Enclosure shall be TEFC.

b. Insulation: Class F.

c. Service Factor: 1.15. Motors shall be non-overloading at rated crane capacity.

d. Power Supply: As specified in Schedule 41 22 23.19-1, located after the "End of Section" designation.

e. Provide winding thermostats for overcurrent protection.

f. Bearings: Anti-friction, L-10: 100,000 hours, lifetime pre-lubricated and sealed.

2. Gear Reducers:

a. General:

1) Close coupled to electric motor.

2) Provide gear reducers conforming to AGMA Standards.

3) Minimum Service Factor Based On Maximum Motor Nameplate Horsepower: 1.5.

4) Thermal Rating: 160 degree F maximum under full load continuous operation.

5) Minimum Efficiency: 95 percent.

6) Size: Based on nameplate motor horsepower times service factor of reducer.

b. Gearing:

1) Type: Spur, helical or combination helical and worm gears.

2) AGMA Quality: 5 or better.

3) Provide gears hobbed and ground smooth.

c. Shafts: Alloy steel

d. Enclosure: Manufacturer's standard. Provide inspection cover, oil fill and drain connections and means for inspection of oil level.

e. Lubrication: Oil

f. Bearings: Antifriction type with a minimum L-10 life of 5,000 hours, lifetime pre-lubricated and sealed.

C. Motor-Driven Trolleys:

1. General:
   a. Motor-driven trolleys shall be compatible with the hoist assembly and of the type specified herein.
   b. The trolley wheels shall be compatible with the furnished monorails and shall be supplied by the monorail manufacturer.
   c. Trolley shall conform to the requirements of HMI-100.
2. Construction:
   a. Trolley shall be fabricated from standard structural steel plates, channels and angles. Frame shall be adequately braced to resist deflection under all dead, live and impact loads in all directions.
   b. Frame shall be precision machined to accept the hoist and traverse mechanism without shimming or selective fitting.
   c. Provide restraining lugs on trolley to limit drop of the trolley to 1 inch or less and preventing rotational movement in all three axes.
   d. Attach load bars to yokes in such a manner that all wheels will stay in contact with the operating flange at all times.
   e. Wheels:
      1) Trolleys for hoists rated 2-ton capacity or less shall have a minimum of 4 wheels. Trolleys for hoists rated higher than 2-ton capacity shall have a minimum of 6 wheels.
      2) Each wheel shall be removable without removing the trolley from the track.
      3) Wheels shall have hardened treads, minimum Brinell Hardness of 400 to 450.
      4) Wheel bearings shall be precision ball or tapered roller bearings with minimum L-10 life of 10,000 hours and permanently grease lubricated.
      5) Wheels shall be true and concentric to within 0.005-inch runout.
      6) Drive wheels shall be matched in diameter to within 0.001-inch per inch diameter, or 0.01-inch, whichever is less.
3. Trolley Drives:
   a. Motorized trolley drives shall be as specified in Schedule 41 22 23.19-1, located after the "End of Section" designation.
   b. Brake shall be magnetic release disc type as follows:
      1) Adjustable and self-compensating for wear.
      2) Integrally mounted to the motor.

3) Set at 50% of rated drive torque.

D. Electric Hoists:

1. General:

a. Hoists shall be suitable for the application and for the trolleys and monorails as specified.

b. Hoist drive shall include a direct-coupled motor, solenoid brake, geared train with inherent load brake, motor brake, built-in load limiter, hook, wire rope, bottom block, load sheave, adjustable limit stop and drum.

c. Lift: As required to meet the clearances shown and indicated in Schedule 41 22 23.19-1.

d. Hoist Lifting Speed: As specified in Schedule 41 22 23.19-1.

2. Construction:

a. Type: Electric wire rope hoists.

b. Duty Class: H-3 HMI-100.

c. Motor size shall be as specified in Schedule 41 22 23.19-1.

d. Gear Train:

1) Conform to applicable AGMA Standards.

2) Provide oil sight gauge on the housing for visual inspection of oil level.

e. Drum:

1) Material: Carbon Steel

2) Diameter; 19X rope diameter, minimum

3) Provide drum so that two (2) full turns of the rope remain in the grooves when hook is at the lowest position and rope does not overlap when the hook is at highest position.

4) Grooves: Machined, not less than half the nominal rope diameter in depth.

5) Provide large flanges on each end, closely seated within the hoist frame, to prevent rope bind or pinch.

f. Wire Rope:

1) Material: Type 316 stainless steel

2) Strength: The rated load divided by the number of parts of the rope shall not exceed 20 percent of the nominal breaking strength.

g. Motor Brake:

1) D.C. rectified disc type, or AC multiple disc type, self-adjusting and rated for 250% of motor torque.

2) Provide motor brake separate from the gear housing for rapid cooling.

3) Enclosure: Totally enclosed, dust-proof, weather resistant.

h. Mechanical Load Brake:

1) The mechanical load brake shall be capable of holding the full load independent of the magnetic load brake.

2) Type: Automatic Weston-type multiple disc.

3) The mechanical load brake shall control the load acceleration while being lowered.

4) Wear compensation adjustment shall not be required on the brake.

5) Lubrication: Oil bath.

6) The mechanical load brake shall be mounted on a separate gear train shaft.

i. Hook Block:

1) Hook shall be standard design, forged steel, with safety latch, sufficient for the rated load.

2) Hook shall be supported on an anti-friction thrust bearing allowing 360-degree rotation of the load.

3) Sheaves shall be forged steel, supported by medium duty, permanently lubricated and sealed roller bearings. Minimum sheave diameter shall be 20 times the rope diameter.

3. Protective Devices:

a. Overload Cut-off: Provide overload cut-off to protect the hoist against lifting heavier than rated load. The cut-off device shall interrupt the raising circuit to the hoist motor and reset automatically when the overload is removed.

b. Limit Switches:

1) Provide geared upper and lower limit switches for each hoist.

2) Provide a back-up weight activated upper limit switch.

E. Electrification:

1. General:

a. Provide system with all necessary junction boxes, trolleys, festoon track, bends, brackets, joint kits, two arm kits, stops, supports and mounting hardware required for a complete installation.

b. Power supply shall be provided by NEC Type SO cable.

c. Starters and variable frequency drives, where required, shall be supplied with the hoisting equipment and mounted locally. Starters, VFDs and enclosures shall conform to the Contract Documents.

d. Provide a suitable number of conductors for power, control and grounding; sized to carry the required current to all connected motors when operated at rated conditions.

e. Give special consideration to clearance, headroom and load approach requirements in designing layout of electrification. System layout shall permit full travel of the equipment.

f. Cables shall not interfere with the operating equipment.

g. Electrification equipment shall be as required by Schedule 41 22 23.19-1.

2. Festoon System for Electrification:

a. Festoon system shall consist of neoprene-jacketed, multi-conductor flat cables with separate control and power conductors. Cables shall be suspended from trolleys mounted on a heavy-duty C-track parallel to the hoist monorail. Track and trolleys shall be non-sparking construction.

b. Provide cable lengths equal to 110 percent of the required length in order to avoid over-stressing.

c. Multi-conductor cables shall be minimum No. 16 and be stranded for flexing operation. Include minimum 10 percent spare wires in each cable.

d. Cable: UL Listed flat cables rated for 85 amps at 40 degrees C, minimum.

e. Loop Length: 5'-0" max.; storage: 4'-0", max.

f. Provide all assembly and mounting hardware of Type 316 stainless steel.

g. Festoon cable shall be comparable to Types ST and STO flexible cords for insulation and rating.

h. Trolleys: Provide one towing trolley and standard trolleys as required:

1)	Body:	Fiberglass reinforced polyamide
2)	Rollers:	Non-ferrous bronze
3)	Ball Bearings:	Dustproof and waterproof, sealed for life

4) Bumpers: Rubber.

i. Tow cables:

1) Festoon cable trolleys shall be connected by tow cables whose length shall be slightly shorter than the electric cable length between trolleys.

2) Provide a strain relief cable between the first trolley and the adjacent wall

3) Tow cables, strain relief cables and components shall be stainless steel.

j. Track:

1) Provide Type 316 stainless steel 'C'-track of suitable size and strength for support of the cable and trolleys.

2) Provide arm and tow rope assembly for proper spacing of trolleys. Tow rope assembly shall include polyamide rope, thimbles and rope clamps.

3) Provide adequate track length for bunched trolleys on service end.

k. End Clamps: Provide fixed end clamps with outrigger arms where required.

l. Provide all wire, cable, connectors, junction boxes, supports, special tooling and incidentals as required for power and control hookups.

3. Cable Reel Electrification:

a. Provide cable reel system consisting of multi-conductor power and control cable and cable reel to maintain a consistent pull on the cable to prevent sagging.

b. Cable reels shall be weather-resistant, self-winding, spring operated, and explosion proof construction.

c. Cable reels shall have swivel bases.

d. Cable reels shall have roller outlets.

e. Hardware shall be Type 316 stainless steel.

F. Controls:

1. Hoist Limit Control:

a. Provide upper and lower limit switches.

1) The upper limit switch shall stop the hoist motor and activate the holding brake when the load hook reaches its upper limit.

2) The lower limit switch shall activate the holding brake when the load hook reaches its lower limit.

2. Contactors:

   a. Each control shall have magnetic contactors sized for the specified class of service.

   b. Reversing contactors shall be mechanically and electrically interlocked to prevent line-to-line faults and shall be provided with automatic reset thermal overloads for the hoist motor.

3. Pendant Control Station:

   a. The motion control pushbutton actuators shall spring return to off.

   b. Pendant control station shall be mechanically supported to protect the electrical conductors against strain.

   c. Provide sufficient cable for the pendant control station to reach within 4 feet of the operating floor.

   d. The function of each push-button actuator shall be clearly marked and shall indicate the direction of resultant motion.

   e. The maximum voltage in the pendant control station shall be 40 VAC.

   f. Push buttons shall be arranged in multiples as follows:

      1) Start-Stop

      2) Raise-Lower

      3) Forward-Reverse

   g. The pendant control station shall also include an Emergency Stop pushbutton.

4. Enclosures: All enclosures shall match the service conditions for the respective monorail hoist system specified in Schedule 41 22 23.19-1, located after the "End of Section" designation.

G. Monorails:

1. The monorail beam(s) shall be as shown on the Contract Drawings, meet the requirements of CMAA Specification Standards, and shall be provided with all necessary supports and appurtenances.

2. Design requirements:

   a. Maximum Allowable Stress: 20 percent of ultimate strength.

   b. Impact Factor: 25 percent of rated load.

   c. Maximum Deflection: Span/600.

   d. Maximum ratio of span to width of top flange: 50 to 1.

   e. Minimum width of bottom flange: 4.5-inch.

   f. Position loads for worst case loadings for stress and deflection analysis.

g. Bottom tee of monorail track:

1) Tensile Strength: 115,000/125,000 psi

2) Brinell Hardness: 210/230

3. Monorail track shall be high carbon steel, raised tread, patented track.

4. Tracks shall be straight with continuously welded sections and factory prepared ends. Welding shall be continuous submerged arc.

5. End stops shall be bolted and moveable. End stops shall be capable of withstanding the impact of a fully loaded hoist traveling at maximum speed.

6. Holes for splices shall be factory drilled.

7. Tripping bars for limit switches shall be Type 316 stainless steel and shall be attached with Type 316 stainless steel hardware.

8. Provide a suspension system connected to the building structure as shown on the Contract Drawings. Suspension system shall provide suitable support and bracing for all live, dead and impact loads.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Anchorage Devices:

1. Provide anchorage devices in accordance with Section 05 05 23, Metal Fastenings and as shown on the Contract Drawings.

2. Contractor shall furnish anchor bolts and nuts of Type 316 stainless steel, of ample size and strength for the purpose intended, sized by the equipment manufacturer. Anchor bolts shall be straight with double nuts and ¼-in. plate washers cast into concrete and provided for direct embedment during placement of concrete.

3. All hardware for mounting of motor drives and control panels shall be Type 316 stainless steel.

B. Identification:

1. Each unit of hoisting equipment and monorail shall bear an inscription, easily readable from the operating floor, showing the rated capacity of the equipment (in tons or pounds) and control identification.

2. Provide brass or stainless steel nameplates for all systems and component subassemblies in accordance with Section 40 05 97, Identification for Process Equipment. Include, at a minimum, the following information:

a. Manufacturer and model number.

b. Date of manufacture with all pertinent ratings and operation information.

c. Certification stamp or label for all applicable codes.

C. Health and Safety: Provide all appurtenances, caution markers, and appliances necessary to satisfy applicable safety laws and codes shall be provided.

D. Shop Painting:

1. Clean and prime coat ferrous metal surfaces of equipment in the shop in accordance with the requirements of Section 09 91 00, Painting.

2. Finish paint ferrous metal surfaces in the shop using the manufacturer's approved standard finish system. Finish system shall be compatible with the primer specified in Section 09 91 00, Painting and herein in this Section. Motors shall be painted in accordance with Section 26 05 91, Low Voltage Electric Motors.

3. Coat machined, polished, and non-ferrous metal surfaces and similar un-painted surfaces with corrosion prevention compound which shall be maintained during storage and until equipment begins operation.

4. Stainless Steel: Do not paint stainless steel.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Certified shop test the hoisting equipment for static and dynamic loads in accordance with manufacturer's approved testing protocol.

B. Shop tests shall be performed in accordance with the requirements of ASME B30.11.

C. Certified shop tests for electric motors furnished under this Section shall be performed in accordance with the requirements of Section 26 05 91, Low Voltage Electric Motors.

D. Certified shop tests for instrumentation and control system items furnished under this Section shall be performed in accordance with the requirements of Section 40 80 81 - PMCS Factory Testing .

E. Shop load test certificates shall be submitted prior to equipment delivery.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Install monorail hoist equipment in complete accordance with the manufacturer's printed instructions and the approved shop drawings.

B. Provide all required lubricants for initial operation.

3.03 FIELD TESTING / QUALITY CONTROL

A. Furnish the services of a qualified manufacturer's representative to check and approve all installations before operation as well as conduct field testing, in accordance with the requirements of the Contract documents. In addition:

1. Contractor shall verify that all work furnished and installed conforms to the requirements the Contract Documents.

2. Reports: Submit a report from the manufacturer of each visit to the site. Reports shall provide complete information on time, schedule, tasks performed, persons contacted, problems corrected, test results, training, instruction and all other pertinent information.

B. Preliminary Field Test:

1. After Contractor and Engineer have mutually agreed that the equipment installation is complete and ready for continuous operation, Contractor and a qualified field service representative of the manufacturer shall conduct a running test of the hoist and its controls in the presence of Engineer to demonstrate that the hoist and its controls will function correctly.

2. Field test the hoist unit together with its controls. Tests shall demonstrate that each part and all parts together function in the manner intended.

3. Prior to applying electrical power to any motor driven equipment, the drive motor shall be rotated by an external source to demonstrate free operation of all mechanical parts.

C. Final Field Tests: After successful completion of the preliminary field tests, perform load tests in accordance with CMAA standards and the NYC Building Code requirements.

1. Contractor shall provide all necessary instruments, labor, tools, and materials to conduct the field tests.

D. In the event that the Contractor is unable to demonstrate that the equipment meets the requirements of the above described field tests, the deficient equipment will be rejected and Contractor shall adjust and/or modify and retest the equipment as often as necessary to meet the specified requirements.

E. At a minimum, the services of the manufacturer's representative shall be provided as indicated below. The number of visits and person-days per visit, indicated below, shall be understood as referring to the total required services for the lot of equipment provided under this Section.

Visit:	Purpose:	No. of Visits:	Person-days per visit:
1	Installation Checkout	2	1
2	Field Testing	-2	1

3.04 STARTUP / DEMONSTRATION

A. Furnish the service of a qualified manufacturer representative to assist in the start-up of the equipment and train the plant operations and maintenance staff in the care, operation, and maintenance of the equipment in accordance with the requirements of the Contract Documents. In addition:

1. Contractor shall make all adjustments required to place Work in proper operating condition.
2. Contractor shall include in training of plant personnel instruction on care and maintenance of the materials and equipment.
3. In the event of trouble with the equipment during startup / initial operation, the manufacturer's representative shall revisit the site as often as required until all troubles are corrected and the installation is entirely satisfactory.

B. At a minimum, the services of the manufacturer's representative shall be provided as indicated, below. The number of visits and person-days per visit indicated, below, shall be understood as referring to the total required services for the lot of equipment provided under this Section.

Visit:	Purpose:	No. of Visits:	Person-days per visit:
3	Startup / Initial Operation	2	1
4	Training	1	1

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Provide field touch up painting of scratched or damaged surfaces, using primer, intermediate and finish paints provided by the manufacturer, in accordance with the requirements of this Section and Section 09 91 00 - Painting.

END OF SECTION

SCHEDULE 41 22 23.19-1
ELECTRIC MONORAIL AND HOIST REQUIREMENTS

Location:	TI-010 Dechlorination Facility	TI-011 Disinfection Facility (Chlorination Room)	TI-011 Disinfection Facility (Dechlorination Room)
Tag No(s).	TI-010-SBS-HST	TI-011-HYPO-HST	TI-011-SBS-HST
Top of Monorail El.: (ft)	34.33	31.21	31.21
Quantity:	1	1	1
Lift Capacity: (tons)	1	1	1
Hoist Power: (hp)	1/2	1/2	1/2
Trolley Power: (hp)	1/4	1/4	1/4
Area Classification:	Unclassified	Unclassified	Unclassified
Reeving:	Single	Single	Single
Hoist Mounting:	Lug	Lug	Lug
Maximum Lift: (ft)	30	30	30
Radius: (ft)	--	--	--
Hoist Drive Type:	Single	Single	Single
Hoist Speed: (fpm)	8	8	8
Trolley Drive Type:	Single	Single	Single
Trolley Speed: (fpm)	75	75	75
Monorail Turns:	None	None	None
Lifting Media:	--	--	--
Electric Service:	208 V, 3Ø, 60Hz	208 V, 3Ø, 60Hz	208 V, 3Ø, 60Hz
Tractor Drive:	Yes	Yes	Yes

SECTION 43 05 21 – COMMON WORK RESULTS FOR PUMPING UNITS CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to furnish, install, and test all Pumping Units, complete and operational.

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 05 05 23.02 – Miscellaneous Metal Fastenings

B. Section 09 91 00 – Painting

C. Section 26 05 91 – Low Voltage Electric Motors

D. Section 40 05 05 – Exposed Piping Installation

E. Section 40 05 06 – Couplings, Adapters, and Specials for Process Piping

F. Section 40 05 56 – Process Valves, Smaller than Four-Inch Diameter

G. Section 40 05 97 – Identification for Process Equipment

H. Section 40 70 01 – Measurement

1.04 REFERENCES

A. Definitions

1.	Pumping Unit:	A pump, complete with (but not limited to): drive motor, base, connecting shafting, bearings, belts, gear reducing units, couplings, seals, machine guards, sensors, accessories, appurtenances, and all associated equipment necessary and required for a fully functional unit.

B. Reference Standards

1.	ANSI/ASME B16.1	Standard Specification for Cast Iron Pipe Flanges and Flanged Fittings
2.	ANSI/ASME B1.20.1	Pipe Threads, General Purpose (inch).
3.	ANSI B11.19	Performance Criteria for Safeguarding.
4.	ANSI S2.41	Mechanical Vibration of Large Rotating Machines with Speed Range from 10 to 200 Rev/s - Measurement and Evaluation of Mechanical Vibration Severity In-situ.
5.	ANSI/HI 14.6	American National Standard for Rotodynamic Pumps for Hydraulic Performance Acceptance Tests.
6.	ANSI Z535	Safety Alerting Standards.
7.	OSHA 1910.219	Machinery and Machine Guarding.

1.05 DESCRIPTION

A. The scope of this Section includes requirements common to all Pumping Units, except where requirements for Pumping Units are shown or specified elsewhere in the Contract Documents. In addition:

1. Each Pumping Unit shall be furnished complete with drive motor and all other components necessary and required for a complete and operational unit.

a. Each Pumping Unit shall be furnished complete with machine guards.

2. The Contractor shall be entirely responsible for the compatibility between all components of the Pumping Unit(s) furnished.

3. If the Pumping Unit requirements of this Section and Pumping Unit requirements specified elsewhere are in conflict, the more stringent provision shall apply.

B. Coordination of Pumping Units with Contract Drawings:

1. The Contract Drawings only show a general arrangement of Pumping Units, unless otherwise indicated.

a. Pumping Units shown are generic and do not necessarily reflect the details of any Pumping Unit manufacturer.

b. Structural supports, foundations, equipment pads, as well as connected piping and/or valves, in part or in whole, may have to be modified from the arrangement(s) shown, in order to accommodate the specific Pumping Unit(s) furnished.

c. The Contractor shall be responsible for identifying any and all modifications to the design required by the Pumping Unit(s) furnished, and submitting those modifications to the Engineer as specified herein.

d. The pump suction and discharge nozzles shown (or, if not shown, as indicated by the connected pipe size shown) on the Contract Drawings shall be considered minimum sizes, unless otherwise specified.

C. The electric motor furnished with each Pumping Unit shall comply with the requirements of Section 26 05 91 – Low Voltage Electric Motors

1.06 QUALITY ASSURANCE

A. Qualifications of Manufacturer:

1. All Pumping Units shall be of approved design and make and products of manufacturers who have built equipment of similar type, size, and capacity for at least five (5) years.

a. The manufacturer shall have, in the opinion of the Engineer, sufficient experimental and test data to cover the design of the equipment specified.

2. All Pumping Units shall be of manufacturers who possess at least two (2) installations that were designed in accordance with United States industrial standards (ANSI, ASTM, ASME, etc.), and are of design, capacity, and service similar to the equipment proposed to be furnished. Both these installations shall have been in continuous, successful operation for a period of at least four (4) years.

3. All Pumping Units shall be the products of manufacturers who can produce evidence of their ability to promptly furnish any and all interchangeable replacement parts as such may be needed at any time within the expected life of the pumps.

4. All Pumping Units shall be of manufacturers in possession of a factory equipped with the necessary machinery, jigs, fixtures, and gages to assure the tolerances and finishes shown on the submitted shop drawings permit such interchangeability.

5. The pump manufacturer must possess, or have readily available, access to suitable testing facilities adequate for performing the shop tests required or specified and by the provisions of the Contract requirements.

   a. Testing facility shall be ISO certified.

6. Poor performance of similar pumping equipment now in operation under the specified conditions of service and pump rating constitute grounds for disqualification of the pump manufacturer, supplier, or both, unless such poor performance has been corrected.

B. Supply and Compatibility:

1. Traceability to original heat numbers shall be maintained for all major components including wear rings, shafts, shaft sleeves and impellers.

2. The equivalent parts of identical Pumping Units shall be inter-changeable.

   a. All parts and components of all Pumping Units shall be designed and built for interchangeability so that replacement parts may be installed without any additional fitting or machining.

C. Regulatory Requirements:

1. If the Pumping Unit requirements of this Section and referenced standards or manufacturer requirements are in conflict, the more stringent provision shall apply.

1.07 SUBMITTALS

A. Coordination of Pumping Unit Submittals:

1. Except for characteristic curves, all information required for each Pumping Unit (or group of identical Pumping Units) shall be submitted at one time.

   a. Partial submission of the following information will not be acted upon -- partial submissions shall be returned with a disposition of 'Rejected' for noncompliance with the requirements of the Contract Documents until the receipt of all required information has been submitted.

2. No pump will be deemed approved until all specified or requested information thereon is approved.

3. Pumping Unit submittals shall be submitted under the specification section number corresponding to the type of Pumping Unit.

B. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Quality Assurance Requirements:

1) The Contractor shall submit all information necessary and required to substantiate approval of a Pumping Unit manufacturer in accordance with the quality assurance requirements of this Section.

b. Schedule of deviations for all Pumping Units.

c. Characteristic Pump Curves:

1) Characteristic curves shall not be submitted for positive displacement pumps.

2) The following characteristic curves shall be shown as ordinates, plotted against the rate of flow as abscissae, for the complete range of flow of the pump:

a) Outlet Total Head

b) Net Positive Suction Head *

c) Pump Power Output

d) Driver Power Input*

e) Pump Efficiency

f) Overall Efficiency *

* Submit only if a value (or range of values) is specified for the identified performance criteria in the individual Pumping Unit specification Section(s).

3) Characteristic curve values shall be defined as per ANSI/HI 14.6, regardless of type of Pumping Unit.

4) Curves shall be plotted in the following units:

a) Flow shall be in the flow units specified for the pump.

b) Head shall be in feet.

c) Power shall be in horsepower

5) Curves not submitted in the correct units shall result in the entire submittal being rejected.

6) The operable range of flow shall be shown on all curves, if specified.

7) For multi-speed Pumping Units:

a) All characteristic curves shall be shown for both the maximum and for the minimum speeds specified.

b) Both maximum and minimum curves shall be shown on the same page.

8) Each page of the characteristic curves shall include the Pumping Unit tag number(s).

9) A single set of characteristic pump curves may be submitted for identical Pumping Units.

a) All Pumping Unit tag numbers to which the set of characteristic curves belong shall be noted.

d. General Arrangement Drawings:

1) Pump tag number(s).

2) Connected piping and valves.

3) Pump drip and bearing cooling water drainage piping.

4) Electrical connections.

5) Starting, speed regulating, and protective equipment.

6) Auxiliary equipment.

e. Detail Drawings and Catalog Cuts:

1) Dimensioned assembly outline drawing(s) of the complete Pumping Unit, drive, and all associated equipment furnished.

a) Drawing(s) shall show plan, elevation and any other views or sections specified under the specification section corresponding to the type of Pumping Unit.

2) A dimensioned cross-sectional drawing of the assembled Pumping Unit.

a) Drawing shall show full details and associated materials of construction.

3) For Pumping Units powered by motors rated at 20 hp or less, catalog cuts may be submitted to supplement the outline and cross-sectional drawings specified.

4) Submit detailed dimensioned drawings for all Pumping Unit steel base plates, subbases, and similar components, if furnished as part of the Pumping Unit, and as applicable.

5) Submit details of the fabrication, materials, and construction of the shaft coupling machine guards.

f. Foundation Bolt Drawings:

1) Drawings showing location, size, and full details of foundation bolts for all Pumping Unit components.

a) All weights and forces on foundation, motor support and bearing supports shall be clearly shown.

(1) Such forces shall be the maximum possible under any conditions (except those caused by water hammer in the connected piping).

(2) Such forces shall include hydraulic, static, and dynamic forces set up in any manner including the failure of any component or combination of components, such as impeller and shafting.

2) All additional drawings and information necessary and required for the final design of foundations and structural supports.

g. Detailed Drainage Piping Drawings:

1) All pump drip and bearing cooling water drainage piping shop drawings.

h. Motor Data:

1) Submit in accordance with the submittal requirements of Section 26 05 91 – Low Voltage Electric Motors, or Section 26 05 92 – Medium Voltage Electric Motors, as applicable.

i. Test Reports:

1) In addition to the submittal requirements of the Contract Documents, submit the following test reports for all Pumping Units:

a) Test reports for all shop tests, regardless of whether said test was witnessed.

b) Electric motor shop tests in accordance with the requirements of Division 26, Electrical.

j. Spare Parts and Special Tools:

1) List of spare parts being furnished.

2) List of special tools being furnished.

k. Operation and Maintenance Manuals.

2. Information Submittals:

a. Quality Assurance:

1) Submit a signed statement from each manufacturer stating that all Pumping Units furnished comply with the quality assurance requirements specified herein.

b. Recommended Lubricants:

1) Submit list of recommended lubricants and quantities being furnished.

c. Contact Information:

1) Submit the following information on suppliers of all castings and other major components:

a) Name and address of the company.

b) Contact name.

c) Phone number.

d. Forge Lot Numbers:

1) Submit the lot number for pump parts which are shown, specified, and/or required to be forged.

e. Certified Material Test Reports:

1) Certified reports indicating physical, chemical, and mechanical properties, as well as heat treatment (as applicable), shall be furnished for the following parts:

a) Wear rings.

b) Shafts.

c) Shaft sleeves.

d) Impellers.

e) Cast iron parts, such as front and back heads, volutes, frames, covers, and bearing housings.

2) Certified material test reports on shafts shall indicate Jominy end-quench hardenability data.

3) Certified material test reports on impellers shall indicate tensile strength.

f. Description of Manufacturer's Testing Facilities:

1) Description shall include including hydraulic, mechanical, electrical, and instrumentation elements.

2) The description should cover initial and periodical calibration provisions for all instruments.

3) The descriptive matter shall contain illustrative photographs, drawings, and such other matter as may be required to demonstrate compliance with the Contract Documents.

g. For performance tests of centrifugal pumps that were not witnessed by DEP personnel:

1) A notarized certificate executed by a company official, stating that no contact between pump rings occurs over the full range of pump performance operation.

3. Closeout Submittals:

a. Manufacturer's Certification:

1) As a condition necessary to acceptance by the City of any Pumping Unit with a drive unit rated at five (5) horsepower or more, the Contractor shall deliver to the Engineer a certificate from the manufacturer, stating that:

a) The installation of the Pumping Unit is satisfactory.

b) Unit is ready for operation.

c) Operating personnel have been suitably instructed in the operation, lubrication and care of the unit.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall furnish spare parts and special tools necessary to service, disassemble, repair, and adjust all Pumping Units, and as per the requirements of the Contract Documents. In addition, the Contractor shall furnish the following:

1. Spare Parts:

a. For each Pumping Unit, the Contractor shall furnish:

1) Two (2) sets of all eyebolts.

2. Special Tools:

a. For each Pumping Unit, or for each group of identical Pumping Units, the Contractor shall furnish:

1) All special tools made specifically for the Pumping Unit.

2) Gages and fixtures which are required to operate, disassemble, and maintain each type of Pumping Unit.

b. All special tools shall be furnished in neat special steel cases fitted with locks and keys.

3. Supplies:

a. Where oil lubricated equipment is used, sufficient oil, of types approved by the equipment manufacturer, shall be supplied for one (1) year of operation.

b. For grease lubricated bearings sufficient grease shall be supplied for one year's operation.

B. The Contractor shall furnish spare parts for the Pumping Unit electric motors in accordance with the requirements of Section 26 05 91 – Low Voltage Electric Motors

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. General:

1. All related components for each Pumping Unit shall also be furnished by the corresponding manufacturer of that Pumping Unit.

2. Only standard parts of the specified manufacturer shall be used, unless otherwise approved by the Engineer.

3. Should any standard part fail to satisfy the requirements of the Contract Documents, with the explicit approval of the Engineer, the Contractor shall supply parts of approved special design to suit the requirements.

B. Threaded joints shall be made up with:

1. Permatex® joint compound, as manufactured by Permatex, Inc., Solon, OH.

2. Or approved equal.

C. Ball and Roller Bearings (if applicable):

1. ALEMITE Model No. 54278, as manufactured by SKF Group, Gothenburg, Sweden.
2. Lincoln Industrial Model No. 5580, as manufactured by SKF Group, Gothenburg, Sweden.
3. Or approved equal.

D. Button Head Grease Fittings (if applicable):

1. Alemite Model No. A-1184, as manufactured by SKF Group, Gothenburg, Sweden.
2. Lincoln Model No. 5700, as manufactured by SKF Group, Gothenburg, Sweden.
3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. General:

1. All Pumping Units shall be designed and built for twenty-four (24) hour continuous service at any and all points within the specified range of operation, without overheating, without cavitation, without excessive vibration or strain, and requiring only that degree of maintenance generally accepted as normal with the specific type of pump required, unless otherwise specified in the Pumping Unit specification sections.

B. Material Compatibility:

1. All Pumping Unit materials shall be of a type and quality to withstand the hostile environment and stresses to which the Pumping Units and components may be subjected.

C. Connections:

1. Inlet and Discharge:

a. Inlet and discharge connections shall be flanged or threaded, as shown or specified in the individual Pumping Unit specification section(s).

1) For flanged openings: Flanges shall meet ANSI/ASME B16.1 Class 125 standards.

2) For threaded openings: Threads shall meet American standard taper pipe threads complying with ANSI/ASME B1.20.1.

D. Anchor Bolts:

1. All Pumping Unit anchor bolts shall comply with the requirements of Section 05 05 23.02 – Miscellaneous Metal Fastenings.

a. Pumping Unit anchor bolts shall be Type 316 stainless steel with nitronic-60 nuts, unless otherwise shown or specified in the Pumping Unit specification section(s).

b. Expansion bolts shall not be used, unless otherwise shown or specified in the Pumping Unit specification sections.

2. The Contractor shall furnish anchor bolts in conformance with the pump manufacturer's requirements and shall install them in accordance with the manufacturer's instructions.

3. Concrete foundation anchor bolts shall be set in steel pipe sleeves for the full length of the bolts.

4. Approved special washers and nuts shall be furnished and installed on the lower ends of bolts unless pockets are provided for access to the nuts. Bolts or studs engaging tapped holes in pump components shall be of silicon bronze.

E. Concrete Pads:

1. The Contractor shall coordinate concrete pads with the Pumping Unit manufacturer and provide concrete pads as shown and specified.

F. Drainage Piping:

1. Drainage piping shall be furnished for each Pumping Unit.

2. Drainage piping shall be of the minimum size specified and shall be provided with approved cleanout plugs.

3. Drip piping from pump to floor or floor drain shall include a plugged cross at the first drop and a screw union located between the cross and the pump.

G. Lubrication:

1. All oil pumps, oil or grease piping, oil tanks, oil filters, grease storage and grease feeding apparatus necessary for supplying lubrication to the Pumping Units shall be provided if necessary for a complete working installation.

2. Where water-cooled bearings are specified, an approved type of flow meter and a differential pressure switch shall be provided in the cooling water line. Pressure switches shall shut down the Pumping Unit in the event of low water flow.

3. All ball and roller bearings designed for grease lubrication shall be furnished with a safety vent type bushing of suitable size.

4. Ball and roller bearing lubricating greases shall be as recommended by the pump manufacturer.

H. Gages:

1. Gages shall comply with Section 40 70 01 – Measurement, unless otherwise specified.

2. All gages shall be graduated in feet of water for positive pressures, unless otherwise specified.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Identification:

1. Provide in accordance with Section 40 05 97 – Identification for Process Equipment.

2. Each unit of equipment shall be identified with the equipment item numbers shown on the Contract Drawings.

3. A corrosion resistant tag and nameplate, securely affixed in a conspicuous place on each unit shall give the equipment item number, manufacturer's name or trademark and such other information as the manufacturer may consider necessary, or as specified, to complete identification.

B. Pump Piping, Fittings and Valves:

1. Piping, fittings, and valves furnished with the Pumping Units shall comply with:

a. Section 40 05 06 – Couplings, Adapters, and Specials for Process Piping

b. Section 40 05 56 – Process Valves, Smaller than Four-Inch Diameter

C. Painting:

1. All work shall be painted in conformity with the requirements of Section 09 91 00 – Painting.

D. Direction of Rotation:

1. The direction of pump rotation shall be shown on the Pumping Unit.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Shop tests shall be performed and certified at the factory for all Pumping Units in accordance with the requirements of the Contract Documents.

B. Witnessing of shop tests:

1. For all Pumping Units with a drive motor (or engine) rated less than 125 hp:

a. Shop tests shall be witnessed by representatives of the DEP if specified in the Pumping Unit specification sections:

2. Electric drive motors shall be shop tested as required by Section 26 05 91 – Low Voltage Electric Motors.

C. Hydrostatic Shop Test:

1. General:

a. All Pumping Units shall undergo a certified hydrostatic shop test.

b. If required by the Pumping Unit specification sections, hydrostatic tests on pumps shall be made concurrently with the performance tests.

2. Test Procedure:

a. Test pressure:

1) For centrifugal, vortex, and turbine type Pumping Units: the test pressure shall be ≥ 150% of the shutoff head as shown on the approved characteristic curve. The test pressure shall be held for a duration of time according to ANSI/HI 14.6.

2) For positive displacement Pumping Units: The test pressure shall be ≥ 150% of the maximum head specified. The test pressure shall be held for a duration of time according to the applicable ANSI/HI standard governing that type of pump.

D. Performance Shop Tests:

1. General:

a. All Pumping Units shall undergo a certified performance test.

1) For all dry and wet pit submersible pumps:

a) The performance shop test shall include (but not be limited to) testing the pump in the configuration shown on the Contract Drawings (i.e., all dry pit submersible pumps shall be tested in dry pit, all wet pit submersible pumps shall be tested submerged.)

(1) Wet pit submersible pumps shall be tested submerged in clean water.

2) All performance shop tests shall be conducted at the point of manufacture for the pump, or a manufacturer testing facility within the same State, if domestic, or Country of Origin is nondomestic.

b. The performance shop test shall:

1) Show that the pump has the general characteristics of head, efficiency, horsepower and such other properties as appear on the approved pump curves submittals.

2) Prove the specified head, efficiencies, horsepower and other properties at the rating point.

3) Establish that the pump is free from overheating, cavitation, and excessive vibration over the specified range of the rate of flow.

c. Vibration displacement, velocity and/or acceleration readings shall be taken if specified or required at a witnessed test and the results shall be recorded. Tests at lower than maximum speed will not be required except for positive displacement plunger pumps, where runs at all speeds are required.

d. All electrical starting and other control equipment necessary for testing shall be furnished by the pump manufacturer and shall be present at the test.

2. Procedure:

a. For centrifugal pumps:

1) The Pumping Unit shall be run at normal rated speed over the specified range of flow and then held at shutoff head for at least 1 min.

b. For positive displacement pumps:

1) The Pumping Unit shall be run for at least 30 min at each speed and capacity specified.

2) During part of a run at maximum head and flow rate specified, a plug valve on the pump discharge shall be rapidly operated (opened and closed) manually several cycles without causing any damage to the pump as evidenced by a trouble free resumption of pumping at the same head and delivery.

c. For duplicate pumps with motors rated at < 5 hp:

1) Check tests against complete performance tests of pumps of exactly the same model, speed, head and capacity rating shall be acceptable.

3. Results:

a. For all centrifugal Pumping Units:

1) The Pumping Unit shall conform to the criteria of ANSI/HI 14.6 Acceptance Grade 1U for all applicable performance

criteria specified. Pumping units that do not conform to Acceptance Grade 1U may be subjected to rejection by the Engineer.

2) At no point over the performance test range shall contact between the impeller ring and casing ring be permitted.

3) The manufacturer shall demonstrate evidence of no contact.

a) For witnessed performance tests:

(1) The manufacturer, immediately after the pump testing, shall have the pump disassembled and shall facilitate the visual inspection of the pump rings by the official witness.

b) For pumps which are not witnessed shop tested:

(1) The manufacturer shall submit, along with the shop test results, a notarized certificate executed by a company official, stating that no contact between pump rings occurs over the full range of pump performance operation.

4) Contact between the impeller and casing rings over the operating range shall constitute grounds for rejection of the pumps.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Inspection:

1. The Contractor shall not install damaged items until repairs or replacements are made in accordance with manufacturer's written instructions and approval by Engineer.

a. Only minor repair work will be permitted in the field.

b. All damaged items requiring remedial work shall be returned to the manufacturer for repair or replacement at no additional cost to DEP.

B. Base Installation:

1. Equipment bases and grouting shall be installed as follows:

a. Leveling wedges or metal supports shall be installed beneath the base at each foundation bolt.

b. Grout allowance of ¾ to 1½ in. shall be provided between the base and the top of the foundation or equipment pad.

c. The Pumping Unit shall be aligned to the connecting piping.

d. Drive and driven equipment alignment shall be checked.

e. Piping shall not be connected until after the grout has cured.

f. Leveling wedges or metal supports shall be adjusted to level the unit.

g. Foundation bolts shall be tightened evenly but not too firmly.

h. Horizontal shaft units shall be leveled to within 0.005 in./ft and the driven equipment shaft of vertical units shall be plumb to within 0.002 in./ft.

i. Equipment bases shall be filled with grout. Grout shall be worked to release any entrained air in the grout or base cavities.

j. Foundation bolts shall be fully tightened only after the grout has cured.

C. Footing Adjustment:

1. The following procedure shall be used for any driver or driven equipment having four (4) or more individual support feet:

a. All mounting bolts shall be checked for tightness before proceeding.

b. A dial indicator shall be set on the equipment base next to the foot being checked.

c. The dial indicator on the foot being checked shall be zeroed.

d. The mounting bolt on the foot being checked shall be loosened and the indicator deflection shall be noted. A maximum deflection of 0.002 in. shall be permitted.

e. The mounting bolt shall be retightened and the procedure shall be repeated for all feet.

f. Any footing condition that exceeds the 0.002-in. limit shall be corrected.

1) The driver and driven equipment alignment shall be verified after making any corrections.

3.02 INSTALLATION

A. Install all Pumping Units in complete accordance with the manufacturer's printed instructions and the approved shop drawings.

B. Manufacturer's Representative during Installation

1. For all Pumping Units powered by drive units rated at ≥ 5 hp:
   a. The Contractor shall furnish the services of accredited representatives of the pump manufacturer who shall supervise the installation, adjustment and field tests of each Pumping Unit and give instructions to designated DEP operating personnel.
   b. The services of the manufacturer's representative shall be furnished for at least the number of days stipulated in the associated Pumping Unit Specification sections.
   c. Should additional days of service be necessary for a successful installation, such services shall be provided by the Contractor at no additional cost to the City.
2. For all Pumping Units powered by drive units rated at < 5 hp:
   a. The Contractor shall furnish the services of accredited representatives of the pump manufacturer only when, in the opinion of the Engineer, there is some evident malfunction or over-heating.

C. Alignment of Pump Components and Pumping Units

1. Proper alignment of pump components and Pumping Units shall be maintained by shouldered fits of mating parts where such construction is at all possible and in accordance with best practice, or where the nature of such components obviates the use of shouldered fits, by dowels or turned bolts in reamed holes fitted after final alignment of parts is approved.
2. Assemblies of components for which alignment depends upon friction between mating parts or gaskets are unacceptable, except for the use of set screws, taper pins, certain screw threads and only those other elements for which specific approval is given by the Engineer or specified.
3. Shaft components transmitting torque from the shaft shall be keyed to the shaft.
   a. Set-screws or pins shall not be used in lieu of a key unless specifically approved by the Engineer.
4. Where the associated Pumping Units specification Sections identify model or catalog numbers for pumps, the equipment shall comply with the foregoing requirements of this Section, even though modifications of the manufacturer's standard product shall be necessary.
5. Sufficient metal shall be provided on all components for field dowelling or pinning, where such is specified after final field alignment.
6. Mating shafts on Pumping Unit components connected by couplings shall be aligned and the components shall then be dowelled or pinned.

a. Alignment shall be made only after complete piping and electric conduit connections have been made and all required grouting has set.

b. Alignment shall be made with an approved fixture which shall have two (2) components:

1) Each component shall be securely clamped to one of the mating shaft ends.

2) Two dial indicators shall be mounted on one of the two components.

a) One dial indicator shall be so mounted as to indicate the parallel misalignment of the two shafts;

b) the other dial indicator shall be so mounted as to give a measurable indication of angular misalignment.

c. The Pumping Unit components shall be so adjusted and shimmed, that, before and after dowelling, the maximum variations in the reading of each of the two (2) dial indicators shall not exceed 0.001 in. per in. of minimum connected shaft diameter in one revolution of the coupling.

1) Such alignment shall be demonstrated to the Engineer.

7. Where rigid vertical line shafting is required between a pump and its driving unit, alignment and concentricity of the line shafting shall be accomplished as follows:

a. The pump shall be completely connected to the piping, shall be levelled with a machinist's level, and bolted and grouted to the foundation.

1) Prior to grouting, the seal ring clearance shall be checked out within the manufacturer's limits.

2) After grout has set, seal ring clearances shall be rechecked at four quadrants.

b. The drive unit shaft shall be located concentrically by plumb bob; the drive unit shall be subsequently dowelled and bolted in final position.

c. Special fixtures shall then be attached to the pump shaft and drive shafts.

1) Fixtures shall accommodate a suitable taut wire, concentric with both shafts, and so arranged that the wire may be placed under controlled tension by attached weighting. Taut wire shall be passed through each intermediate bearing.

d. Each bearing and bearing mounting components shall be so adjusted so that bearings are concentric with the wire within ±0.002-in..

e. Bearing mounting components shall then be completely dowelled so that all connections of bearings through all components are made by metal to metal fit, without reliance upon friction between mating parts.

f. Line shafting shall be concentric and each shaft section shall be dial indicated at a point midway between fixed bearings, and shall be so demonstrated to the Engineer.

g. An eccentricity of not more than 0.001-in. per in. of shaft diameter shall be permissible after pump, drive unit and all line shaft components are installed, grouted and dowelled and ready to run.

8. All shim stock used shall be of Type 316 stainless steel, unless otherwise shown or specified for specific Pumping Unit(s).

D. Drainage Piping Installation:

1. Drainage piping shall be installed and connected to each Pumping Unit, to convey the stuffing box or mechanical seal drippings and bearing cooling water to the nearest sump, gutter, floor drainage pipe or outlet.

a. Such drainage piping shall be as shown, as specified, and/or as necessary and required to remove the drippings and/or cooling water from the Pumping Units without spilling on any floor area unless otherwise expressly stated or shown on the Contract Drawings.

2. Drainage piping shall be installed in accordance with the requirements of Section 40 05 05 – Exposed Piping Installation. In addition:

a. Drainage piping from the pump to the point of disposal shall be run below the floor surface.

b. Drainage piping shall not be run along the surface of a floor area, unless the space directly above or below the drainage piping is blocked by other piping shown on the Contract Drawings.

c. For existing work and for new work where pump drainage piping was not installed before the floor structure was installed, chases shall be cut for the pump drainage piping and the floor finish shall be restored.

E. Piping and Equipment Identification

1. The Contractor shall furnish and install identification signs for all Pumping Units, valves and piping in accordance with the requirements of Section 40 05 97 – Identification for Process Equipment.

F. Refer to the associated Pumping Unit specification Sections for additional installation requirements.

3.03 FIELD TESTING / QUALITY CONTROL

A. Furnish the services of a qualified manufacturer's representative to check and approve all installations before operation in accordance with the requirements of the Contract documents. In addition:

1. The Contractor shall verify that all work furnished and installed conforms to the requirements of the Contract Documents.

B. The Contractor shall provide the services of the manufacturer's representative at such times and for such durations of time as are needed to perform the tasks required of the representative.

1. The services of the manufacturer's representative shall be provided as indicated for each type of Pumping Unit as indicated in the associated Pumping Unit specification section(s).

2. The number of visits and person-days per visit indicated in the associated Pumping Unit specification section(s) shall be understood as referring to the total required services for the lot of equipment provided under this Specification.

3. The Engineer reserves the right to require that any unused person-days from any visit be applied to any other specified visit.

4. Person-days shall be understood only as days spent on-Site (not in transit).

5. Unless otherwise authorized by Engineer, the manufacturer's representative shall be a direct employee of the equipment manufacturer, with at least three (3) years' experience in the installation, testing and start-up of equipment of the type provided under this Specification. The manufacturer's sales and marketing personnel will not be accepted as manufacturer's representatives.

6. The manufacturer's representative shall sign in and out at the office of the Engineer each day they are at the Site.

C. Field Tolerance Check:

1. When tolerances on pump shaft alignment, pump line shaft alignment and eccentricity, and on bearing alignment are herein specified (or specified in an associated Pumping Unit specification Section), such tolerances shall be checked and demonstrated to the Engineer to be within the limits permitted.

D. Field Performance Tests

1. For centrifugal Pumping Units ≥ 5 hp:

a. Each Pumping Unit shall be run at maximum rated speed for at least three (3) rates of flow, corresponding to:

1) The specified minimum rate of flow;

2) The specified design or operating rate of flow, as directed by the Engineer; and

3) The specified maximum rate of flow.

b. Record the total dynamic head at each of the three rates of flow.

1) Total dynamic head shall be read from the pump pressure gages.

c. The flow rates shall be verified using a calibrated flow meter during the test.

1) If a flow meter is not installed or available for testing, the rate of flow shall be set by achieving the corresponding, specified total dynamic head.

2) Variation of the rate of flow shall be made by throttling the discharge valve.

d. Simultaneous ammeter readings shall be taken at each of the three flow rates.

1) The rated motor nameplate current and power shall not be exceeded at any rate of flow within the specified range.

2. Pumps with drive motors rated at less than five (5) horsepower shall only be tested for excess current or power when overheating or other malfunction becomes evident in general testing.

E. Field Vibration Tests:

1. The vibration shall be measured for each and all Pumping Units across the full operating range specified in the associated Pumping Unit specification Section(s).

a. Measurement of vibration for all Pumping Units shall be witnessed by the Engineer.

b. The operating range shall exclude the shut-off point as specified in the associated Pumping Unit specification Section(s).

2. Vibration measurements shall include overall unfiltered vibration amplitude and vibration signatures.

a. The signatures shall be plots of filtered vibration velocity in in./s versus vibration frequency for a range of 100 to 60,000 cycles per min.

3. Locations of Measurement:

a. For vertical Pumping Units with open type shafting:

1) Measurements shall be taken at locations near:

a) The two (2) motor bearings;

b) The intermediate shaft bearings (if any); and

c) At the lower pump bearing.

b. For vertical Pumping Units supporting drive motors:

1) Measurements need be taken only at:

a) The lower pump bearings.

c. For horizontal type Pumping Units:

1) Measurements shall be taken at locations near:

a) The two (2) motor bearings; and

b) At the inboard pump bearing.

4. An approved type of instrument, calibrated by an approved laboratory just prior to and after the test, shall be used.

a. Certification of such calibration shall be submitted to the City as part of the field testing submittal in accordance with the requirements of the Contract Documents.

5. Vibration in excess of ANSI S2.41 shall not be acceptable and shall be judged as presumptive evidence of defective construction, including but not limited to: unbalanced construction; flimsy construction of the base or mounting structure; and/or misalignment of parts of the Pumping Units.

a. The Contractor shall take all measures to remedy the condition of excessive vibration to the satisfaction of the Engineer at no additional cost to the City.

1) The field vibration test shall be repeated after remedial measures are taken.

F. Refer to the associated Pumping Unit specifications for additional field testing requirements.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Provide field touch up painting in accordance with the requirements of Section 09 91 00 – Painting.

B. Provide identification accordance with the requirements of Section 40 05 97 – Identification for Process Equipment.

END OF SECTION

SECTION 43 22 39 – LIQUID CHEMICAL DIFFUSERS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, as shown, specified and required, to furnish and install all liquid chemical diffusers and appurtenances. Liquid chemical diffusers shall be as specified herein and as shown on the Contract Drawings

B. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Service Description:

1. Liquid Chemical Diffusers shall be open channel diffuser type that are specifically designed for the following chemical solutions specified herein:

a. Sodium hypochlorite, up to 15% solution.

b. Sodium bisulfite, up to 38% solution.

B. Design Requirements:

1. Refer to the Contract Drawings for diffuser size, width, and quantity of nozzles.

1.06 QUALITY ASSURANCE

A. Qualifications of Manufacturer:

1. The manufacturer shall have a minimum of five (5) years of experience in the design and fabrication of liquid chemical diffusers, fittings, appurtenances, and specials of similar size, capacity, and type to those shown on the Contract Drawings and specified in the Contract Documents and shall show evidence of at least five (5) substantially similar installations in satisfactory operation.

B. Supply and Compatibility:

1. All liquid chemical diffusers, appurtenances, and specials included in this section shall be provided by the Contractor through a single, qualified liquid chemical diffuser manufacturer.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Shop Drawings:

1) Layout drawings showing the size, width, and nozzle spacing of each liquid chemical diffuser.

2) Catalog cuts and data sheets, including but not limited to

a) Specifications for all components of the liquid chemical diffuser.

b) illustrations in sufficient detail to serve as a guide for assembly and disassembly.

c) Details on joining methods.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Not Used

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Liquid Chemical Diffusers:

1. Saf-t-Flo, Anaheim, CA.
2. Hydro Instruments, Telford, PA.
3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Liquid Chemical Diffusers:

1. Liquid chemical diffusers shall be provided with end studs to allow for installation to mounting flanges on each end of the open channel.
2. Mounting flanges shall be provided by the manufacturer.
3. Material: Hastelloy C, or per manufacturer recommendations.
4. Liquid chemical diffusers shall be provided with elastomeric tips at each port to prevent sedimentation inside the diffuser piping.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Damaged liquid chemical diffusers will be rejected and shall be replaced at the Contractor's expense.

3.02 INSTALLATION

A. All liquid chemical diffusers shall be installed in accordance with all of the following:

1. The manufacturer's printed instructions and recommendations.
2. The approved shop drawings.
3. As specified in the Contract Documents.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Cleaning:

1. During construction, all liquid chemical diffusers shall be thoroughly cleaned before placement and the lines kept free from foreign matter of whatever origin. The pipes shall be left thoroughly clean to the satisfaction of the Engineer.
2. Flush all process and potable water piping with clean water.

END OF SECTION

SECTION 43 23 31.03 – VERTICAL CENTRIFUGAL PUMPING UNITS (WET PIT SUMP SERVICE)
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install vertical centrifugal Pumping Units and appurtenances, complete and operational. This Section describes the specific requirements for vertical centrifugal Pumping Units for wet pit sump service, specifically for chemical containment applications, and supplements Section 43 05 21 – Common Work Results for Pumping Units. Pumping Units shall be as specified herein and in the Contract Documents and as shown on the Contract Drawings.

B. The following index of this Section is presented for convenience:

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A. The following schedule, attached after the End of Section designation, is a part of this Section:

1. Schedule 43 23 31.03-1, Vertical Centrifugal Pumping Units (Wet Pit Pump Service) Characteristics

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 05 91 – Low Voltage Electric Motors

B. Section 40 67 16 – PMCS Panels and Enclosures

C. Section 40 78 90 – PMCS Panel Mounted Instruments and Devices

D. Section 43 05 21 – Common Work Results for Pumping Units

1.04 REFERENCES

A. ASTM A276 – Stainless and Heat-Resisting Steel Bars and Shapes

B. ASTM A536 – Ductile Iron Castings

C. ASTM E10 – Standard Test Method for Brinell Hardness of Metallic Materials

1.05 DESCRIPTION

A. Service Description

1. In sump pump service, the liquid pumped will be sodium hypochlorite, 15% solution or sodium bisulfite, 38% solution or washdown water.

2. Pumping Units, when specified in the Contract Documents for wet pit sump pump service, shall be installed in duplex (pairs).

3. Pumping Units shall be suitable for the wet pit sump service specified.

B. Pump Type:

1. Single stage, vertical shaft, non-clogging, bottom inlet, side discharge, centrifugal type.

C. Pump Support:

1. Pump and discharge pipe shall be supported by a pump suspension plat, which shall be supported by a FRP support system. Both the pump suspension plate and FRP support system shall be provided by the pump manufacturer.

D. Drive Unit:

1. Electric drive motor supported on the pump suspension plate above the top of the chemical containment area.

E. Design Requirements

1. Schedule 43 23 31.03-1, Vertical Centrifugal Pumping Units (Wet Pit Pump Service) Characteristics.

1.06 QUALITY ASSURANCE

A. In addition to the requirements under Section 43 05 21 – Common Work Results for Pumping Units:

1. Supply and Compatibility:

a. All vertical centrifugal pumping units (wet pit sump service), appurtenances, and specials included in this section shall be provided by the Contractor through a single, qualified pump manufacturer.

B. Quality Assurance Inspections:

1. Quality Assurance inspections may be made by NYC DEP Bureau of Engineering Design and Construction, Quality Assurance Section or its representative at the manufacturer's facility.

2. Quality Assurance inspections shall be in accordance with the requirements of the Contract Documents.

3. Submit copies of Manufacturer Certificates of Conformance

1.07 .SUBMITTALS

A. In addition to the submittals to be made under Section 43 05 21 – Common Work Results for Pumping Units, the following submittals are required for approval by the Engineer:

1. Informational Submittals:

a. Certificate of chemical compatibility from the manufacturer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall comply with the requirements of Section 43 05 21 - Common Work Results for Pumping Units.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Provide spare parts, special tools, and supplies in accordance with the requirements of Section 43 05 21 - Common Work Results for Pumping Units. In addition, the Contractor shall provide the following:

1. One (1) complete rotor, including impeller, shaft, shaft sleeve, keys, set-screws, complete coupling and any and all other rotating parts except the drive unit, for each five (5) pumps or less of the same type and size furnished.

2. One (1) complete set of pump and intermediate line shaft bearings and shaft seals for each five (5) pumps or less of the same type and size furnished.

3. One (1) complete set of gaskets for each and every pump furnished.

4. Spare parts for motors as required by Sections 26 05 91 – Low Voltage Electric Motors.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. TI-010C Chlorination Facility

1. Vertical Centrifugal Pumping Units (Wet Pit Pump Service) for diluted chemicals:

a. Series 6000 (Fybroc 6308) as manufactured by Fybroc Division, CECO Environmental., Telford, PA.

b. NM 3171 as manufactured by ITT Goulds Pumps, Seneca Falls NY 13148

c. Or approved equal.

B. TI-010D Dechlorination Facility & TI-011 Disinfection Facility

1. Vertical Centrifugal Pumping Units (Wet Pit Pump Service) for diluted chemicals:

a. Series 6000 as manufactured by Fybroc Division, CECO Environmental., Telford, PA.

b. NM 3171 as manufactured by ITT Goulds Pumps, Seneca Falls NY 13148

c. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Pumping Unit Components

1. General:

a. Design requirements are outlined in Schedule 43 23 31.03-1, Vertical Centrifugal Pumping Units (Wet Pit Pump Service) Characteristics.

2. Materials:

a. All materials shall be of a quality to withstand the hostile environment and stresses to which the Pumping Units and components may be subjected. Wetted materials shall be chemically compatible with the chemical.

b. Pump Support System: FRP

c. Suspension Plate/Cover: FRP

d. Motor Support Plate: Cast iron.

e. Casing: Vinyl ester resin FRP

f. Impeller: Vinyl ester resin FRP

g. Shaft: Titanium

h. Column Pipe Assembly: Vinyl ester resin FRP

i. Suction Strainer: Polyester or CPVC.

j. Discharge Pipe Assembly: Vinyl ester resin FRP

k. O-Rings: Viton

B. Pump Supports

1. Each pump shall be suspended by means of a drive shaft enclosing, cylindrical column whose upper end shall be bolted to the suspension plate. The pump discharge piping shall also be bolted to the suspension plate to avoid strain on the pump casings.

2. Suspension plates shall in turn be bolted to a support system which shall be sufficiently heavy and rugged to support all components of the Pumping Units without undue strain.

3. Suspension plates shall be sized and shaped to fit each sump.

C. Drive Unit Support

1. The electric drive motors and motor support brackets shall be bolted to the topside of the pump suspension plates.

2. The motor bracket shall provide easy access to the shaft coupling and shall support the motor approximately one foot above the top of the chemical containment area unless otherwise indicated on the Contract Drawings.

D. Impellers

1. Impellers shall be of the recessed vortex design and shall be keyed to the motor shaft. Impellers shall be statically balanced and shall contain no thrust balancing holes.

a. Impellers shall be built to pass sand, grit, solids, trash, rags, condoms, sticks and stringy material with maximum freedom from clogging. Vanes shall have well rounded entrances.

b. The waterways through the impellers shall have smooth contours and shall be free from sharp edges.

c. Impellers shall be statically and dynamically balanced after assembly to the rotor as covered in the Contract Documents.

2. Impellers shall be key seated and securely held to the shaft by a key and a streamlined silicon bronze nut or by a specifically approved equal method.

The arrangement shall be such that the impeller cannot unscrew or be loosened by torque from either forward or reverse rotation. Designs based on threaded connection between pump shaft and impeller will not be considered.

3. The use of wearing rings or surfaces located on the upper side of impellers and casings, with or without the use of flush or pressure water as a means of balancing hydraulic thrust, will not be considered, unless expressly specified.

E. Pump Shafts

1. Pump shafts shall be sufficiently large in diameter to safely transmit the maximum torque developed by the drive unit and, where axial pump thrust is transmitted through the pump shaft, to simultaneously transmit such thrust.

2. Shaft couplings shall be keyed or splined to the shaft. Set screws or pins shall not be used to transmit torque or thrust from shafts to couplings or other shaft mounted components.

3. Where shafts pass through stuffing boxes or where exposed directly to sewage, they shall be protected by readily renewable, snug fitting wearing sleeves, internally ground to approved tolerances and positively secured to the shaft so as to prevent relative rotation. Passage of water from pump casing between shaft and sleeve shall be prevented by "O" ring packing or other approved means.

4. All shafts shall be furnished with approved all bronze or bronze and plastic water slingers of approved construction.

5. After assembly of shaft, sleeve and impeller, the rotor assembly shall be statically and dynamically balanced.

F. Pump Bearings

1. The weight of the pump shaft and impeller and impeller thrust shall be carried by an anti-friction thrust bearing mounted in an oil-tight housing equipped with an approved shaft seal ring.

2. The thrust bearing shall be located at, or preferably above, the suspension plate level.

3. The thrust bearing shall be greased for life.

G. Suction Bell and Strainer

1. Provide a suction bell and strainer on the inlet of each pump.

H. Discharge Pipe Assembly

1. Discharge pipe shall be supported by the pump suspension plate.

2. Discharge pipe shall terminate with a 150-lb flange located above the pump suspension plate.

I. Pump Drive Motors

1. Pump drive motors shall be as required by the provisions of these Sections, the Contract Documents and Sections 26 05 91 – Low Voltage Electric Motors, except as otherwise specified herein.

2. The pump drive motors shall be vertical, squirrel cage induction type with grease lubricated ball bearings; the motors shall be totally enclosed and shall be of sufficient capacity to operate the driven equipment from shut-off head to the maximum rate of flow specified without loading beyond their rated nameplate current or power.

3. The pump drive motors shall operate within rated temperature limits with thirty (30) starts per hour.

J. Controls (TI-010C Chlorination Facility Only):

1. Pumping units shall be provided with float-level control switches and a dedicated sump pump control panel. Control panel shall house the motor starter for each pump.

2. Floats Switches:

a. Provide four float switches:

1) High Water Alarm

2) Lag Pump On

3) Lead Pump On

4) Pumps Off

b. The float switches shall be of the mercury free, mechanically actuated type; the housing shall be NEMA type 4X watertight construction and shall be supported at a convenient height by a pipe stanchion mounted on the pump suspension plate.

c. The float switches shall be of polyurethane construction with PVC-coated suspension wires.

3. Control Panel:

a. General:

1) Tag No.: HYPO-SCP-10

2) Control Panel and panel-mounted components shall conform to the requirements of Section 40 67 16 – PMCS Panels and Enclosures and Section 40 78 90 – PMCS Panel Mounted Instruments and Devices.

b. Main Power Supply: 480 volt, 3 phase, 60 Hz

c. Control Power Transformer: 480 VAC to 120 VAC and for any other voltage conversions necessary to power system components.

d. Pump Starters: Combination-type magnetic starter with overload reset and low voltage protection.

e. Enclosure:

1) NEMA 4X stainless steel.

2) Maximum Dimensions: 36” W x 48” H x 12” D

f. Inputs and Outputs: The Control Panel shall be capable of accepting and providing the following inputs and outputs:

1) Inputs:

a) Pump No. 1 Running Status

b) Pump No. 1 Fault Status

c) Pump No. 1 Not In Auto

d) Pump No. 2 Running Status

e) Pump No. 2 Fault Status

f) Pump No. 2 Not In Auto

g) Level Hi-Hi (From level float switch)

h) Level High (From level float switch)

i) Level Intermediate (From level float switch)

j) Level Low (From level float switch)

2) Outputs:

a) High Level Alarm

b) System Running

c) System Fault

g. Door Mounted Items:

1) Power On Pilot Light.

2) Three-way Lead Pump Selector Switch for Pump No. 1, Alternate, and Pump No. 2.

3) Hand/Off/Auto Selector Switch, for each Pumping Unit

4) Run Indication Light, for each Pumping Unit.

5) Seal Failure Pilot Light, for each Pumping Unit.

6) Pump Failure Alarm Pilot Light, for each Pumping Unit.

7) Pump Failure Reset Pushbutton, for each Pumping Unit.

8) High Level Alarm Pilot Light.

9) High Level Alarm Audible Horn.

10) High Level Alarm Silence Pushbutton.

11) High Level Alarm Reset Pushbutton.

h. Colors for all panel indicating lights shall be in conformance with the requirements of Section 40 78 90, PMCS Panel Mounted Instruments and Devices.

4. Sequence of Operations:

a. HAND: When the pump selector switch is in HAND position, the Pumping Unit will run.

b. OFF: When the pump selector switch is in OFF position, the Pumping Unit will not run

c. When the pump selector switch is in the AUTO position, the Pumping Unit HYPO-SCP-10 based on the float switches as follows:

1) "High Water Alarm" float actuates high sump level alarm on float rise and de-energizes alarm on drop in liquid level in sump.

2) "Lag Pump On" float starts second pump of duplex set upon rise of liquid level in sump for two-pump operation.

3) "Lead Pump On" float switch starts lead pump of duplex set through electric alternator in control panel upon rise of liquid level in sump.

4) "Pumps Off" float switch de-energizes all pumps on drop of liquid level in the sump and closes control holding circuit upon rise in liquid level in the sump.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. In addition to the tests to be performed under Section 43 05 21– Common Work Results for Pumping Units, the following tests are required.

1. Tensile and chemical analysis tests shall be made for each impeller for centrifugal or mixed flow pumps.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Inspection, installation of equipment and piping, and piping and equipment identification shall be in accordance with Section 43 05 21 - Common Work Results for Pumping Units.

3.02 INSTALLATION

A. Install all Pumping Units in accordance with the requirements of Section 43 05 21 - Common Work Results for Pumping Units.

B. Manufacturer's Representative:

1. The Contractor shall furnish the services of accredited representatives of the Pumping Unit manufacturer to supervise the installation, adjustment, and field tests of the equipment and to provide training for DEP operating personnel.

2. The services of the manufacturer's representative shall be furnished for installation supervision for at least the following number of days:

Visit:	Purpose:	Number of Visits:	Person-days per Visit:
No. 1	Installation Supervision	3	1

3. Should additional days of service be necessary for a successful installation, such services shall be provided by the Contractor at no additional cost to the City.

3.03 FIELD TESTING / QUALITY CONTROL

A. Perform field testing in accordance with Section 43 05 21 - Common Work Results for Pumping Units. In addition:

1. Measure the bearing temperature:

a. Temperature readings in excess of 135° F shall be deemed presumptive evidence that the operating internal temperature of the bearings exceed 180 °F, unless the Contractor can conclusively prove otherwise to the satisfaction of the Engineer.

1) In the absence of such proof, it shall be incumbent on the Contractor to take such steps as may be required to reduce the temperature to ≤ 135 °F with no additional cost to the City.

B. The Contractor shall provide the services of the Pumping Unit manufacturer's representative at such times and for such durations of time as are needed to perform the field testing tasks required of the representative.

1. The services of a manufacturer's representative shall be furnished for field testing for at least the following number of days:

Visit	Purpose:	Number of Visits:	Person-days per Visit:
No. 2	Field Testing	3	1

3.04 STARTUP / DEMONSTRATION

A. Furnish the services of a qualified Pumping Unit manufacturer's representative to assist in the start-up of the equipment and train DEP operations and maintenance staff in the care, operation, and maintenance of the equipment in accordance with the requirements of the Contract Documents. In addition:

1. Contractor shall make all adjustments required to place Work in proper operating condition.

2. Contractor shall include in training of DEP personnel instruction on care and maintenance of the materials and equipment.

3. In the event of trouble with the equipment during startup / initial operation, the manufacturer's representative shall revisit the Site as often as required until all troubles are corrected and the installation is entirely satisfactory.

B. At a minimum, the services of the Pumping Unit manufacturer's representative shall be provided as indicated, below. The number of visits and person-days per visit indicated, below, shall be understood as referring to the total required services for the lot of equipment provided under this Section.

Visit:	Purpose:	Number of Visits:	Person-days per visit:
No. 3	Startup / Initial Operation	3	1
No. 4	Training	3	1

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SCHEDULE 43 23 31.03

VERTICAL CENTRIFUGAL PUMPING UNITS (WET PIT SUMP PUMP SERVICE) CHARACTERISTICS

Location:	**TI-010C Chlorination Facility**	**TI-010D Dechlorination Facility**	**TI-011 Disinfection Facility**	
Pump Tags:	HYPO-CSP-1 HYPO-CSP-2	SBS-CSP-1 SBS-CSP-2	HYPO-CSP-1	SBS-CSP-1
Fluid Pumped:	Diluted sodium hypochlorite, 15% solution	Diluted sodium bisulfite, 38% solution	Diluted sodium hypochlorite, 15% solution	Diluted sodium hypochlorite, 38% solution
Type	Duplex	Duplex	Duplex	Duplex
Flow	190 gpm	50 gpm	50 gpm	50 gpm
Total Dynamic Head	71 feet	20 feet	20 feet	20 feet
Maximum Shutoff Head	75 feet	25 feet	25 feet	25 feet
Motor Horsepower	15 HP	<1 HP	<1 HP	<1 HP
Electrical Supply	480 V, 3 phase, 60 Hz	208 V, 3 phase, 60 Hz	208 V, 3 phase, 60 Hz	208 V, 3 phase, 60 Hz

SECTION 43 26 13 – SUBMERSIBLE GRINDER PUMPS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. Contractor shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish, install, adjust, and test submersible grinder pumps as shown on the Contract Drawings and as described in these Specifications.

B. Pump manufacturer scope of supply:

1. Submersible grinder pump motors
2. Power and sensor cable
3. Bearings
4. Mechanical seals
5. Volutes
6. Impellers
7. Pump shafts
8. Axial cutter
9. Cutter plate
10. Other pump component parts
11. Spare parts
12. Extra materials as specified
13. Technical services

C. Contractor scope of supply: Provide materials, equipment, appurtenances, and services not supplied as part of the system, including but not limited to

1. Unloading, storing, and protecting equipment at the site in accordance with supplier's recommendations.
2.

D. The following index of this Section is presented for convenience:

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1.02 PAYMENT

A. : No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 26 05 91 – Low Voltage Electric Motors

B. Section 43 05 21 - Common Work Results for Pumping Units

1.04 REFERENCES

A. Hydraulic Institute Standards (HI)

B. American Society for Testing Materials (ASTM)

C. ASTM A48/A48M – 03 Standard Specification for Gray Iron Castings

D. ASTM A470 Standard Specification for Vacuum-Treated Carbon and Alloy Steel Forgings for Turbine Rotors and Shafts

E. American Iron and Steel Institute (AISI)

F. Insulated Cable Engineers Association (ICEA)

G. American Society of Mechanical Engineers (ASME)/American National Standards Institute (ANSI)

H. B16.1 Gray Iron Pipe Flanges and Flanged Fittings

I. National Electrical Manufacturers Association (NEMA)

J. Institute of Electrical and Electronics Engineers (IEEE)

K. National Electric Code (NEC)

L. American Bearing Manufacturers Association (ABMA)

M. American Society for Testing and Materials International (ASTM)

1.05 DESCRIPTION

A. Service Conditions:

1. The pumps shall be submersible end suction centrifugal grinder type, installed in wet pit submersible installation. The pump will be suitable for submergence up to a depth of 66 ft.

a. The pumps shall be provided with a permanently installed "c"-channel guide rail system, with a sliding movable fitting that automatically connects to the discharge piping when lowered into place. The moveable fitting shall be equipped with a check valve, including integrated anti-siphon..

b. The pumps shall be installed on a pump support stand that is fabricated of 300 series stainless steel with rubberized pads on the feet, fixing the pump at the required distance to provide adequate suction clearance. The pumps shall be equipped with a 1.25-inch NPT or BSP discharge fitting which includes a check valve and integrated anti-siphon.

2. A centrifugal submersible grinder pump designed to reduce all material found in normal domestic and light industrial sewage, including plastics, rubber, sanitary napkins, and disposable diapers into a finely ground slurry. The resultant slurry is then pumped through small diameter piping into a facility. The temperature limitation of the liquid being pumped is 104°F/40°C continuous, 160°F/70°C intermittent and the submersible motor shall be capable of running dry for extended periods.

3. Each pump will be capable of the following performance:

	T-10-SMP-1 & 2; T-10-SMP-1 & 2 (four total)	Units
Primary Flow	20	US GPM
Primary Head	20	TDH - psi
Discharge Size	1.25	In
Motor Speed	3450	RPM
Motor HP	2	HP
Frequency	60	Hz
Voltage and Phase	1 ph - 208- 3 ph - 208	V and ph
Motor Service Factor	1.0	SF

1.06 QUALITY ASSURANCE

A. In addition to the requirements under Section 43 05 21 – Common Work Results for Pumping Units:

1. Supply and Compatibility:

a. All submersible grinder pumps shall be provided by a single manufacturer.

B. Manufacturer Qualifications

1. Pump(s) shall be manufactured by a company regularly engaged in the manufacture and assembly of similar units for a minimum of (5) years.

2. Manufacturer shall be certified to ISO 9001 and shall provide a valid certificate upon request.

C. Quality Assurance Inspections

1. Quality Assurance inspections may be made by NYC DEP Bureau of Engineering Design and Construction, Quality Assurance Section or its representative at the manufacturer's facility.

2. Quality Assurance inspections shall be in accordance with the requirements of the Contract Documents.

3. Submit copies of Manufacturer Certificates of Conformance.

1.07 SUBMITTALS

A. In addition to the submittals to be made under Section 43 05 21 – Common Work Results for Pumping Units, the following submittals are required for approval by the Engineer:

B. Action Submittals:

1. The manufacturer will supply the standard submittal, consisting of:

a. Pump Catalog Data, including a certified performance curve and pump dimensional drawing

b. Materials of construction list

c. Mounting Accessory details

d. Moveable fitting data

e. Typical installation drawing

f. Electrical schematics and diagrams, including control panel data and panel wiring schematic

g. Accessory data

h. Certified copies of test data from factory testing when specified, only after pumps have been ordered and manufactured.

C. Informational Submittals:

1. Descriptive information on material and equipment furnished

2. Anchorage requirements

3. Installation instructions

4. Manufacturer’s certificate of acceptance of installation and testing

5. List of manufacturer's recommended spare parts
6. Installation & Operation Manual with parts list
7. Warranty documents
8. Name and address of factory authorized service facility
9. Contractor shall provide DEP with location and description of manufacturer's Service Centers and spare parts stock.

D. Closeout Submittals:

1. Project record documents: Record actual locations of pumps and appurtenances on the contract drawing, reflecting all post-bid changes.
2. Operations and Maintenance Data: Submit maintenance instructions for equipment and accessories.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling for all Pumping Units shall comply with the requirements of Section 43 05 21 - Common Work Results for Pumping Units.

1. List the special storage and handling requirements for the products specified, including location and environmental conditions to protect from damage.
2. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
3. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the unit and equipment are ready for operation.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Spare Parts

1. One spare full diameter impeller for each pump model
2. One spare cutter assembly set
3. All gaskets
4. All o-rings
5. Spare set of starting components

1.10 WARRANTY

A. Warranty

1. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Submersible Grinder Pumps:

1. Barnes RAZOR submersible grinder pump model XZOGP
2. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Component Material

Volute	ASTM A48 Class 30 Cast Iron
Impellers	85-5-5-5 Bronze
Axial Cutter	ASTM A276 440C Stainless Steel, Heat Treated to a minimum Rockwell C55
Cutter plate	ASTM A276 440C Stainless Steel, Heat Treated to a minimum Rockwell C55
Motor Housing	ASTM A48 Class 30 Cast Iron
Seal Plates	ASTM A48 Class 30 Cast Iron
External Hardware	300 Stainless Steel
Lifting Bail	300 Stainless Steel
Shaft	416 Stainless Steel
Tandem Mechanical Seals	Silicon carbide for the rotating face and silicon carbide for the stationary face
Coating	The pump (s) shall be powder coated with an epoxy primer and polyester top coat
Gaskets	Buna-N
O-Rings	Buna-N
Motor Rotor Bars	Die Cast Aluminum
Elastomeric plug holding plate	ASTM A48 Class 30 Cast Iron
Cable Entry Housing	ASTM A48 Class 30 Cast Iron
Nameplate	304 Stainless Steel

B. Pump Components

1. The volute will be ASTM A48 Class 30 Cast Iron. All exposed hardware shall be 300 series stainless steel. The volute shall be a single piece non-concentric design, with smooth passages. The volute shall have two stages connected by a cutwater passage, positioned 180 degrees from the discharge for balance. The discharge connection shall be a standard 1.25-inch NPT in the vertical position using a threaded bolt on discharge flange. A movable fitting with C-Channel connection or a breakaway fitting are also acceptable.
2. The pump shall include two impellers. The impellers shall be of the recessed vortex design. Pumps with standard centrifugal semi-open impeller designs

shall not be acceptable. The impellers shall be of 85-5-5-5 Bronze construction and machined such that the upper and lower impeller are locked for positive rotation by a shaft key. Both impellers are dynamically balanced to ISO G6.3. Progressive cavity pumps shall not be acceptable.

3. The grinder mechanism shall be specifically designed for use in a grinder pump. The mechanism shall consist of an axial cutter that is locked for rotation by a shaft key. The cutter is fixed axially by a socket head cap screw. The cutter plate is held in place by a press fit. The entire cutting mechanism shall be recessed, protecting the mechanism. All grinding mechanism components, including both the cutter plate and radial cutter shall be constructed of 440C stainless steel hardened to a minimum Rockwell C55 and shall have a ground finish for a fine cutting edge. The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece, stainless steel motor shaft. The grinding assembly shall operate without objectionable noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed so as to eliminate clogging and jamming under all normal operating conditions including starting. In order to demonstrate adequate flow velocity and grinding capability, the grinder pump shall be capable of passing a series of stringy type solids (diapers, rags, feminine products, etc.) through the pump without roping or winding the material in or immediately below the pump suction. The pump shall be certified to NSF46 standards.

4. The pump and motor shaft will be a solid, continuous piece of 416 stainless steel. Shafts utilizing a coupling or other attachment method will not be acceptable. The shaft will have a maximum allowable deflection of 0.002 inches at the lower mechanical seal during operation.

5. The mechanical seals will be a double mechanical seal system, consisting of two independent mechanical seals, each with its own single spring system acting in a common direction. The upper seal will have a silicon carbide rotating face and a silicon carbide stationary face and will be located between the seal chamber and the motor housing. The lower seal will have a silicon carbide rotating face and a silicon carbide stationary face. Both seals will have 300 series stainless steel hardware and Buna-N elastomers.

6. Seals must operate in an oil filled chamber which shall provide superior heat transfer & seal cooling. Seal faces shall be lapped and polished to a tolerance of one light band. The seals must not require routine maintenance or adjustment. The seal shall be commercially available and not a pump manufacturer’s proprietary design.

7. The common pump and motor shaft shall rotate on two bearings. These bearings shall be high quality and commercially available. The bearings shall be of the self-lubricated design, with grease for superior lubrication, cooling, and life. The pump shall be a two-bearing design consisting of an upper ball bearing carrying the thrust loads, and lower ball bearing for the purpose of carrying the thrust loads and radial loads. Sleeve bearings will

not be considered equal. The lower bearing shall be of the single row ball type, locked in position to accept radial and axial thrust loads and the upper bearing shall be of the single ball type for radial loads as needed to provide a minimum L10 Life of 50,000 hours at -50% to +50% of BEP.

8. Gaskets except for seal gland and bearing retainer shall be of the angular gland compression O-ring type eliminating critical slip fits and the possibility of damage during service associated with sliding O-ring sealing arrangements. Mating surfaces where watertight sealing is required shall be machined and fitted with O-rings.

9. The exterior of the pump liquid end shall be coated per Article 2.03.

10. The pump shall be equipped with a stainless-steel nameplate, located in an easily accessible location. The following data will be included on the nameplate:

    a. Manufacturer's Name

    b. Pump Part Number, Model Number and Serial Number

    c. Motor Horsepower Rating

    d. Voltage, Phase, and Frequency

    e. Motor Speed

    f. Motor Full Load Amps

    g. Ambient Temperature Rating

    h. Code Letter

    i. Impeller Diameter

    j. Motor Insulation Class

C. Motor Components

1. The major driver components will be ASTM A48 Class 30 Cast Iron. The motor shaft shall be of 416 stainless steel.

2. The motor shall be a squirrel cage induction type and shall be dielectric oil filled for optimal thermal management and maximum bearing life. The pump shall be capable of operating in a totally, partially, or non-submerged condition for extended periods of time without damage due to heat being generated. Oil used must be able to be disposed of as nonhazardous waste. Air-filled motors shall not be acceptable. The motor shall be NEMA Type B. The stator windings shall be insulated with moisture resistant and spike resistant Class F varnish and magnet wire insulation, rated for 155°C (311°F). The motor shall be designed to run continuously in a 40° (104°F) ambient environment.

3. Single Phase motors shall be of the capacitor start, capacitor run design. Start and run components will be provided by the pump manufacturer and shall be installed in the control panel.

4. The stator shall be pressed into the motor housing and shall be secured via bolts to the bearing retainer and lower seal chamber.

5. The motor shall have a minimum 1.0 service factor. The motor shall be designed for usage in submersible applications only. The motor horsepower shall be non-overloading of the nameplate rating throughout the entire pump performance curve. The motor shall meet the performance requirements of a NEMA L speed torque curve.

6. The rotor bars shall be die cast aluminum.

7. The motor will be capable of operating continuously at a maximum submergence depth of 20 ft.

8. The motor will be capable of 11.5 starts per hour with a minimum rest time of 77 seconds between starts without overheating.

9. Motor shall be CSA Listed to the CSA 108 / UL 778 harmonized standard and to CSA 145 / UL 674 harmonized standard for use in Class 1, Division 1 hazardous locations.

D. Sensors

1. Motors shall have built-in thermal overload protection.

   a. For single phase pumps, an automatically resetting, heat sensing thermal device that interrupts current flow if excessive temperature and/or current is detected shall provide protection against excessive temperature.

   b. For three phase pumps, Protection against excessive temperature shall be provided by heat sensor thermostat attached to the stator windings and connected in series with the contactor coil in the control panel.

2. The moisture sensor detection system shall consist of a dual probe system in the seal chamber. The probes shall monitor conductivity of the oil. It is recommended to use a pump monitor relay (PMR) installed inside the control panel which will trigger a warning light and shut down the pump when pumped fluid is detected.

E. Power Cord

1. The pumps shall be equipped with 50ft. of type SOW power cord. The power and sensor cords and motor shall be connected via quick disconnect pin terminals located within the motor housing. Pin receptacles shall be molded in an elastomeric puck. The power and sensor cord cables will be connected via male receptacle pins, and potted in place. A neoprene grommet will provide strain relief, secured by a stainless-steel washer and gland nut. The plug shall be secured with a stainless-steel compression plate to prevent water from entering the motor housing at the point of cord entry. A Valox® 457 terminal block with brass pin inserts shall connect the power cord leads with motor leads. The ground pin shall be longer than the other

pins such that the ground connection is the first connection made and the last connection broken when the plug is inserted and removed, respectively. A Buna-N O-ring shall provide isolation sealing between terminal block and the motor housing. The cord assembly shall be guaranteed by the manufacturer to meet UL approval for submersion.

2. The pumps shall be capable of being easily removed and replaced without the removal of the pump power cord from the electrical conduit.

F. Accessories

1. The pump shall be supplied with a "C" channel rail assembly to facilitate removal of the pump(s) from ground level. The "c"-channel guide rail assembly is made of 300 series stainless steel. The guide rail mounts to the upper and lower horizontal brackets attached to the basin wall. The wait also rests on the basin floor. The stainless steel guide rail supports the pump the required distance from the basin floor. Guide brackets are attached to the pump from positioning of the unit on the guide rail during installation and removal. The stationary fitting of the hydraulically sealed discharge is powder coated machined cast iron, with an 85-5-5-5 bronze, non-sparking sliding fixture. The stationary fitting has a fiber reinforced neoprene diaphragm clamped between the stainless steel rail and the stationary pressure vessel. The moveable fitting is held against the stationary fitting by the construction of the stainless steel rail, aligning the moveable fitting to the flexible diaphragm for proper sealing of the two surfaces.

2. The pumps shall be installed on a pump support stand that is fabricated of 300 series stainless steel with rubberized pads on the feet, fixing the pump at the required distance to provide adequate suction clearance. The pumps shall be equipped with a 1.25-inch NPT or BSP discharge fitting which includes a check valve and integrated anti-siphon.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. The pump (s) shall be powder coated with an epoxy primer and polyester top coat.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Factory Tests:

1. The pump manufacturer shall perform a pump performance test to verify hydraulic performance as standard. The pump shall be completely submerged and run to determine that the unit meets three pre-determined hydraulic performance points.

2. If certified testing is required, the manufacturer shall offer to perform tests in accordance with Grades B, E, or U of Hydraulic Institute standards 11.6 and 14.6.

3. A check of the motor voltage and frequency shall be made as shown on the name plate.

4. A motor and cable insulation test for moisture content or insulation defects, in accordance with CSA criteria.
5. Each motor shall be dielectric tested to verify the motor insulation integrity.
6. Contact the manufacturer for tests not listed here.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Install in accordance with manufacturer's printed instructions.

1. The pump shall be capable of operating continuously in a vertical submerged condition.
2. Contractor shall complete all piping and supports, make all electrical power and control connections, and install all safety devices and instrumentation prior to equipment start-up.
3. All anchor bolts, nuts, washers, and sleeves shall be Type 316 stainless steel furnished by the contractor and shall be of ample size and strength for the purpose intended.

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Tests:

1. After installation, the pumping system shall be field tested using potable water for a minimum of 30 minutes and check for correct direction of rotation in the presence of the manufacturer's representative and the Engineer. Contractor shall be responsible for providing water and for conveying the water to the site and providing required meter and back-flow prevention check valve assembly. Each pump shall be cycled through the sequence of operation "pump on" as the level rises in the wet well and then "pump off" during draw down. Once each pump has been tested separately, the pumps will be operated in parallel.
2. Each pump shall operate over its intended operating range without undue noise, vibration, or cavitation. Contractor shall monitor and record vibration at three symmetrically located points on each pump at maximum and minimum speed and supply data to DEP.

B. Inspections

1. Upon completion of the installation and on-site testing, and before acceptance by DEP, the Pump Manufacturer or the authorized Pump Manufacturer's Representative shall submit a written statement that the pump installation has been inspected and is completed in accordance with the manufacturer's recommendations.

C. Manufacturer's Representative

1. The Contractor shall furnish the services of accredited representatives of the Pumping Unit manufacturer to supervise the installation, adjustment, and field tests of the equipment and to provide training for DEP operating personnel.

2. The representative shall inspect the equipment, carry out the equipment start-up procedures, and provide training to the operators in how to effectively operate and maintain the equipment. The manufacturer's representative may be an employee of the manufacturer's distributor.

3. Prior to Operational Testing, Contractor shall have the manufacturer's representative perform the following:

   a. Megger test the stator and power cables.

   b. Check proper rotation.

   c. Check power supply voltage.

   d. Measure motor operating load and no-load current.

   e. Check level control operation and sequence.

4. During Final Acceptance Testing, the manufacturer's service representative shall review recommended operation and maintenance procedures with the DEP's personnel.

5. The manufacturer's representative shall be present for a period of not less than one (1) day to complete the following:

   a. Inspect completed installation

   b. Observe equipment testing

   c. Observe equipment start-up

   d. Instruct operational personnel on equipment operation and maintenance.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjust parts for smooth, uniform operation.

B. Clean as recommended by manufacturer. Do not use materials or methods which may damage finish (surface) or surrounding construction.

END OF SECTION

SECTION 43 33 44 – PERISTALTIC HOSE PUMPING UNITS
CONTRACT CSO-FC-D

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, as shown, specified and required, to furnish and install all peristaltic hose pumping units and appurtenances, complete and operation. Peristaltic Hose Pumping Units shall be as specified herein and as shown on the Contract Drawings.

B. The following index of this Section is presented for convenience:

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C. The following schedules, attached after the End of Section designation, is a part of this Section:

1. Schedule 43 33 44-1, Peristaltic Hose Pumping Units – Metering Pump Schedule.
2. Schedule 43 33 44-2, Peristaltic Hose Pumping Units – Transfer Pump Schedule.
3. Schedule 43 33 44-3, Peristaltic Hose Pumping Units – Sample Pump Schedule.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 09 91 00 – Painting.

B. Section 26 29 23 – Variable-Frequency Motor Controllers.

C. Section 40 05 56 – Process Valves, Smaller than Four-Inch Diameter

D. Section 40 79 91 – PMCS Field Instruments

E. Section 43 05 21 – Common Work Results for Pumping Units

1.04 REFERENCES

A. AGMA 2000-A88 – Gear Classification and Inspection Handbook

B. ASTM A48 – Standard Specification for Gray Iron Castings

C. ASTM A1011 / A1011M – F Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

D. ASME/ANSI B16.5 – Pipe Flanges and Flanged Fittings

1.05 DESCRIPTION

A. Peristaltic Hose Pumping Units shall be self-priming peristaltic hose type pumps that are specifically designed for pumping the following chemical solutions specified herein.

B. Service Description:

1. Pump Units shall be for the following chemical services:

a. Sodium hypochlorite, up to 15-percent solution.

b. Sodium bisulfite, up to 38-percent solution.

C. Design Requirements:

1. Refer to Schedule 43 33 44-1, Peristaltic Hose Pumping Units – Metering Pump Schedule, Schedule 43 33 44-2, Peristaltic Hose Pumping Units – Transfer Pump Schedule, and Schedule 43 33 44-1, Peristaltic Hose Pumping Units – Sample Pump Schedule located after the "End of Section" designation.

1.06 QUALITY ASSURANCE

A. Quality assurance for all Peristaltic Hose Pumping Units shall comply with the requirements of Section 43 05 21 - Common Work Results for Pumping Units

B. Qualifications of Manufacturer:

1. The manufacturer shall have a minimum of twenty (20) years of experience in the design and fabrication of liquid chemical diffusers, fittings, appurtenances, and specials of similar size, capacity, and type to those shown on the Contract Drawings and specified in the Contract Documents and shall show evidence of at least fifty (50) substantially similar installations in satisfactory operation.

C. Supply and Compatibility:

1. All peristaltic tube pumps, appurtenances, and specials included in this section shall be provided by the Contractor through a single, qualified peristaltic tube pump manufacturer.

a. Pump manufacturer must provide pumps and accessories, which are integral to pump operation, and specified herein as a coordinated package, regardless of manufacturer. This includes pumps, gear reducers, motors, leak detectors, control panels/drives and other such accessories specified under this section as the responsibility of the pump supplier. Equipment specified herein that is not supplied by the pump manufacturer, as an integrated package will be rejected.

2. Pumps are to be manufacturer's standard catalog product.

D. Quality Assurance Inspections

1. Quality Assurance inspections may be made by NYC DEP Bureau of Engineering Design and Construction, Quality Assurance Section or its representative at the manufacturer's facility.

2. Quality Assurance inspections shall be in accordance with the requirements of the Contract Documents.

3. Submit copies of Manufacturer Certificates of Conformance.

1.07 SUBMITTALS

A. Submittals for all Peristaltic Hose Pumping Units shall comply with the requirements of Section 43 05 21 - Common Work Results for Pumping Units. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Shop Drawings

1) Manufacturer’s standard overhaul instruction for motors.

2) Catalog information for all components, materials lists, and additional information describing the conformance of the proposed equipment with design and operating requirements of this Section.

3) System layouts and/or schematics.

4) Elementary and connection wiring diagrams clearly showing external connections to other equipment.

b. Operation and Maintenance manuals, in accordance with the requirements of the Contract Documents.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling for all Peristaltic Hose Pumping Units shall comply with the requirements of Section 43 05 21 - Common Work Results for Pumping Units.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Provide spare parts, special tools, and supplies in accordance with the requirements of Section 43 05 21 - Common Work Results for Pumping Units. In addition, the Contractor shall provide the following:

1. Two (2) replacement hoses of each size provided.
2. Two (2) hose lubricant refills.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Peristaltic hose pumps shall be:

1. Watson-Marlow Bredel Series.
2. Vederflex VF Series.
3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Design Criteria:

1. Refer to Schedule 43 33 44-1, Peristaltic Hose Pumping Units – Metering Pump Schedule, Schedule 43 33 44-2, Peristaltic Hose Pumping Units – Transfer Pump Schedule and Schedule 43 33 44-3, Peristaltic Hose Pumping Units – Sample Pump Schedule located after the "End of Section" designation.
2. Pump shall be horizontal, positive displacement, peristaltic type.
3. Pump shall be capable of operating in either direction without flow variation.
4. Pump shall be capable of running dry without damage to pump or hose.
5. Pump shall be capable of pulling 95 percent of full vacuum.

6. Repeatability: + 1% accuracy.

7. Valveless/glandless design with no dynamic seals in contact with the pumped media.

8. Pump shall be capable of being rotated in 90-degree increments for four (4) different port-mounting configurations.

9. Direct coupled gear drive arrangement as specified herein.

B. Hose and Lubricant:

1. Hose shall be manufactured of three-layer elastomer with an extruded inner wetted layer compatible with the process fluid, four layers of nylon reinforcement, and an EPDM or natural rubber outer layer. Hose outside diameter shall be machined to maintain a wall thickness within + 0.25 mm tolerance. The hose external surface shall have surface average roughness of Ra 8+4µ. Hoses that do not meet these minimum requirements are not acceptable.

2. Minimum Static Burst Pressure rating of 800 psi.

3. Hose hardness rating shall be 53-68 shore A durometer.

4. Hose must be replaceable without cover or pump removal.

5. Pump housing shall contain a NSF-listed food-grade glycerin-based hose lubricant blended to provide a medium for cooling and lubrication.

6. Provide a threaded drain plug at the lowest point of the pumping chamber to allow the complete drainage of lubricant.

C. Pump Housing with Internal Bearing Frame:

1. Pump housing shall be constructed of Cast Iron ASTM A48 Class 25 and shall be either supplied with an internally mounted bearing hub and rotor assembly or use the bearing system of the gear reducer to support the load of the rotor within the pump. Gear unit shall be direct coupled to the back of the pump housing and shall be completely isolated from the process fluid and pump lubricant through the sealed bearing hub.

2. Rotor shall be constructed of Cast Iron ASTM A48 Class 25 with two pressing shoes mounted 180 degrees apart. Shoes shall be constructed of epoxy or extruded aluminum as recommended by the manufacturer and shall be adjustable for varying degrees of compression via flat shims constructed of 316 Stainless Steel or aluminum. Rotors incorporating rollers or fixed occlusion shoes are unacceptable.

3. Pump rotor shall be independently supported on its own set of ball bearings such that the bearings are located directly under the rotor's load. Bearings shall be supported by the bearing hub located within the pump housing and shall be sealed via a dynamic seal constructed of Buna-N. Bearings shall be sealed and greased for life. Pumps which use pump lubricant to lubricate

the bearings or external bearing frames which allow overhung loading and require long coupling configurations are not acceptable.

4. Pumphead rotor shall be driven and connected to the gearing via a splined shaft or keyed shaft. Rotor or shaft construction shall be constructed with shear points to allow disengagement from the drive, which shall prevent pump or gearing damage in the event of overtorque caused by a locked rotor.

5. Pump construction shall include a buffer zone between the gearing and pumphead to prevent gearbox contamination in the event of a hose lubricant seal failure. The internal pump bearing hub shall be vented through the rear of the pump housing to allow visual detection in the event of a hose lubricant seal failure.

D. Connectors:

1. Supply pump with flanged inlet and outlet to ASME/ANSI B16.5 Class 150 standards. Flanges and brackets (if provided) shall be constructed of galvanized steel galvanized to 15 microns minimum and shall be provided with PVC wetted inserts or other material compatible with the process fluid as indicated in the Operating Requirements.

2. Pump hose shall extend from the pumping chamber to allow visual confirmation of hose/flange insert connection. Flange insert shall be secured to the pump hose via a single band clamp or compression fitting. Securing the hose using multiple clamps is not acceptable.

3. Flange supports shall be one piece and constructed of galvanized steel galvanized to 15 microns minimum and shall be secured to the pump housing via four hex head bolts for the 1.5-inch to 4.0-inch pumps and two bolts for 1-inch to 1.25-inch pumps. Flange supports shall maintain a compression seal between the pump housing and hose

E. Pump Cover:

1. For 1-inch and 1.25-inch pumps, cover shall be constructed of Cast Iron ASTM A48 Class 25 or Carbon Steel ASTM A1011 / A1011M – 10 GR36 and shall be fitted with a fixed window constructed of PMMA. The cover shall be retained to the housing by no more than four hex head bolts and shall be equipped with two hand grips to allow quick and easy removal for replacement of the pressing shoes or shim adjustment.

2. For 1.5-inch to 4.0-inch pumps, cover shall be constructed of Carbon Steel ASTM A1011 / A1011M – 10 GR36 with a removable clear viewing inspection window constructed of PMMA and sufficiently large enough to replace pressing shoes and allow shim adjustment without removing pump cover.

3. The window shall be sufficiently sized to view direction of rotation of the pump and shall be marked with a minimum lubricant registration mark for proper indication of lubricant level when the pump is stationary.

4. Pump cover shall be sealed to the pumphead via a captive Buna-N quadring seal.

5. Pump hardware shall be stainless steel.

F. Frame:

1. Support frame shall be torsion free and constructed of formed hot dipped galvanized steel with a coating thickness of 15 microns or powder coated carbon steel. Welded steel or modular adjustable frames are not acceptable.

G. Leak Detector:

1. Leak detector to be one of the following:

a. A float type magnetic reed switch located near the top of the pump to detect leakage of pumped product into the pump housing. Mount the sensor on the rear of the pump housing. Switch shall be rated to the following maxima: Vmax = 240VAC, Imax = 1 Amp, Pmax = 50VA.

b. A pressure-sensing device to detect high pressure above the normal lubricant level that would be indicative of leakage of pumped product into the pump housing for indication of hose failure. Device shall have a 100V power supply.

2. Supply sensor Normally Closed with the ability for field adjustment to Normally Open

3. Pump manufacturer to supply switch only. Contractor is responsible for alarm and relay to turn pump off unless otherwise specified herein.

H. Gearing:

1. Provide gearing with direct-coupled mounting to the pump housing.

2. For 1- to 1.25-inch pumps, provide foot mounted helical gearbox with direct-coupled mounting face. Helical gearing shall be 2 or 3 stage with gear reducer housing constructed of cast iron.

3. For 4- to 10-inch pumps, provide planetary gearing with direct coupled mounting face. Gear planetary drive shall be of a modular construction, 1, 2 or 3 stages as required with each module consisting of an internal gear meshing with 3 planetary gears mounted on the planet carrier which shall also engage with the sun pinion. Construct gears and shafts of alloy steel, planet carriers in modular cast iron or steel, and housing of cast iron.

4. Design gear reduction to match output speed requirement of the pump using two or three-stage gearing and matching torque rating of pumping equipment. Gearing shall be classified for continuous heavy shock duty, AGMA Class II, 24 hr duty with a minimum of 1.4 service factor.

I. Motors:

1. Electric motors shall be inverter duty and conform to the requirements of Section 26 05 91, Low Voltage Electric Motors.

J. Variable Frequency Drives:

1. Contractor shall provide variable frequency drives, where indicated, in accordance with Section 26 29 23 – Variable-Frequency Motor Controllers.

K. Accessories:

1. All components that come in contact with the specified chemicals shall be compatible with those chemicals.

2. All components and hardware that do not come in contact with the specified chemical are to be type 316 stainless steel. Control panel mounting hardware shall be type 316 stainless steel.

3. Anchor Bolts: Type 316 stainless steel, sized by equipment manufacturer, 1/2-inch minimum diameter.

4. Gauge Connections: Tapped and plugged suction and discharge gauge connections on piping headers adjacent to pumps.

5. Pressure Relief Valve: Provide one pressure relief valve per pump. Pressure relief valve shall be non-metallic, suitable for use with fluid being pumps and as specified in Section 40 05 56, Process Valves, Smaller than Four-Inch Diameter.

6. Pressure Switch: Provide one pressure switch per pump. Pressure switch shall shut-down pump at the pressure shown on the drawings. Pressure switch shall be as specified in Section 40 61 96 - PMCS Control Strategies.

7. Pulsation Dampener: Provide a pulsation dampener sized to dampen 90% of the pulsation caused by the pumps. The volume of the dampener should be a minimum of 9 times the volume displaced by one hose compression release. Dampeners shall have PVC Inserts and EPDM Hose. The dampener should be sized to match the size of the hose of each respective pump.

L. Revolution Sensor:

1. A revolution sensor shall be provided and installed on the pump and locally displayed.

M. Flexible Hose:

1. Provide flexible hose on the suction and discharge sides of the pumps as shown on the drawings. Contractor to provide all couplings to connect to pump discharge and suction as well as upstream/downstream PVC piping. Hose to be a reinforced synthetic rubber, with spiral-plied synthetic fabric with double wire helix reinforcement and a synthetic rubber cover. Pressure resistance up to 150 PSI working pressure at 70 degrees F and minimum temperature range -25 to 150 degrees F. Hose to be chemically compatible with the fluid being pumped for continuous use. Hose to be Goodyear Brown Flexwing or equal. Flexible hose shall be supported per the requirements of Section 40 05 07, Hangers and Supports for Process Piping.

N. Back-Pressure Sustaining Valve: Provide one back-pressure sustaining valve per pump. Back-pressure sustaining valve switch shall be set to the pressure described above and shall be non-metallic, suitable for use with fluid being pumps. Pressure switch shall be as specified in Section 40 79 91, PMCS Field Instruments.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Shop Coatings:

1. Equipment shall be shop primed prior to shipment from the factory with a primer compatible with the coating system in Section 09 91 00 – Painting.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Performance Shop Test:

1. Perform non-witnessed inlet vacuum testing as follows:

a. Test assembled pump running on air.

b. Run test for a minimum of 30 seconds and record vacuum reading which must meet or exceed 28" Hg vacuum.

c. In the event that specified tests indicate that the pump does not meet specifications, Engineer has the right to require complete tests for the pump at no additional cost to DEP.

d. Correct or replace promptly all defects or defective equipment revealed by or noted during tests at no additional cost to DEP.

e. Repeat tests until specified results are obtained.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Inspection, installation of equipment and piping, and piping and equipment identification shall be in accordance with Section 43 05 21 - Common Work Results for Pumping Units.

3.02 INSTALLATION

A. Install all Pumping Units in accordance with the requirements of Section 43 05 21 - Common Work Results for Pumping Units and the manufacturer’s written recommendations.

B. Install pumping equipment on a concrete pad and make final alignments thereon.

C. Ensure the pumps’ suction and discharge port connections to process lines are nonleaking and made in a free supported state without need to apply vertical or horizontal pressure to align piping with pump nozzles.

D. Manufacturer's Representative:

1. The Contractor shall furnish the services of accredited representatives of the Pumping Unit manufacturer to supervise the installation, adjustment, and

field tests of the equipment and to provide training for DEP operating personnel.

2. The services of the manufacturer's representative shall be furnished for installation supervision for at least the following number of days:

Visit:	Purpose:	Number of Visits:	Person-days per Visit:
No. 1	Installation Supervision	6	1

3. Should additional days of service be necessary for a successful installation, such services shall be provided by the Contractor at no additional cost to the City.

3.03 FIELD TESTING / QUALITY CONTROL

A. In addition to the field tests to be performed under Section 43 05 21 – Common Work Results for Pumping Units, the following tests are required.

1. Performance Test - Conduct tunning test for each pump to determine its ability to operate within the performance limits specified and to deliver its rated capacity within the pressure requirements specified.

B. The Contractor shall provide the services of the Pumping Unit manufacturer's representative at such times and for such durations of time as are needed to perform the field testing tasks required of the representative.

1. The services of a manufacturer's representative shall be furnished for field testing for at least the following number of days:

Visit	Purpose:	Number of Visits:	Person-days per Visit:
No. 2	Field Testing	6	1

3.04 STARTUP / DEMONSTRATION

A. Furnish the services of a qualified Pumping Unit manufacturer's representative to assist in the start-up of the equipment and train DEP operations and maintenance staff in the care, operation, and maintenance of the equipment in accordance with the requirements of the Contract Documents. In addition:

1. Contractor shall make all adjustments required to place Work in proper operating condition.

2. Contractor shall include in training of DEP personnel instruction on care and maintenance of the materials and equipment.

3. In the event of trouble with the equipment during startup / initial operation, the manufacturer's representative shall revisit the Site as often as required until all troubles are corrected and the installation is entirely satisfactory.

B. At a minimum, the services of the Pumping Unit manufacturer's representative shall be provided as indicated, below. The number of visits and person-days per visit indicated, below, shall be understood as referring to the total required services for the lot of equipment provided under this Section.

Visit:	Purpose:	Number of Visits:	Person-days per visit:
No. 3	Startup / Initial Operation	6	1
No. 4	Training	2	1

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting, protection, and cleanup shall comply with the requirements of Section 43 05 21, Common Work Results for Pumping Units.

END OF SECTION

SCHEDULE 43 33 44-1
PERISTALTIC HOSE PUMPING UNITS – METERING PUMP SCHEDULE

Location	**TI-010C Chlorination Facility**		**TI-010D Dechlorination Facility**	**TI-011 Disinfection Facility**	
Equipment Tags:	HYPO-MP-1A HYPO-MP-1B	HYPO-MP-2A HYPO-MP-2B	SBS-MP-1 SBS-MP-2 SBS-MP-3	HYPO-MP-1 HYPO-MP-2 HYPO-MP-3	
Chemical Service:	Up to 15% Sodium Hypochlorite	Up to 15% Sodium Hypochlorite	Up to 22% Sodium Bisulfite	Up to 15% Sodium Hypochlorite	
Drive Type:	VFD	VFD	VFD	VFD	
Rated Capacity:	41 GPM	76 GPM	8 GPM	28 GPM	
Total Dynamic Head	30 psi	35 psi	35 psi	63psi	
Temperature Range:	40-100 degrees F				
Normal temperature	60 degrees F				
Specific gravity at 70 degrees F	1.2	1.2	1.3	1.2	
Viscosity at 68 degrees F	5.4 cp	5.4 cp	3.6 cp	5.4 cp	
pH	12	12	3.5 to 5.0	12	
Maximum Horsepower	7.5	15	5	5	
Duty	FBCSO	DC-5	TI-010 18’x10’ Triple Barrel Culvert Outfall	Regulator TI-09	
Back Pressure Valve	Included	Included	Included	Included	

Relief Valve Setpoint	TBD	TBD	TBD	TBD	

SCHEDULE 43 33 44-2
PERISTALTIC HOSE PUMPING UNITS – TRANSFER PUMP SCHEDULE

Location	TI-010 Chlorination Facility	TI-010 Dechlorination Facility	TI-011 Disinfection Facility	
Equipment Tags:	HYPO-TP-1 HYPO-TP-2	SBS-TP-1 SBS-TP-2	HYPO-TP-1 HYPO-TP-2	SBS-TP-1 SBS-TP-2
Chemical Service:	Up to 15% Sodium Hypochlorite	Up to 22% Sodium Bisulfite	Up to 15% Sodium Hypochlorite	Up to 22% Sodium Bisulfite
Drive Type:	Constant	Constant	Constant	Constant
Rated Capacity:	30 GPM	20 GPM	30 GPM	20 GPM
Total Dynamic Head:	10 psi	25 psi	25 psi	25 psi
Temperature Range:	40-100 degrees F			
Normal temperature	60 degrees F			
Specific gravity at 70 degrees F	1.2	1.3	1.2	1.3
Viscosity at 68 degrees F	5.4 cp	3.6 cp	5.4 cp	3.6 cp
pH	12	3.5 to 5.0	12	3.5 to 5.0
Maximum Horsepower	5	5	5	5
Duty	Transfer between HYPO-TP-1 HYPO-TP-2	Transfer between SBS-TP-1 SBS-TP-2	Transfer between HYPO-TP-1 HYPO-TP-2	Transfer between SBS-TP-1 SBS-TP-2
Back Pressure Valve	Included	Included	Included	Included
Relief Valve Setpoint	TBD	TBD	TBD	TBD

SCHEDULE 43 33 44-3
PERISTALTIC HOSE PUMPING UNITS – SAMPLE PUMP SCHEDULE

Location	TI-010 Chlorination Facility
Equipment Tags:	FBCSO-SMP-1 and FBCSO-SMP-2
Service:	Combined Sewer
Drive Type:	Constant
Rated Capacity:	20 GPM
Ttoa Dynamic Head:	25 psi
Temperature Range:	40-100 degrees F
Normal temperature	60 degrees F
Specific gravity at 70 degrees F	1.2
Viscosity at 68 degrees F	1 cp
pH	6-8
Maximum Horsepower	3 HP
Duty	Sampling to TRC Analyzer
Back Pressure Valve	Yes
Relief Valve Setpoint	45 psi

SECTION 43 33 54 – PERISTALTIC TUBE PUMPING UNITS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, as shown, specified and required, to furnish and install all peristaltic tube pumping units and appurtenances, complete and operation. Peristaltic Tube Pumping Units shall be as specified herein and as shown on the Contract Drawings.

B. The following index of this Section is presented for convenience:

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C. The following schedules, attached after the End of Section designation, is a part of this Section:

1. Schedule 43 33 54-1, Peristaltic Tube Pumping Units Schedule.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Not Used

1.05 DESCRIPTION

A. Peristaltic Tube Pumping Units shall be positive displacement type complete with replaceable cartridge, style peristaltic pumphead technology and self-contained variable speed drive.

B. Service Description:

1. Pump Units shall be for the following chemical services:

a. Sodium bisulfite, up to 22-percent solution.

C. Design Requirements:

1. Refer to Schedule 43 33 54-1, Peristaltic Tube Pumping Units Schedule, located after the "End of Section" designation.

2. Pumps shall be self-priming, and shall have a maximum suction lift capability of up to 30' vertical water column.

3. Discharge Pressure Rating: up to 36 psi.

4. Pumps shall be capable of pumping both liquids and gases without vapor locking.

5. Pumps shall be rated for continuous duty.

6. Pump shall not require the use of back pressure valves, suction foot valves, strainers, pulsation dampeners, or auto degassing valves and shall not require dynamic seals in contact with the pumped fluid. Process fluid shall be contained within pump tubing and shall not directly contact any rotary or metallic components during operation. Upon failure, the process fluid shall be completely contained within the pump head to prevent hazardous exposure to operators. Manufacturers that do not offer a completely contained pump head are not acceptable.

1.06 QUALITY ASSURANCE

A. Quality assurance for all Peristaltic Hose Pumping Units shall comply with the requirements of Section 43 05 - Common Work Results for Pumping Units

B. Qualifications of Manufacturer:

1. The manufacturer shall have a minimum of twenty (20) years of experience in the design and fabrication of liquid chemical diffusers, fittings, appurtenances, and specials of similar size, capacity, and type to those shown on the Contract Drawings and specified in the Contract Documents and shall show evidence of at least fifty (50) substantially similar installations in satisfactory operation.

C. Supply and Compatibility:

1. All peristaltic tube pumps, appurtenances, and specials included in this section shall be provided by the Contractor through a single, qualified peristaltic tube pump manufacturer.

a. Pump manufacturer must provide pumps and accessories, which are integral to pump operation, and specified herein as a coordinated package, regardless of manufacturer. This includes pumps, gear reducers, motors, leak detectors, control panels/drives and other such accessories specified under this section as the responsibility of the pump supplier. Equipment specified herein that is not supplied by the pump manufacturer, as an integrated package will be rejected.

2. To ensure proper function and quality, pumphead, tubing, and drive shall be manufactured by the same company. Tubing purchased by the pump manufacturer from a third party is not acceptable.

3. Pumps are to be manufacturer's standard catalog product.

D. For quality assurance, pumps shall be supplied and labeled by the original manufacturer. Relabeled products, even under license by manufacturer, shall not be acceptable.

E. Pumps shall be manufactured in compliance with ISO 9001-2015 standards.

F. Pumps shall be meet CE, NSF 61 and applicable electrical standards.

G. Quality Assurance Inspections:

1. Quality Assurance inspections may be made by NYC DEP Bureau of Engineering Design and Construction, Quality Assurance Section or its representative at the manufacturer's facility.

2. Quality Assurance inspections shall be in accordance with the requirements of the Contract Documents.

3. Submit copies of Manufacturer Certificates of Conformance.

1.07 SUBMITTALS

A. Submittals for all Peristaltic Tube Pumping Units shall comply with the requirements of Section 43 05 21 - Common Work Results for Pumping Units. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Shop Drawings

1) Manufacturer’s standard overhaul instruction for motors.

2) Catalog information for all components, materials lists, and additional information describing the conformance of the proposed equipment with design and operating requirements of this Section.

3) System layouts and/or schematics.

4) Tool-free pumphead replacement instructions.

5) Manufacturer's certification that pumphead, drive, and tubing are all manufactured by the same manufacturer.

6) Elementary and connection wiring diagrams clearly showing external connections to other equipment.

b. Operation and Maintenance manuals, in accordance with the requirements of the Contract Documents.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling for all Peristaltic Hose Pumping Units shall comply with the requirements of Section 43 05 21 - Common Work Results for Pumping Units.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Spares:

1. Provide one (1) spare pumphead per pump supplied.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Peristaltic Tube Pumps:

1. Watson-Marlow, Inc.

2. Verder Inc.

3. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Pumphead

1. Technology: Provide tool-free ReNu cartridge-style peristaltic pumphead technology. For operator safety, pumphead shall be serviceable as a single replaceable component. Pumps that require an operator to open the pumphead for tube replacement, cleaning, or rebuilding or that require tools for maintenance are unacceptable.

2. Max rating: Qdos 600, with Santoprene pumphead – 158.5 GPH and 36 psi of discharge pressure.

3. Housing construction: corrosion resistant and high impact resistant glass filled PPS or PPE/PS.

4. Geometry: Pumphead shall consist of sealed track housing with in-line porting. Suction and discharge ports shall be 180 degrees apart with bottom suction and top discharge.

5. Rotor: Pumphead rotor shall be constructed of glass filled Nylon, sealed within the track housing, and supported by its own bearings. Peristaltic occlusion level shall be factory set to ensure flow accuracy of +/- 1% and repeatability performance of +/- 0.5% and shall not require any field adjustment.

6. Contact Materials: All pumphead components in the fluid path shall be NSF61 listed and shall be of materials specified by the manufacturer as compatible with the process fluid.

7. Leak containment/detection: In the event of peristaltic element failure, the leak sensor shall shut the pump down immediately with all process fluid contained within the sealed pumphead.

   a. Sensor type: Utilize non-contacting optical sensor. Sensor shall not come in contact with the process fluid, shall contain no moving parts, shall not depend on the capacitance of the process fluid, shall not require fluid to leak out of the pump housing for engagement, nor shall require any sensitivity or calibration adjustment.

   b. Alarm: Sensor shall shut down the pump, give a visual indication on the drive controller, and if specified shall provide an output general alarm signal.

   c. For operator and environmental safety, pumps which do not have leak containment, leak sensor, and shutdown are not acceptable. For additional overpressure safety, sealed pumphead shall have a controlled drain-to-waste port.

8. Port connections: Pumphead shall utilize polypropylene compression fittings which shall mate to 10mm ID reinforced, transparent PVC interface hose. Provide polypropylene compression by ½" NPT adaptors for connecting interface hose to process line.

B. Drive

1. Rating: Continuous 24 hour operation, 45° C ambient.

2. Voltage: Drive shall be suitable for 100-240VAC, 50-60Hz, 1-Phase with an internal switch-mode power supply. Supply nine-foot length mains power cord with standard 115VAC three-prong plug.

3. Max drive power consumption: 190VA.

4. Enclosure: NEMA 4X constructed out of corrosion and impact resistant engineering plastic, 20% Glass filled PPE/PS. By nature of the

environmental conditions, painted or unpainted metallic housing including 316SS are not acceptable. Enclosure shall house the drive motor and all control circuitry in one integrated unit. Separate VFDs and motors are not acceptable.

5. Direct coupled pumphead with fully protected drive

   a. Pumphead shall direct couple mount to the controller via a splined drive shaft and shall be locked in place by two tool-free thumbscrews or lever mechanism.

   b. Pumphead shall be fully sealed to prevent any contamination of the controller or drive shaft by process fluid.

   c. Pumphead shall contain its own rotor bearings and not impart an overhung load on the pump shaft.

   d. Pumpheads shall be supplied mounted to the left or right side of the drive enclosure as specified in the drawings. If not specified, pumpheads shall mount to right side of the enclosure.

   e. Drive shall stop shaft rotation and give visual alarm in the event the pumphead is removed.

   f. Drive motor: brushless DC motor with integral gearbox and closed loop tachometer feedback.

6. Circuitry complete with temperature and load compensation and protection.

C. Human-Machine Interface (HMI) and Control

1. Remote Control I/O

   a. Speed Control Input: Analog 4-20mA speed input with 1,600:1 turndown with incremental steps of 10 microamps. Signal shall be trimmable and speed scaleable over any part of the drive speed range. Pump shall be programmable to either increase pump speed or decrease pump speed against an increasing Analog 4-20 mA signal.

   b. Run/Stop Input: Either 5-24V industrial logic, dry contact or powered 110 VAC contacts as shown per the process and instrumentation drawings.

   c. Run/Stop & General Alarm Status Outputs: Either 24VDC Open Collector, 24VDC Status relay, or 110VAC Status Relay

2. HMI, analog connections, and mains power shall be accessible from the front or side of the enclosure.

3. Minimum requirements: Pumps that do not meet the minimum manual and automatic control requirements as specified above are not acceptable.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

B. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

1.2 INSTALLATION

A. Contractor shall install items in accordance with manufacturer's printed instructions and as indicated and specified.

B. Contractor shall supply shielded signal wiring for wiring of the required remote input and output to the connectors.

C. Manufacturer's Representative:

1. The Contractor shall furnish the services of accredited representatives of the Pumping Unit manufacturer to supervise the installation, adjustment, and field tests of the equipment and to provide training for DEP operating personnel.

2. The services of the manufacturer's representative shall be furnished for installation supervision for at least the following number of days:

Visit:	Purpose:	Number of Visits:	Person-days per Visit:
No. 1	Installation Supervision	1	1

3. Should additional days of service be necessary for a successful installation, such services shall be provided by the Contractor at no additional cost to the City.

3.02 FIELD TESTING / QUALITY CONTROL

A. In addition to the field tests to be performed under Section 43 05 21 – Common Work Results for Pumping Units, the following tests are required.

1. Performance Test - Conduct tunning test for each pump to determine its ability to operate within the performance limits specified and to deliver its rated capacity within the pressure requirements specified.

B. The Contractor shall provide the services of the Pumping Unit manufacturer's representative at such times and for such durations of time as are needed to perform the field testing tasks required of the representative.

1. The services of a manufacturer's representative shall be furnished for field testing for at least the following number of days:

Visit	Purpose:	Number of Visits:	Person-days per Visit:
No. 2	Field Testing	1	1

3.03 STARTUP / DEMONSTRATION

A. Furnish the services of a qualified Pumping Unit manufacturer's representative to assist in the start-up of the equipment and train DEP operations and maintenance staff in the care, operation, and maintenance of the equipment in accordance with the requirements of the Contract Documents. In addition:

1. Contractor shall make all adjustments required to place Work in proper operating condition.

2. Contractor shall include in training of DEP personnel instruction on care and maintenance of the materials and equipment.

3. In the event of trouble with the equipment during startup / initial operation, the manufacturer's representative shall revisit the Site as often as required until all troubles are corrected and the installation is entirely satisfactory.

B. At a minimum, the services of the Pumping Unit manufacturer's representative shall be provided as indicated below. The number of visits and person-days per visit indicated, below, shall be understood as referring to the total required services for the lot of equipment provided under this Section.

Visit:	Purpose:	Number of Visits:	Person-days per visit:
No. 3	Startup / Initial Operation	2	1
No. 4	Training	1	1

3.04 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting, protection, and cleanup shall comply with the requirements of Section 43 05 21, Common Work Results for Pumping Units.

END OF SECTION

SCHEDULE 43 33 54-1
PERISTALTIC TUBE PUMPING UNIT SCHEDULE

Location	TI-011 Disinfection Facility
Equipment Tags:	SBS-MP-1 SBS-MP-2 SBS-MP-3
Chemical Service:	Up to 22% Sodium Bisulfite
Drive Type:	Integral
Rated Capacity:	20GPM
Total Dynamic Head @ Rated Capacity	30psi
Temperature Range:	40-100 degrees F
Normal temperature	60 degrees F
Specific gravity at 70 degrees F	1.3
Viscosity at 68 degrees F	3.6 cp
pH	3.5 to 5.0
Maximum Horsepower	1/2
Duty	TI-011 8-ft DB Culvert Outfall
Back Pressure Valve	Included
Relief Valve Setpoint	TBD

NO TEXT ON THIS PAGE

SECTION 43 41 45 – FIBER-REINFORCED PLASTIC TANKS
CONTRACT CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to fiberglass reinforced plastic (FRP) tanks, complete and operational.

B. The following index of this Section is presented for convenience:

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C. The following schedule, attached after the "End of Section" designation, is a part of this Section:

1. Schedule 43 41 45-1, Fiber-Reinforced Plastic Tank Schedule.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. Abbreviations and Acronyms:

1.	CMTR	Certified Material Test Reports
2.	FRP	Fiber-Reinforced Plastic

B. Reference Standards:

1.	ASME RTP-1	-	Reinforced Thermoset Plastic Corrosion Resistant Equipment
2.	ASTM C581	-	Practice for Determining Chemical Resistance of Thermosetting Resins Used in Glass-Fiber-Reinforced Structures Intended for Liquid Service
3.	ASTM C582	-	Standard Specification for Contact-Molded Reinforced Thermosetting Plastic
4.	ASTM D638	-	Test Method for Tensile Properties of Plastics
5.	ASTM D790	-	Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
6.	ASTM D2583	-	Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
7.	ASTM D2584	-	Test Method for Ignition Loss of Cured Reinforced Resin
8.	ASTM E84	-	Test Method for Surface Burning Characteristics of Building Materials

9. Chemical Abstract Service (CAS), Division of the American Chemical Society
10. NFPA 704 - Hazard Identification System
11. 6NYCRR Part 595-599 (Hazardous Substances)
12. Occupational Safety and Health Administration (OSHA)
13. New York City Fire Department (FDNY)
14. National Fire Protection Association (NFPA)

1.05 DESCRIPTION

A. This Section includes requirements for providing tanks made of FRP built in accordance with the applicable standards and regulations.

1. The tanks will be used for the storage of chemical solutions that will be pumped into the tanks from tanker trucks and pumped out of the tanks by chemical metering pumps or chemical transfer pumps.

2. Project specific requirements can be found in Schedule 43 41 45-1, Fiber-Reinforced Plastic Tank Schedule, located after the "End of Section" designation.

B. All FRP tanks and appurtenances shall be provided by one (1) manufacturer with sole responsibility for the satisfactory manufacture, delivery, installation supervision, compatibility, and performance of the items furnished.

C. The FRP tanks shall be furnished complete with liquid level gages, all accessories, special tools, spare parts, base attachments, mountings, anchor bolts and other appurtenances as specified or as may be required for a satisfactory installation. All components provided shall be compatible for use with the chemical being stored.

1.06 QUALITY ASSURANCE

A. Manufacturers shall have a minimum of ten (10) years' experience in the design and fabrication of FRP tanks of similar size, capacity, and type to those shown and specified herein, and who have in the opinion of the Engineer sufficient experimental and test data to confirm the design of the specified FRP tanks.

B. Manufacturers that have previously provided FRP tanks on DEP projects that have had Non Conformance Reports issued for use of unapproved materials and/or poor construction-related issues may, at the Engineers option, be rejected as a supplier.

C. All equipment provided under this Section shall be obtained from a supplier or manufacturer who shall assume full responsibility for the completeness of the system.

1. The supplier shall be the source of information on all equipment furnished regardless of the manufacturing source of that equipment.

2. The tank manufacturer shall not subcontract the fabrication of any of the component parts of the tanks, except for the instrumentation and controls specified herein. Subcontracted components (with the exception of instrumentation) shall be rejected by the Engineer.

D. Structural design computations shall be performed by a registered Professional Engineer licensed in the State of New York that is experienced in the design of ASME RTP-1 vessels. All design calculations shall be made specific for the tank(s) being provided herein. Reuse of calculations from prior tank designs of similar size and applications is expressly prohibited herein.

E. The Contractor shall supply only tanks manufactured by a manufacturer who is certified by ASME in the design and fabrication of ASME RTP-1 tanks. The tank manufacturer's quality control procedures shall conform to the requirements of ASME RTP-1 and shall confirm that all fabrication complies with the specified requirements and that all laminates are at least equal to the reference samples in laminate quality.

F. At a minimum, the following shop inspection operations shall be conducted by the Engineer:

1. Inspection at the shop is intended as a means of facilitating the work and avoiding errors, but is expressly understood that it will in no way relieve the Contractor from any responsibility for meeting the requirements of the Contract Documents.
2. Prefabrication Meeting:
    a. The manufacturer shall schedule a pre-fabrication meeting before the start of work with the Engineer to ensure that all equipment, materials, skilled labor, and conditions are in place that are necessary to adequately perform the work and to establish all applicable inspection witness points.
3. Notice:
    a. The Contractor shall give a minimum 45 days' notice to the Engineer prior to the beginning of any work so that inspection may be provided.
4. The Contractor shall furnish all facilities for the inspection of materials and workmanship in the shop and the Engineer shall be allowed free access to the necessary parts of the work.

1.07 SUBMITTALS

A. Submittals shall include, but not be limited to:
    1. Action Submittals:
        a. All shop drawings and design calculations shall be coordinated with ASME RTP-1 requirements.
        b. Suitable evidence of manufacturer experience in the design, fabrication, and successful operation in other facilities of FRP tanks similar to that specified herein.
        c. Shop drawings and catalog data, including but not limited to:
            1) Dimensions of tanks, fittings, attachments, and anchor bolt locations.
            2) Wall thicknesses (shell, top, and bottom).
            3) Location of all fittings, attachments, and joints.
            4) Shop drawings shall have a table illustrating all connection scenarios of secondary bonds attached to primary bonds detailing laminate resin-glass sequences and their respective development lengths, widths, and thickness.
        d. Data sheets identifying all materials used and methods of fabrication, including but not limited to:
            1) Description of fabrication.

2) Complete description of chemical resistance for all materials that will come in contact with the materials stored, including a certification from the manufacturer that the various materials, including resins and veils, used are suitable for the intended application (including maximum rated chemical concentrations and temperature).

a) This certification shall state that the resins used in the fabrication of the laminates have been evaluated in accordance with ASTM C581 for chemical resistance for a service comparable to the intended service and that the resin is recommended by the resin manufacturer for the intended service.

3) Before the resin is ordered by the tank manufacturer, the Contractor shall submit certification in writing from the resin and veil manufacturers that the resins and veils to be provided are suitable for use with the specified chemicals to be stored in each tank under the specified conditions of service.

e. Calculations:

1) Structural design computations for each FRP tank signed and sealed by a New York State Professional Engineer.

2) Calculations on tank hold-down lugs/anchor bolts to demonstrate they will hold the tank in place when an empty tank is subjected to buoyant forces created by a 2.25-foot depth (relative to tank bottom) of the stored liquid contained outside the tanks. These calculations shall include pre-tension and torque values for hold-down lugs and anchor bolts.

3) Calculations for each secondary bonds attached to primary bonds.

4) Laminate specifications including resin and reinforcing materials required, layer (laminate sequence) construction and thickness, glass data and specifications, resin properties, resin curing processes, post cure processes, and any and all catalysts used.

f. Complete assembly, layout required clearances, and installation drawings with clearly marked dimensions.

g. Weights of all component parts, assembled weight of units, and approximate total shipping weight.

h. Description of the Service conditions.

i. Shop and field testing procedures.

j. Example Quality Control Documentation Data Package that will be provided for each finished FRP Vessel.

1) This data package shall identify the DEP Contract No., Specification Section, Equipment Description, Fabricator, and Equipment Serial Number.

2) The data package shall include, at a minimum:

a) Equipment Inspection Requirements Checklist.

b) Resin/Reinforcement Log Sheets, Component Data Sheets, and Nozzle Fabrication Reports (that applicable material certifications will be attached to).

c) Cutout Thickness Reports.

d) Glass Content Test Reports.

e) Post Cure Hardness and Acetone Sensitivity Reports.

f) Hydrostatic Test Reports.

g) Final Visual Inspection Checklists.

h) Final Dimension and Orientation Check Sheets.

k. After Fabrication, Contractor shall submit Quality Control Documentation Data Package for each finished FRP Vessel listed in Schedule 43-41-15-1, as described above.

l. Certified copies of all factory test results, including but not limited to:

1) Certified Material Test Reports (CMTRs) shall be provided for the proposed laminate sequence. Test reports shall include test results for flexural strength, flexural modulus, tensile strength, tensile modulus, and glass content of the structural and corrosion layers.

m. Instructions for handling, storage, loading and unloading, and installation of tanks. These instructions shall include bolt torque values and detailed instructions for pipe connections.

n. A list of manufacturer's recommended special tools and spare parts to be supplied.

o. Operation and Maintenance manuals, in accordance with the requirements of the Contract Documents.

p. Deviations from the Contract Documents.

q. Samples:

1) Representative laminate samples of both the cylindrical shells and the tops shall be submitted.

a) These samples shall be from plant production and shall be representative of actual construction, workmanship, appearance and surface hardness of tanks to be furnished.

b) Any furnished tank which later does not meet the standard of the representative samples will be rejected by the Engineer.

2) After fabrication, submit cutouts and retain cutout samples of the laminate for each tank for assessment of laminate properties and laminate construction by the Engineer.

a) Cutouts and cutout samples shall be labeled with unique numbers traceable to data sheets and to each other.

b) If the sizes of the cutouts are insufficient, an extension to the shell of suitable size, as approved by the Engineer, shall be added for testing purposes.

2. Information Submittals:

a. Tank label information.

b. An officer of the manufacturer shall submit an affidavit certifying to the Engineer that all fabrication, assembly, and curing was performed indoors and in a climate-controlled atmosphere.

c. Affidavits from the manufacturer stating that:

1) The FRP tanks will meet the specified performance requirements with the contained liquids specified herein. The design and the fabrication of the tanks are in accordance with the requirements of:

a) This Section, and

b) ASME RTP-1.

2) The tanks are designed for a useful life of thirty (30) years minimum, in accordance with 6NYCRR Part 599.8 (b).

3) Prior to the beginning of the shop performance tests, submit manufacturer's Certification of Compliance with the approved laminate schedule.

d. After fabrication, submit post cure time/temperature charts.

e. Material certifications shall be submitted for the FRP components at the time of specified quality assurance shop inspection by representatives of the DEP. The material certifications shall include, as a minimum:

1) laminate reinforcing material used.

2) resin and cure system used for the structural layer.

3) resin and cure system used for the corrosion resistant barrier.

4) fire retardant additives.

5) other additives.

6) gasket materials.

3. Submit a description of the proposed testing facilities and procedures prior to the commencement of shop tests.

4. The Contractor shall submit a report from the manufacturer for each visit to the Site of the manufacturer's representative.

a. The report shall provide complete information regarding the visit, including, but not limited to, dates, times, subject equipment, tasks performed, persons contacted, problem corrected, test results, training provided, and other pertinent information.

b. The report shall be certified by the equipment manufacturer, documenting the findings of the authorized person(s).

c. Reports of field tests shall be in accordance with the 6NYCRR Part 599 standards.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. Mount tanks on padded cradles if shipped horizontally or on a suitable skid if shipped vertically.

2. Protect all flanged nozzles with wooden blinds bolted to the flange and having a diameter of 2-inches greater than the outside diameter of the flange.

3. For all un-flanged connections, provide either threaded or rigid plugs inside the ends to prevent deflection.

4. Brace the open ends of tanks with a suitable stiffening member to prevent deflection.

5. Do not ship components or other pieces loose inside the tanks.

6. Load tanks with at least 2 inches clearance between the tank (including fittings) and the bulkheads or bed of the vehicle.

7. Regardless of the mode of transportation, firmly fasten and pad all components to prevent shifting of the load or flexing of components while in transit.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents. In addition:

1. Tanks shall be unloaded with care and tanks and appurtenances shall be stored in a location where they will be free from damage and deterioration.
2. Components for site fabricated tanks shall be prepared and protected for shipment, unloading and storage with the same care as the fabricated tanks.
3. The Contractor shall provide the services of person(s) authorized by the manufacturer to witness the unloading at the Site of the equipment provided, and to ascertain the condition of said equipment.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall provide spare parts and special tools, necessary to service, disassemble, repair, and adjust the equipment provided under this Section, and as per the requirements of the Contract Documents. In addition:

1. Top and side access covers shall be provided only where these covers are shown on the Contract Drawings.
2. Provide the following spare parts for each FRP tank listed in Schedule 43 41 45-1:
    a. Provide one (1) top access cover gasket and set of bolts, nuts, and washers.
    b. Provide one (1) side access cover gasket and set of bolts, nuts, and washers.
    c. Additional spare parts as may be shown or specified.
3. Provide one (1) set of all special tools required for maintenance. All such tools shall be furnished in a suitable steel tool chest complete with lock and duplicate keys.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer's standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. FRP Tanks:

1. Belco Manufacturing, Belton, TX.
2. RL Industries, Fairfield, OH.
3. Composites USA, North East, MD
4. Troy Dualam Inc., Brockville, ON, CA.
5. Augusta Fiberglass, Blackville, SC.
6. Or approved equal.

B. Resins and Veils:

1. Ashland Inc., Dublin, OH.
2. Dow, Midland, MI.
3. AOC, Collierville, TN.
4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Regulatory Requirements:

1. All tanks shall be designed for a useful life of thirty (30) years minimum, as per 6NYCRR Part 599.8 (b).
2. Tanks shall be designed and constructed in accordance with ASME RPT-1. Tanks do not require ASME RTP-1 Stamp.
3. Corrosion resistant barrier shall be Type I or Type II laminate. Structural layer shall only be constructed using Type II laminate.
    a. The use of a manual chopper gun shall not be permitted.
    b. Semi-automatic or automatic chopper guns shall be permitted only with the approval of the Engineer.
4. Shell joints and secondary bond overlays for vessel penetrations shall be in accordance with ASME RTP-1, Section 4-300 or Section 4-400, except that each successive overlay ply shall overlap the preceding ply by 1-inch minimum on each side.
5. Tanks shall have an ASTM E84 Flame Spread Rating of less than 25 achieved by fabricating the outermost three (3) mat layers and outer surface veil layer from the halogenated resin with additional antimony pentoxide and cure system specified. The entire corrosion barrier and structural laminate shall be fabricated using the corrosion resistant resin and cure system specified.

B. General Design Requirements:

1. All material shall be new and both workmanship and materials shall be of the very best quality, entirely suitable for the liquids which the FRP tanks are to contain and shall conform to all applicable requirements specified herein.
2. The tanks shall be designed for a seismic zone rating of 2A.
3. FRP tanks shall be designed to adequately support all static and dynamic loads imposed on the tank surfaces.
4. Unless otherwise indicated in Schedule 43 41 45-1, the tanks shall be designed as atmospheric tanks vented directly to the atmosphere. For other types of tanks, Schedule 43 41 45-1 indicates:
    a. Design pressure/vacuum.

5. Operating pressure/vacuum. Each tank fill nozzle shall include a modified drop tube of the same diameter as the nozzle.

   a. The drop tubes shall extend 6 inches vertically down from the top shell, and then turn 45 degrees toward the tank vertical wall. Drop tubes shall be terminated 2 inches from the tank wall. The tank wall shall be reinforced with a resin rich impingement plate at point of fluid contact over a 6-inch by 6-inch area. The end of the drop tube shall be supported with a structural fiberglass strut permanently attached to the tank wall to prevent vibration of the assembly.

6. The tanks shall be provided with lifting lugs and designed such that they can be handled by crane and transported intact to their installation locations through building/structure openings and access ways shown on the Contract Drawings.

7. No cutting of the tanks will be allowed. The tanks shall be suitable for transport into and installation in the buildings/structures after these buildings/structures have been completely constructed.

8. Unless otherwise specified in the Schedule 43 41 45-1, tanks shall be designed for a contained liquid temperature of up to 150 degrees F.

9. Tanks shall be designed for a maximum fill rate of 200 gpm.

C. FRP Tank Materials:

1. General: The materials used for fabrication shall be clean, consistent in quality and in conformance with these specifications and the manufacturer's specifications for the materials.

   a. All batches of resin that have been modified by the addition of additives (such as promoters or accelerators) shall be tested for gel time and proper cure characteristics.

   b. The laminate surface and materials temperatures shall be as specified by the resin manufacturer. A minimum 5 degree F spread between the atmospheric wet bulb (higher) and the laminate surface temperatures shall be maintained at all times during fabrication.

   c. All fiberglass reinforcements, catalysts, cure-control additives and paraffinic waxes used shall be as recommended by the resin manufacturer, in writing, as consistently giving the best results with the resin being used. Resin binders in chopped strand mats shall be suitable for fabrication of the corrosion barrier.

2. Resins: Resins shall be suitable for the liquid to be contained in the FRP tanks.

   a. Resin for the corrosion barrier and structural layer shall be a Bisphenol A Epoxy Vinyl Ester Resin compatible with the material stored.

b. Resins for the outer fire retardant layer shall have a flame spread rating of 25 or less based on ASTM E84 with the addition of antimony pentoxide.

c. Resins used in the corrosion barrier and resin-rich inner liner and structural layers shall not have any fire retardant agents or antimony compounds and shall be cured using Benzoyl Peroxide (BPO) catalyst and a Dimethylaniline (DMA) promoter cure system.

d. No thixotropic agent shall be added to resins used for the resin-rich inner liner, corrosion barrier, or structural layer. Up to 2 percent by weight of thixotropic agent may be added for viscosity control of resins not used for a corrosion barrier and resin-rich inner liner. The quantity of thixotropic agent added, however, shall not interfere with visual inspection of the laminate. No other fillers to the resin, including pigments, dyes and colorants, shall be permitted, unless approved in writing by the Engineer.

e. An ultraviolet adsorption agent shall be added to the resin throughout the outer layer beyond the structural layer.

3. Reinforcement: Glass reinforcement shall be Type E, electrical glass, unless otherwise specified in Schedule 43 41 45-1.

a. Surfacing Veil:

1) Protective veils for exterior surfaces shall be Type C glass surfacing mat. The thickness of the surfacing veil shall be 10 to 20 mils for all applications.

2) Surfacing veils for interior surface applications where the glass may be attacked by compounds in the process shall be a suitable spun-laced synthetic organic entangled fiber fabric not less than 20 mils in thickness, consisting of two plies of 10 mils each with each ply separately gelled prior to application of the subsequent ply, all backed by chopped strand in resin.

b. Chopped strand mat shall be Type E glass, 1½ oz./sq ft.

c. Continuous roving used in chopper guns for spray-up shall be Type E glass with coupling agent.

d. Woven roving shall be Type E glass, 24 oz./sq. yd, 4 x 5 weave.

e. Woven cloth shall be Type E glass.

4. Miscellaneous:

a. Lifting and hold down lugs, nuts, bolts, washers and miscellaneous fabricated parts shall be titanium.

b. Gaskets shall be suitable for the liquid contained in the FRP tanks.

D. Laminate Construction:

1. The structural laminate thickness of the tanks and components shall be ½-inch minimum, or double the calculated design thickness, whichever is greater.

2. The corrosion barrier shall consist of Type I Laminate and shall contain two (2) resin rich veil layers (saturated with catalyzed resin) followed by three (3) layers of chopped strand mat (saturated with catalyzed resin).

   a. The total thickness of the resin rich veil layer shall be 20 to 30 mil (0.02 to 0.03-inch). These first layers consisting of veil and resin shall contain 90 percent resin and 10 percent veil material by weight.

   b. Each layer of chopped strand mat (saturated with catalyzed resin) shall have a thickness of 43 mils. The chopped strand mat layers in the finished corrosion barrier laminate shall be 70-80 percent resin and 20-30 percent glass by weight.

   c. The inner corrosion barrier plus the three mat layers shall total 0.149-inches minimum thickness and constitute the inner lining. The entire lining shall reach complete cure before the structural layers are applied. The corrosion barrier thickness shall not be included in the structural laminate thickness calculations.

3. The structural layer shall consist of a Type II laminate saturated with catalyzed resin. The structural layer shall be placed over the corrosion barrier within 12 hours after the corrosion barrier has cured, otherwise the surface of the corrosion barrier must be completely ground to assure adequate bonding with the structural layer being applied. The structural layer shall have an average glass content of at least 35 percent by weight per ASTM D2584.

4. The outer fire retardant exterior layer shall consist of three (3) mat layers and an outer surface C-Veil layer saturated with catalyzed halogenated resin with added Antimony Pentoxide. The outer fire retardant layer shall have an average glass content of at 25-30 percent by weight per ASTM D2584. The fire retardant exterior layer thickness shall not be included in the structural laminate thickness calculations.

E. The post-cure process shall be a heat post cure utilizing a forced hot air heating system or an oven curing system.

1. If a forced hot air heating system is used for the heat post-cure, as per the resin manufacturer's recommendations, the manufacturer shall utilize a forced hot air heating system that induces the heat on the interior and forces the heat through the wall to the exterior. An optimum cure is achieved when the temperature normalizes on the tank exterior.

   a. Post-curing may also be conducted in a hot air convection curing oven such that both the interior and exterior laminate surfaces are exposed to the same hot air temperatures.

b. Post-curing ovens/structures shall be equipped with time/temperature recording devices such that the temperatures are logged. A continuous record or chart or curing air temperatures shall be made available for review by the Engineer prior to shipment of the tanks.

c. Manufacturer shall post-cure the equipment at a minimum of 180 degrees F. Post-cure temperature shall not exceed the Heat Distortion Temperature of the resin.

d. The post-cure hold period shall be a minimum of 4 hours. The duration of the hold period shall be engineered based upon laminate volume. Laminate volume calculations shall be made available for review by the Engineer along with the post curing temperature charts specified above.

e. The post-cure temperature shall be ramped up to and down from the hold period temperature to avoid thermal shock to the laminates being cured. The post-cure period, including ramping and holding time shall be a minimum of 6 hours and shall be engineered based upon laminate volume plus laminated thermal properties. The calculations shall be made available for review by the Engineer along with the previously specified calculations.

f. Any cracking that results from the post-cure process shall meet RTP-1 visual inspection acceptance criteria, Table 6-1.

g. The equipment must be properly supported to minimize dimensional changes, such as warping and shrinking that may result from the process. Dimensional changes are limited to the dimensional tolerances specified.

h. All FRP covers and blinds shall be removed from the tanks during post-cure; however, all FRP accessories such as the manway covers and blinds shall be post-cured.

i. All shop repairs or rework shall be performed prior to post-cure.

j. Tanks shall not be moved until they are cured as determined by the Barcol hardness test per ASTM D2583 and Acetone sensitivity test per ASTM C581.

F. Liquid Level Gages:

1. General: Liquid level gages the glass gage type shall be furnished in accordance with the details shown on the Contract Drawings or as specified in Schedule 43 41 45-1.

2. Glass Liquid Level Gage: Glass liquid level gage shall be furnished with upper and lower valves, glass tube, guard rods and all required supports. All components of the gage shall be resistant to the chemicals being stored.

a. Valves shall be of plastic or stainless steel, furnished with internal ball checks in case of glass tube breakage and provided with ¾-in. NPT male threads to fit the threaded outlet fitting on the tank. Materials of construction to be compatible with the stored chemical.

b. Glass gage shall be installed so that the full capacity of the tank shall be measured. Tubes shall be ¾-inch diameter and shall be graduated to indicate gallons or feet of liquid remaining in the tank.

c. Four guard rods with a minimum diameter of $^{3}/_{16}$-inch shall be provided.

G. Concrete Pads:

1. All tanks shall be mounted on concrete pads only when demonstrated to be fully cured, including after protective coating is applied, cured and accepted, if applicable. The finished surface of each tank bottom shall be sufficiently flat, smooth, and free of irregularities, to prevent the possibility of tank failure from point loads or other sources.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Closed Top Vertical FRP Tanks:

1. The Contractor shall furnish, deliver, install, test and place in satisfactory operation the closed top vertical FRP tanks of the dimensions and number called for in Schedule 43 41 45-1, or as shown on the Contract Drawings.

2. The FRP tanks shall be vertical cylindrical units with internally sloped flat bottom and dome top. Manholes shall be provided as shown on the Contract Drawings or as specified in Schedule 43 41 45-1.

3. FRP tanks shall be furnished with lifting and hold down lugs, ladder clips (per OSHA requirements), manholes, calibration markings, nozzles, drains, vents, mounting hardware and other appurtenances as specified in Schedule 43 41 45-1, or as shown on the Contract Drawings.

B. Vessel Connections: All connections shall be of the number and dimensions shown on the Contract Drawings and as specified in the Contract Documents.

1. Gaskets shall be ⅛-inch thick full-face elastomeric material, Shore A60, suitable for the intended service.

2. Flanged nozzles shall be rated at 25 psig with dimensions appropriate for this pressure rating, unless otherwise required by the Contract Documents.

3. The back face of all flanges to be spot-faced, flat and parallel to the flange face. Flanges shall be of sufficient diameter to accept a metal washer under the bolt head or nut.

C. Calibration Strips: Translucent calibration (gallonage) strips shall be 6-inches wide. Calibration numbers shall be in the multiples of 200 gallons or less and shall have gallonage stenciled in 2-inch high numerals.

D. Miscellaneous Tank Requirements:

1. The outer surface of the fabricated product shall be relatively smooth and shall have no glass fibers exposed.

2. All edges of reinforcement material shall be lapped 1 inch minimum format and 2 inches minimum for woven roving. Lapped edges of adjacent layers shall be staggered.

3. All cut edges on parts which will make up a secondary joint or be incorporated into a finished product shall first be sealed with at least two coats of lay-up resin.

E. Anchor Bolts and Anchors:

1. Anchor bolts, nuts and washers shall be titanium and shall be sized by the tank manufacturer and provided by the Contractor, and shall be of the size and diameter required for anchoring the tank(s) to the foundation and meet all applicable codes and specified standards.

F. Tank Labels:

1. Tank Labels shall be in compliance with all applicable Federal, State, and local codes and regulations including but not limited to OSHA, FDNY, NFPA, and NYC Right-to-Know Requirements.

2. Tank Label: Provide permanent FRP laminated labels as per paragraph 1-530 of ASME RTP-1 and as required by 6 NYCRR Part 596 containing the following minimum information:

a. Tank Equipment Number.

b. Tank name.

c. Manufacturer.

d. Model number.

e. Manufacturer's serial number and purchase order number.

f. Total (nominal) capacity in gallons.

g. Working (usable) volume in gallons.

h. Chemical name of liquid contained and the Chemical Abstract Service (CAS) No.

i. Maximum allowable specific gravity of stored material.

j. Date of fabrication.

k. Design pressure and temperature.

l. Resin name and manufacturer's specific product identification for resin and cure system used for each laminate layer.

m. Laminate sequence for each laminate layer.

G. Chemical Labels:

1. Provide designation of chemical conforming to the specifications contained in the NFPA 704. Hazardous materials classification shall include rating for health, flammability, reactivity, specific hazard, contents, viscosity, and hazard number:

a. The sign shall be non-metallic and mounted on equipment at a height and location clearly visible for all personnel. The sign shall be located near the liquid level gauges, as shown on the Contract Drawings.

b. Provide a minimum of 2 signs per tank that are shop fastened and readily visible when tanks are installed.

2. Warning labels as required by 6 NYCRR Part 596.2(h) (4).

3. Size of labels shall be 18-in. x 18-in., unless a larger size is shown on the Contract Drawings or required by the Contract Documents.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. At a minimum, the following vessel inspection operations shall be conducted:

1. Measurement of Tolerances:

a. Tolerances for laminate thickness shall comply with ASME RTP-1, paragraph 6-920 (f) (2).

b. Tolerances for average spot thickness shall comply with ASME RTP-1, Sub-part 2C-110.

c. Tolerances for average thickness of a major part shall comply with ASME RTP-1, Sub-part 2C-120.

d. Any component of the FRP tanks which does not satisfy the tolerances specified will be cause for rejecting the tanks.

2. The minimum acceptable level for workmanship, finish and appearance shall conform to the requirements of ASME RTP-1. The finished product shall conform to Table 6-1, RTP-1 Visual Inspection Acceptance Criteria. Level of acceptance shall be as specified in ASME RTP-1 Section 1.08, Shop Tests, unless specified otherwise in the Contract Documents.

3. Visual defects shall be classified in accordance with Table 6-1, ASME RTP-1 Visual Inspection Acceptance Criteria and RTP-1 Section 6-940, Laminate Imperfections – Visual Inspection.

B. Shop Tests:

1. Shop Hydrostatic Testing:

a. Preliminary Inspection: Prior to hydrostatic testing of any vessel, that vessel shall be made available indoors for the Engineers and the City's inspection, which will include but not be limited to following:

1) Vessel size, dimensions and fabrication tolerances.

2) Proper nozzle and appurtenance placement per fabrication drawings.

3) Minimum design thicknesses.

4) Minimum structural joint widths and thicknesses.

5) Inner seam integrity and continuity.

b. General:

1) All materials, labor and equipment for all tests and retests shall be furnished by Contractor.

a) This will not relieve Contractor from repairing leaks that may appear when vessels are filled for testing.

c. Blind flange, seal, or plug all openings in the FRP tanks, as required for testing.

d. Procedure: Fill with water to the top of the straight side shell. Each tank shall remain full for a period of 24 hrs.

e. There shall be no leakage from the tanks, however small.

f. Repair:

1) Any leak shall be repaired by a manufacturer's factory-trained serviceman with reinforcing and resin to match tank.

2) Repaired surface shall be equal in strength and corrosion resistance to original tank material.

2. After final curing, the interior of all tanks shall additionally be shop tested for Acetone Sensitivity in accordance with ASTM C582, paragraph 9.2.2.

3. Barcol hardness readings of all tanks are required and shall be performed in accordance with ASTM D2583, paragraph 12 and in accordance with ASME RTP-1, sub-part 6-910. Barcol hardness shall be taken at various areas inside and outside of FRP vessels and recorded. As a minimum one set of readings for the top, two sets of readings for the vertical straight shell and one set of readings for the bottom. Submit Barcol hardness readings to Engineer.

4. Shop tests shall include a final inspection after hydrostatic testing by the manufacturer and a written record of this final inspection shall be provided. This final inspection shall be in accordance with 6 NYCRR Part 599.11 and ASME RTP-1, sub-part 6-910. Final inspections shall include but not be limited to a check of: punctures, scrapes of corrosion barrier, cracks, structural damage, resin cure, dimensions, laminate thickness, physical properties, reinforcing content of the corrosion barrier and structural layers of all major components, pressure tests and visual inspections for laminate imperfections.

a. The resin-rich interior surface consisting of the synthetic Nexus veil and the corrosion barrier consisting of the three (3) mat layers shall be visually inspected to ensure that imperfections in this laminate are within the tolerances of ASME RTP-1. The interior surface and corrosion barrier shall have no more visual defects allowed other than what is permitted under Table 6-1, ASME RTP-1 Visual Inspection Acceptance Criteria Level 1. Gaseous bubbles or blisters shall be limited in quantity to four (4) per square inch. The maximum percent repairs allowed shall be limited to 1.5% of the components total surface area.

b. The structural layer of each tank shall be visually inspected to ensure that imperfections in this laminate are within the tolerances of ASME RTP-1. The structural layer shall have no more visual defects allowed other than what is permitted under Table 6-1, ASME RTP-1 Visual Inspection Acceptance Criteria Level 1. Gaseous bubbles or blisters shall be limited in quantity to ten (10) per square inch up to $^{1}/_{16}$–inch in diameter and four (4) per square inch from $^{1}/_{16}$–inch to $^{3}/_{16}$-inch in diameter. The maximum percent repairs allowed shall be limited to 3% of the components total surface area.

c. The outer exterior layer consisting of three (3) mat layers of fire retardant resin and surfacing veil shall be visually inspected to ensure that imperfections in this laminate are within the tolerances of ASME RTP-1. The structural layer shall have no more visual defects allowed other than what is permitted under Table 6-1, ASME RTP-1 Visual Inspection Acceptance Criteria Level 2. Gaseous bubbles or blisters shall be limited in quantity to ten (10) per square inch up to $^{1}/_{16}$-inch in diameter and four (4) per square inch from $^{1}/_{16}$-inch to ¼-inch in diameter. The maximum percent repairs allowed shall be limited to 10% of the components total surface area.

5. All visual inspections shall be made before the exterior finish gel coating is applied to the tank.

6. Shop test reports shall include the following information:

   a. Hydrostatic test report as described herein

   b. Acetone sensitivity test results for all components

   c. Barcol hardness test reading for all components

   d. Provide glass content rest results in accordance with ASTM D2584 of both the corrosion layer and the structural layer of the laminate cutouts and other components.

   e. Thickness measurements of the corrosion barrier, structural layer and outermost fire retardant layer of all components

f. Measurements showing compliance with dimensions and tolerance in diameters, lengths, squareness of ends, angle of fittings and flanges and flatness of flanges.

g. Provide Tensile Test results of the structural layer of laminate cutouts per ASTM D638, if applicable.

h. Provide Flexural Test results of the structural layer of laminate cutouts per ASTM D790, if applicable.

i. Certification of compliance of visual acceptance criteria of laminate quality for presence of pits, foreign inclusions, dry spots, air bubbles, pinholes, pimples, delamination, etc., as required above.

7. Certified shop tests shall be performed for all equipment provided.

C. Shop inspections shall be made by NYC DEP representatives only for equipment listed in the Contract Documents as being subject to Witness Shop Testing and Quality Assurance Inspection. If the equipment is listed in the Contract Documents as being subject to Witness Shop Testing and Quality Assurance Inspection:

1. The Contractor shall give ample notice to the Engineer prior to the beginning of any work so that inspections may be performed. Shop Quality Assurance Inspections will be performed in accordance with the requirements of Contract Documents.

2. As a minimum, the Division of Design Services, Quality Assurance Section shall conduct the following Quality Assurance Inspection operations at the manufacturer's facility(ies):

a. Review and obtain material certifications and/or Certified Material Test Reports for all specified items.

b. Witness mixing of resins and obtain copies of Resin Mix Data Sheets for all resins mixed and used.

c. Only new resin shall be used for NYC DEP Contracts. Resin manufacturer's shelf life shall not be exceeded. Opened resin containers shall be dated and labeled to indicate all components added by percentage weight.

d. Witness lay-up and fabrication to ensure compliance with the approved laminate sequence.

e. Review and obtain copies of Component Data Sheets for all vessel subsections fabricated.

f. Witness removal of cutouts and retain cutout samples of the laminate for assessment of laminate properties and laminate construction.

g. Witness wall thickness and other dimensional inspections, including measurement of both corrosion and structural layers.

h. Witness glass content test of corrosion layer & structural layer in accordance with the contract specifications and ASTM D2584 and ASME RTP-1.

i. Perform inspection for quality and workmanship of completed and in-progress work as per ASME RTP-1, Table 6.1, as applicable.

j. Witness Barcol Hardness measurements per ASTM D2583 and ASME RTP-1 and Acetone Sensitivity tests per ASTM C582 on the inside and outside of the FRP tanks, after post-cure.

k. Perform final visual and dimensional inspection.

l. Inspect accessories and spare parts.

m. Obtain representative samples of fasteners to verify material conformance.

n. Witness hydrostatic pressure shop test.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Prior to final inspection of FRP tanks, all surfaces shall be made clean by brushing, wiping, or with a compressed air blast as required to remove all loose foreign materials.

B. Upon delivery of the FRP tanks to the site, a thorough examination shall be performed. Particular areas to be inspected for damage are as follows:

1. Top of load (tank).
2. Widest part of load (tank).
3. At cradles or straps holding load (tank).
4. For open top tanks: check location of spiders supporting open end and tank flange.
5. End blocking.
6. All nozzles and manways for cracking/separation.
7. Rotation of tank during transit.

C. Engineer reserves right to reject any and all FRP tanks found to have following: blisters, chips, crazing, exposed glass, dry cracks, burned areas, dry spots, foreign matter, or entrapped air at the laminate surfaces which do not satisfy the tolerances specified in ASME RTP-1, Table 6-1, visual acceptance levels as hereinbefore stated for inside and outside surfaces. If upon inspection more than 5% of the total aggregate area of the FRP tank is found to have a combination of the above listed shortcomings the vessel shall be deemed not acceptable. In the event the tanks are found to be damaged and dependent upon the extent of the damage, the Engineer may:

1. Reject the tanks; or
2. Require the manufacturer to provide the personnel, materials, and equipment to perform the necessary repairs.

3.02 INSTALLATION

A. Installation of the FRP tanks shall be in complete accordance with the manufacturer's printed instructions and the approved shop drawings.

B. Install FRP tanks in the locations shown on the Contract Drawings.

C. Tanks shall be installed in such a manner that connecting piping will not impose any strain on the tank connections.

D. All tanks shall be installed on equipment pads.

1. Equipment pads shall have grooves provided as shown on the contract drawings to visually determine if the bottom of the tank is leaking.
2. The reinforced concrete support base surface shall be free of cracks, depressions and vertical projections.
3. Surface should be trowel finished to American Concrete Institute Specifications (ACI 301, "Trowel Finish").
    a. Flatness shall be determined using the manual straightedge method per ACI 117.
    b. The maximum allowable gap shall be $^{1}/_{16}$-inch.
    c. Levelness shall not exceed 0.1%.
4. Examine equipment pads for:
    a. Proper anchor bolt locations.
    b. Unevenness, irregularities, and incorrect dimensions.
5. Vertical vessels should be set on a cushioning pad to minimize stresses caused by seams, shrinkage distortion, and bottom head and/or support base irregularities.
    a. A minimum of two layers of 30 lb. roofing felt equal in diameter to the outside diameter of the equipment plus 2 inches (O.D. + 2 inch), shall be laid directly on the surface of the support base.
    b. The center of the pad shall be built up by the addition of two layers of the same material, one equal to ½ the diameter of the vessel and the other equal to ¼ the diameter of the vessel.
    c. A suitable pad sheet material of proper environmental resistance material can be substituted for the roofing felt.
6. Where a vessel has a bottom drain, provisions shall be made in the base pad with minimum of 1½-inch clearance so that contact will not occur between the pad, the nozzles, or nozzle flange. Where a trench in a base pad is

required to accommodate bottom discharge piping, a structural trench cover shall be installed flush with the top of the base pad to minimize the unsupported area of the tank. All flat bottom equipment should be secured in place by bolting to the base pad through hold down lugs to minimize the chance of equipment damage at nozzle locations and area of other attachments due to movement of the unit.

E. Hold down lugs shall be bolted to the pad using titanium anchor bolts, at least ½-inch in diameter. Hold down lugs and anchor bolts shall be sized by the tank manufacturer and provided by the Contractor.

F. Any visual abrasions to the vessel shall be sealed with a resin compatible with the original resin in accordance with the manufacturer's recommendations and repair procedures approved by Engineer.

3.03 FIELD TESTING / QUALITY CONTROL

A. After installing the FRP tank, all openings in the tank shall be plugged and tank shall be filled with water to the top of the straight shell. Over a period of twenty-four (24) hours, there shall be no leakage from the tank. In the event of leakage, the tank shall be considered damaged and, as per Article 3.01, the Engineer may:

1. Reject the tanks; or

2. Require the manufacturer to provide the personnel, materials, and equipment to perform the necessary repairs.

B. Leakage tests shall be repeated for any replaced or repaired tank. Tank will not be accepted unless it passes the leakage test.

C. No additional payments will be made for tests or retests.

D. Passage of the leakage test does not relieve the Contractor from repairing leaks that may appear when the tanks are filled with the service liquid.

3.04 STARTUP / DEMONSTRATION

A. Furnish the services of a qualified manufacturer's representative to check and approve all installations before operation as well as conduct field testing, in accordance with the requirements of the Contract documents. In addition, the manufacturer representative shall:

1. Assist in the installation of the equipment;

2. Check the installation before the equipment is placed into operation;

3. Assist in the performance of field tests;

4. Assist in the start-up of the equipment; and

5. Train the plant operations and maintenance staff in the care, operation, and maintenance of the equipment.

6. Verify that all work furnished and installed conforms to the requirements the Contract Documents.

B. At a minimum, the services of the manufacturer's representative shall be provided as indicated, below. The time per tank and person-days per visit indicated below shall be understood as referring to the total required services for each individual tank provided under this Specification.

Visit	Purpose:	No. of Visits	Person-days per visit
1	Installation Checkout	2	1
2	Field Testing	2	1
3	Startup	2	1
4	Training	1	1

C. The services provided shall be in accordance with the requirements of the Contract Documents. In addition:

1. Regardless of the time per tank and person-days per visit indicated, above, the Contractor shall provide the services of the manufacturer's representative at such times and for such durations of time as needed to perform the tasks required of the representative as specified.
2. The Engineer reserves the right to require that any unused person-days from any visit will be applied to any other specified visit.
3. Person-days shall be understood only as days spent on-Site (not in transit).
4. Unless otherwise authorized by the Engineer, the manufacturer's representative shall be a direct employee of the equipment manufacturer, with at least 3 year experience in the installation, testing, and start-up of equipment of the type provided under this Specification. The manufacturer's sales and marketing personnel will not be accepted as manufacturer's representatives.
5. The manufacturer's representative shall sign in and out at the office of the Engineer each day they are at the Site.
6. Reports: The Contractor shall submit reports from the manufacturer for each visit to the Site of the manufacturer's representative as per the requirements specified herein.
7. In addition, Manufacturer shall furnish the services of person(s) authorized by manufacturer to witness the unloading at the site of FRP tanks. Manufacturer's sales and marketing personnel may be accepted as authorized person(s) to perform these specific tasks.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SCHEDULE 43 41 45-1
FRP TANK SCHEDULE

Vertical Tanks

Location:	**TI-011 Disinfection Facility**	**TI-11 Disinfection Facility**	**TI-010 Dechlorination Facility**
Tank Tags:	**HYPO-T-1 HYPO-T-2**	**SBS-T-1 SBS-T-2**	**SBS-T-1 SBS-T-2**
Liquid contained:	15% Sodium Hypochlorite	38% Sodium Bisulfite	38% Sodium Bisulfite
Temperature range:	55 to 85°F	55 to 85F	55 to 85F
Viscosity:	5.4	3.6	3.6
Specific gravity:	1.2	1.3	1.3
Number of tanks required:	2	2	2
Nominal capacity: (gal)	6,000	2,500	3,760
Vertical tank nominal diameter: (ft)	10	8	8
Vertical tank straight side length (ft)	10.5	7	10.33
Vertical tank maximum liquid depth (ft)	10.167	6.67	10
Design Pressure/Vacuum Range: (psig)	Atmospheric	Atmospheric	Atmospheric
Tank connections, description and diameter:	--	--	--
Type of resin and cure:	Derakane 411	Derakane 411	Derakane 411
Glass reinforcement Type:	**--**	**--**	**--**
Exterior color:	Beige	Beige	Beige

NO TEXT ON THIS PAGE

SECTION 43 41 45.01 – MODIFICATIONS TO FIBER-REINFORCED PLASTIC TANKS

CONTRACT WP-169 CSO-FC-DF

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified and required, to modify the existing fiberglass reinforced plastic (FRP) tanks, complete and operational.

B. The following index of this Section is presented for convenience:

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C. The following schedule, attached after the “End of Section” designation, is a part of this Section:

1. Schedule 43 41 45.01-1, Existing Fiber-Reinforced Plastic Tank Details.

1.02 PAYMENT

A. No separate payment shall be made for performing any Work required under this Section. All costs for Work required by this Section shall be included in the applicable lump sum, unit price(s) or allowance(s) as set forth in Section 01 27 00 – Measurement and Payment.

1.03 RELATED SECTIONS

A. Section 40 05 31 – Thermoplastic Process Pipe

B. Section 40 79 91 – PMCS Field Instruments

1.04 REFERENCES

A. Abbreviations and Acronyms:

1. FRP Fiber-Reinforced Plastic

B. Reference Standards:

1. ASME RTP-1 – Reinforced Thermoset Plastic Corrosion Resistant Equipment
2. Chemical Abstract Service (CAS), Division of the American Chemical Society
3. NFPA 704 – Hazard Identification System
4. 6NYCRR Part 595-599 (Hazardous Substances)
5. Occupational Safety and Health Administration (OSHA)
6. New York City Fire Department (FDNY)
7. National Fire Protection Association (NFPA)
8. ANSI/AWWA D130 – Flexible Membrane Materials for Potable Water Applications
9. ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
10. ASTM D624 – Standard Practice for Evaluating the Performance of Diffusive Samplers
11. ASTM D638 – Standard Practice for Tests to Evaluate the Chemical Resistance of Geonets to Liquids
12. ASTM D792 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

13. ASTM D2240 - Standard Test Method for Rubber Property—Durometer Hardness

1.05 DESCRIPTION

A. This Section includes requirements for modifying the existing FRP tanks at the FBCSO Facility. The existing tanks are empty.

1. The tanks will be used for the storage of chemical solutions that will be pumped into the tanks from tanker trucks and pumped out of the tanks by chemical metering pumps or chemical transfer pumps.

2. The existing tank information and project specific requirements can be found in Schedule 43 41 45.01-1, Existing Fiber-Reinforced Plastic Tank Details, located after the "End of Section" designation and the Contract Drawings. Interior inspections of the tanks have been performed and are attached as Attachment 1 for reference.

3. The modifications to the each of the existing FRP tanks listed in Schedule 43 41 45.01-1, consist of the following:

a. Replacement of all tank gaskets.

b. Interior cleaning of the tanks using potable water.

c. Installation of side access manway.

d. Replacement of the liquid level sight gages.

e. Installation of dip pipe for new transfer pump connection.

f. Installation of tank liner.

g. Installation of additional tank labels.

h. Installation of additional chemical labels.

i. For Tank No. FB4215-07, the lower end of the existing interior fill header/agitator shall be placed back in the tank support bracket. Refer to the Tank Inspection Reports included as Attachment No. 1 at the end of this Section for details and photos.

j. Provision of new mounting hardware, including titanium nuts, bolts, and washers for existing tank top access manway covers. There are two access manway covers on each tank. The hardware shall be as specified for manway access covers on the new Side Manways specified herein.

B. All components provided shall be compatible for use with up to 15-percet sodium hypochlorite solution.

1.06 QUALITY ASSURANCE

A. Manufacturer of the side manways shall have a minimum of ten (10) years' experience in the design and fabrication of FRP nozzles of similar size and type to those shown and specified herein, and who have in the opinion of the Engineer sufficient experimental and test data to confirm the design of the specified FRP side manways.

B. Side Manways Installer Qualifications:

1. Engage a single Installer skilled, trained and with successful experience in the field service modifications of existing FRP tanks and who agrees to employ only tradesmen with specific skill and successful experience in this type of Work. Installer shall have a minimum of five (5) years of experience, should work for a fiberglass fabrication company and be able to submit evidence of a minimum of three other successful modifications to existing FRP tanks of similar size and nature.

C. Manufacturers of the tank liner material shall have a minimum of five (5) years' experience in the design, manufacture, and installation of this product.

D. Tank Liner Installer Qualifications:

1. Engage a single Liner Installer skilled, trained and with successful experience in the installation of the flexible tank liner inside each tank. Liner Contractor shall have a minimum of five (5) years of experience, should work for a fiberglass fabrication company and be able to submit evidence of a minimum of three other installations to existing FRP tanks of similar size and nature.

1.07 SUBMITTALS

A. Submittals shall comply with the requirements of the Contract Documents. In addition, submittals shall include, but not be limited to:

1. Action Submittals:

a. Quality Assurance Requirements

1) Side Manway Installer: Submit Installer's record of experience in work similar to that required under this Section.

2) Liner Installer: Submit Installer's record of experience in work similar to that required under this Section.

b. Shop Drawings:

1) Side Manways:

a) Description of fabrication of the side manways, identifying all materials used and methods of fabrication, including but not limited to:

(1) Complete assembly, layout showing the layups and reinforcement around the openings and the required clearances, and installation drawings with clearly marked dimensions for side manways to be installed.

(2) Complete description of chemical resistance for all materials that will come in contact with the materials stored, including a certification from the manufacturer that the various materials, including resins and veils, used are suitable for the intended application (including maximum rated chemical concentrations and temperature).

(3) Laminate specifications including resin and reinforcing materials required, layer (laminate sequence) construction and thickness, glass data and specifications, resin properties, resin curing processes, post cure processes, and any and all catalysts used. All design calculations shall be coordinated with ASME RTP-1 requirements.

(4) All shop drawings and design calculations for the side manway access shall be coordinated with ASME RTP-1 requirements.

2) Dip Pipes:

   a) Complete product data sheet(s) for dip pipe and dimensional drawings for installation.

3) Gaskets:

   a) Complete product data sheet(s) for gaskets. The size(s) submitted for approval shall be specifically identified on the product data sheet(s).

4) Sight Level Gauges:

   a) Complete product data sheet(s) for sight level gauges. The size(s) submitted for approval shall be specifically identified on the product data sheet(s).

5) Tank Liners:

   a) Complete product data sheet (s) for the liner material such as linear composition and chemical compatibility information, strength and elasticity data and temperature ratings.

   b) Complete product data sheet (s) for the liner support structure.

   c) Site-specific liner installation details for all nozzle connections.

   d) Site-specific liner installation details for the interior support structure, including number of support rings and spacing.

   e) Site-specific liner installation procedures.

   f) Installation, maintenance and cleaning instructions.

6) Tank Labels:

   a) Complete product data sheet(s) for tank labels and tank label information.

7) Manway Access Cover Mounting Hardware:

   a) Complete product data sheet(s) for bolts, nuts, and washers required to secure access covers for all manways, new or existing.

c. Calculations:

1) Side Manways:

a) Structural design computations for each FRP manway signed and sealed by a New York State Professional Engineer. Calculations shall include at a minimum, details of reinforcement around side manways and thickness of the manways.

d. Test Reports.

1) Side Manways:

a) Documentation of construction procedure.

b) Inspection tests such as Barcol Hardness Test, RTP-1 Level 2 Visual Inspection and Acetone Sensitivity Test

2) Tank Liners:

a) Provide Liner Installer's Certificate of Proper Installation for each liner after the installation is complete, but not prior to testing.

b) Provide leakage test results.

2. Information Submittals:

a. Materials Compatibility Certification:

1) Certificate of chemical resistance for the following materials:

a) laminate reinforcing material used.

b) resin and cure system used for the structural layer.

c) resin and cure system used for the corrosion resistant barrier.

d) fire retardant additives.

e) other additives.

f) gasket materials.

g) tank liners.

2) For laminates, resins, and other FRP additives, this certification shall state that the resins used in the fabrication of the laminates have been evaluated in accordance with ASTM C581 for chemical resistance for a service comparable to the intended service and that the resin is recommended by the resin manufacturer for the intended service.

3) For Tank Liners and Gaskets, provide certification from the manufacturer of each that the material used will provide chemical resistance for a service comparable to the intended service.

b. Warranty certificates.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall deliver materials provided under this Section in accordance with the requirements of the Contract Documents.

B. The Contractor shall store and handle materials provided under this Section in accordance with the requirements of the Contract Documents

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall provide spare parts and special tools, necessary to service, disassemble, repair, and adjust the equipment provided under this Section, and as per the requirements of the Contract Documents. In addition:

1. Provide the following spare parts for each FRP tank listed in Schedule 43 41 45.01-1:

a. Provide one (1) side manway gasket and set of titanium bolts, nuts, and washers for the manway access cover.

1.10 WARRANTY

A. The Contractor shall obtain from the manufacturer and provide to DEP the manufacturer’s standard warranty, in an acceptable form, warranting against defects in design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Side Manways:

1. Composites USA, North East, MD
2. Troy Dualam Inc., Brockville, ON, CA.
3. Augusta Fiberglass, Blackville, SC.
4. Belco Manufacturing, Belton, TX.
5. RL Industries, Fairfield, OH.
6. Or approved equal.

B. Resins and Veils:

1. Ashland Inc., Dublin, OH.
2. Dow, Midland, MI.
3. AOC, Collierville, TN.
4. Or approved equal.

C. Tank Liners:

1. Flexi-Liner Corporation, Chino, CA
2. No alternate manufacturer or product will be accepted.

2.02 MATERIALS / EQUIPMENT

A. Regulatory Requirements:

1. Tank components shall be designed and constructed in accordance with ASME RTP-1. Tank components do not require ASME RTP-1 Stamp.
2. Laminate construction shall be ASME Type I or Type II except as modified herein.
   a. The use of a manual chopper gun shall not be permitted.
   b. Semi-automatic or automatic chopper guns shall be permitted only with the approval of the Engineer.
3. Shell joints and secondary bond overlays for vessel penetrations shall be in accordance with ASME RTP-1, Section 4-300 or Section 4-400, except that each successive overlay ply shall overlap the preceding ply by 1-inch minimum on each side.
4. FRP components shall have an ASTM E84 Flame Spread Rating of less than 25 achieved by fabricating the outermost three (3) mat layers and outer surface veil layer from the halogenated resin with additional antimony pentoxide and cure system specified. The entire corrosion

barrier and structural laminate shall be fabricated using the corrosion resistant resin and cure system specified.

B. General Design Requirements:

1. All material shall be new and both workmanship and materials shall be of the very best quality, entirely suitable for the liquids which the FRP tanks are to contain and shall conform to all applicable requirements specified herein.

C. Side Manway Materials:

1. General: The materials used for side manway installation shall be clean, consistent in quality and in conformance with these specifications and the manufacturer's specifications for the materials.

a. All batches of resin that have been modified by the addition of additives (such as promoters or accelerators) shall be tested for gel time and proper cure characteristics.

b. The laminate surface and materials temperatures shall be as specified by the resin manufacturer. A minimum 5 degree F spread between the atmospheric wet bulb (higher) and the laminate surface temperatures shall be maintained at all times during fabrication.

c. All fiberglass reinforcements, catalysts, cure-control additives and paraffinic waxes used shall be as recommended by the resin manufacturer, in writing, as consistently giving the best results with the resin being used. Resin binders in chopped strand mats shall be suitable for fabrication of the corrosion barrier.

2. Resins: Resins shall be suitable for the liquid to be contained in the FRP tanks.

a. Resin for the corrosion barrier and structural layer shall be similar to the existing material used on the existing FRP tanks and shall be a Bisphenol A Epoxy Vinyl Ester Resin compatible with the material stored.

b. Resins used in the corrosion barrier and resin-rich inner liner and structural layers shall not have any fire retardant agents or antimony compounds and shall be cured using Benzoyl Peroxide (BPO) catalyst and a Dimethylaniline (DMA) promoter cure system.

c. No thixotropic agent shall be added to resins used for the resin-rich inner liner, corrosion barrier, or structural layer. Up to 2 percent by weight of thixotropic agent may be added for viscosity control of resins not used for a corrosion barrier and resin-rich inner liner. The quantity of thixotropic agent added, however, shall not interfere with visual inspection of the laminate. No other fillers to the resin, including pigments, dyes and colorants, shall be permitted, unless approved in writing by the Engineer.

d. An ultraviolet adsorption agent shall be added to the resin throughout the outer layer beyond the structural layer.

3. Reinforcement: Glass reinforcement shall be Type E, electrical glass, unless otherwise specified in Schedule 43 41 45-1.

a. Surfacing Veil:

1) Protective veils for exterior surfaces shall be Type C glass surfacing mat. The thickness of the surfacing veil shall be 10 to 20 mils for all applications.

2) Surfacing veils for interior surface applications where the glass may be attacked by compounds in the process shall be a suitable spun-laced synthetic organic entangled fiber fabric not less than 20 mils in thickness, consisting of two plies of 10 mils each with each ply separately gelled prior to application of the subsequent ply, all backed by chopped strand in resin.

b. Chopped strand mat shall be Type E glass, 1½ oz./sq ft.

c. Continuous roving used in chopper guns for spray-up shall be Type E glass with coupling agent.

d. Woven roving shall be Type E glass, 24 oz./sq. yd, 4 x 5 weave.

e. Woven cloth shall be Type E glass.

4. Laminate Construction:

a. The structural laminate thickness of the tanks and components shall be ½-inch minimum, or double the calculated design thickness, whichever is greater.

b. The corrosion barrier shall consist of Type I Laminate and shall contain two (2) resin rich veil layers (saturated with catalyzed resin)

followed by three (3) layers of chopped strand mat (saturated with catalyzed resin).

1) The total thickness of the resin rich veil layer shall be 20 to 30 mil (0.02 to 0.03-inch). These first layers consisting of veil and resin shall contain 90 percent resin and 10 percent veil material by weight.

2) Each layer of chopped strand mat (saturated with catalyzed resin) shall have a thickness of 43 mils. The chopped strand mat layers in the finished corrosion barrier laminate shall be 70-80 percent resin and 20-30 percent glass by weight.

3) The inner corrosion barrier plus the three mat layers shall total 0.149-inches minimum thickness and constitute the inner lining. The entire lining shall reach complete cure before the structural layers are applied. The corrosion barrier thickness shall not be included in the structural laminate thickness calculations.

c. The structural layer shall consist of a Type II laminate saturated with catalyzed resin. The structural layer shall be placed over the corrosion barrier within 12 hours after the corrosion barrier has cured, otherwise the surface of the corrosion barrier must be completely ground to assure adequate bonding with the structural layer being applied. The structural layer shall have an average glass content of at least 35 percent by weight per ASTM D2584.

5. The post-cure process shall be a heat post cure utilizing a forced hot air heating system or an oven curing system.

a. If a forced hot air heating system is used for the heat post-cure, as per the resin manufacturer's recommendations, the manufacturer shall utilize a forced hot air heating system that induces the heat on the interior and forces the heat through the wall to the exterior. An optimum cure is achieved when the temperature normalizes on the tank exterior.

1) Post-curing may also be conducted in a hot air convection curing oven such that both the interior and exterior laminate surfaces are exposed to the same hot air temperatures.

2) Post-curing ovens/structures shall be equipped with time/temperature recording devices such that the temperatures are logged. A continuous record or chart or curing air temperatures shall be made available for review by the Engineer prior to shipment of the tanks.

3) Manufacturer shall post-cure the equipment at a minimum of 180 degrees F. Post-cure temperature shall not exceed the Heat Distortion Temperature of the resin.

4) The post-cure hold period shall be a minimum of 4 hours. The duration of the hold period shall be engineered based upon laminate volume. Laminate volume calculations shall be made available for review by the Engineer along with the post curing temperature charts specified above.

5) The post-cure temperature shall be ramped up to and down from the hold period temperature to avoid thermal shock to the laminates being cured. The post-cure period, including ramping and holding time shall be a minimum of 6 hours and shall be engineered based upon laminate volume plus laminated thermal properties. The calculations shall be made available for review by the Engineer along with the previously specified calculations.

6) Any cracking that results from the post-cure process shall meet RTP-1 visual inspection acceptance criteria, Table 6-1.

7) All FRP covers and blinds shall be removed from the tanks during post-cure; Manway covers shall be post-cured.

D. Tank Liners:

1. General:

a. Liner shall be fabricated in one piece.

b. Liner and all material components shall be selected for the specific chemical service required. Chemical services include the following water treatment chemicals:

1) Sodium Hypochlorite (15%)

2. Liners:

a. Material: Modified vinyl terpolymer in accordance with ASTM D130.

1) Specific gravity: 1.32 in accordance with ASTM D792.

2) Durometer Hardness “D”: 65 in accordance with ASTM D2240.

3) Tensile Strength: 3,200 psi in accordance with ASTM D412.

4) Modulus at 300% Elongation: 2,100 psi.

5) Elongation at Break: 325% in accordance with ASTM D638.

6) Graves Tear: 420 lbs/inch in accordance with ASTM D624.

b. Thickness: 0.065-inch minimum thickness

3. Support Structure:

a. Materials: PVC piping in accordance with Section 40 05 31 – Thermoplastic Process Pipe and polyethylene tubing.

b. Fabrication: PVC to PVC connections shall be solvent cement glued.

E. Dip Pipe

1. Material: CPVC in accordance with Section 40 05 31 - Thermoplastic Process Pipe or fiberglass. PVC cement shall be compatible with the chemical

2. Size: 1.5-inch

3. Inside each storage tank, install a flanged dip pipe connected to the tank top inlet nozzle connected to transfer pump discharge. Each dip pipe shall be equipped with one-inch diameter siphon break hole drilled at an elevation equal to the centerline elevation of the tank overflow pipe.

4. Each dip pipe shall be installed with sufficient number of pipe supports molded to the tank interior wall to restrain the dip pipe. Pipe support shall provide not only restraint of dip pipe, but also permit dip pipe removal.

F. Gaskets:

1. Material: Viton.

2. Thickness: 1/8-inch

3. Gaskets shall be suitable for Class 150 flange connections.

G. Liquid Level Gages:

1. General: Liquid level gages shall be furnished in accordance with the details shown on the Contract Drawings .

2. Glass Liquid Level Gage: Glass liquid level gage shall be furnished with upper and lower valves, glass tube, guard rods and all required supports. All components of the gage shall be resistant to the chemicals being stored.

a. Valves shall be of plastic, furnished with internal ball checks in case of glass tube breakage and provided with ¾-in. NPT male threads to fit the threaded outlet fitting on the tank. Materials of construction to be compatible with the stored chemical.

b. Glass gage shall be installed so that the full capacity of the tank shall be measured. Tubes shall be ¾-inch diameter and shall be graduated to indicate gallons or feet of liquid remaining in the tank.

c. Four guard rods with a minimum diameter of $^{3}/_{16}$-inch shall be provided.

H. Flange and Installation Hardware for all Components:

1. Provide bolts, nuts, and washers fabricated of commercially pure, Grade 2 Titanium, 47 Ksi minimum yield strength, and 50 Ksi minimum tensile strength. Bolts and nuts shall be hex-flange type, with SAE dimensions and coarse threads. Provide flat washers.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Gaskets: Gaskets shall be provided for all existing vessel connections in the number and dimensions shown on the Contract Drawings and as specified in the Contract Documents.

B. Tank Liners:

1. Liner Contractor shall fabricate a fully enclosed liner, including floor, sidewall, and top for installation into existing horizontal storage tanks in accordance with the details shown on the Contract Drawings or as specified in Schedule 43 41 45.01-1. The Contractor shall field measure

and locate all existing tank nozzles, openings, manways and penetrations and new manways as needed for the custom fabrication of the tank liner.

a. Tank Nozzles and Manways:

1) Tank nozzles and manways are flanged for external pipe connections.

2) The liner nozzle shall extend from the liner body through the tank nozzle with an exterior liner flange to provide complete protection of the tank and nozzle.

3) Liner boots or nozzle flanges shall be attached to the liner body using heat welding.

4) Liner boots on tank fill or transfer lines that enter from the tank ceiling shall be reinforced and supported by means other than relying on the exterior flange gaskets for support.

2. Liner shall be constructed so that all seams and joints between two or more components shall be thermally fused using RF-welding or heat-welding. Glued or adhesive-bonded seams or joints are not acceptable.

C. Tank Labels:

1. Tank Labels shall be in compliance with all applicable Federal, State, and local codes and regulations including but not limited to OSHA, FDNY, NFPA, and NYC Right-to-Know Requirements.

D. Chemical Labels:

1. Provide designation of chemical conforming to the specifications contained in the NFPA 704. Hazardous materials classification shall include rating for health, flammability, reactivity, specific hazard, contents, viscosity, and hazard number:

a. The sign shall be mounted on equipment at a height and location clearly visible for all personnel. The sign shall be located near the liquid level gauges, as shown on the Contract Drawings.

b. Provide a minimum of 2 signs per tank that are shop fastened and readily visible when tanks are installed.

2. Size of labels shall be 18-in. x 18-in., unless a larger size is shown on the Contract Drawings or required by the Contract Documents.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Tank Liners:

1. All plant welds shall be inspected and tested prior to shipment. All plant-welds shall be lap-weld with a minimum ½-inch overlap. Thickness of the finished weld shall not be more than 0.010-inch more than the thickness of the unwelded original material.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Contractor shall inspect and clean the interior of each existing FRP tank prior to beginning the modification work.

1. All interior surfaces shall be made clean by brushing, wiping, or with compressed air blast as required to remove all loose foreign materials. There shall be no remaining chemical product or standing liquid upon completion of the tank cleaning.

B. Upon delivery of the FRP side manways to the Site, a thorough examination will be performed. The Engineer reserves the right to reject any and all or require repair to FRP sideways found to have blisters , chips, crazing, exposed glass, dry cracks, burned areas, dry spots, foreign matter, or entrapped air at the laminate surfaces which do not satisfy the tolerances specified in ASME RTP-1, Table 6-1, visual acceptance levels as hereinbefore stated for inside and outside surfaces.

3.02 INSTALLATION

A. Side Manways:

1. Installation of the side manway access hatch shall be in accordance with the manufacturer’s/installer’s instructions and approved drawings.

2. Install side manway in the locations shown on the Contract Drawings.

B. Gaskets:

1. Contractor shall reinstall existing flange hardware.

C. Tank Liners:

1. Liner shall be provided with a suspension system fastened to J-hooks fastened to the roof of the tank.

2. Field adjustments of the factory installed liner shall not be permitted and shall be cause for rejection of the liner.

3. The liner nozzle shall extend from the liner body through the tank nozzle with an exterior liner flange to provide complete protection of the tank and nozzle.

4. Liner boots or nozzle flanges shall be attached to the liner body using heat welding. Field welds shall be lap-welded with minimum of 3-inch overlap. Field welds shall be vacuum tested.

5. Liner boots on tank fill or transfer lines that enter from the tank ceiling shall be reinforced and supported by means other than relying on the exterior flange gaskets for support.

6. Special care must be taken in protecting the installed liner against protrusion of existing tank nozzles into the interior of the tank.

3.03 FIELD TESTING / QUALITY CONTROL

A. Leakage Tests:

1. Contractor shall perform leakage tests on each tank after installing the tank liners.

2. Test Procedure

a. Bulkhead the openings and fill the tanks with potable water to a level 6-inches below the overflow level.

1) The tank shall be kept full until the water temperature has stabilized but not less than 24 hours before the start of the leakage test.

b. Measure the water surface elevation from a fixed point on the tank at two locations 180-degrees apart.

c. Where environmental conditions could lead to changes in water level due to evaporation or precipitation, measurement of these factors shall be made as specified for testing concrete structures.

1) A clear plastic calibrated open-top container not less than 18 inches in diameter and depth shall be partially filled, floated in the tank, and held in position near each measurement location.

2) The container shall be located so as not to be shaded by tank walls and away from any items passing over it such as beams or pipes.

d. The following measurements shall be recorded at each test location at the start of the test period and 24 hours later:

1) Distance from reference point to test water surface.

2) Depth of water in the floating container.

3) Temperature of the test water at 18 inches below water surface.

4) Temperature of the water in the evaporation-precipitation container at mid-depth.

e. The exterior surface of the structure shall be inspected for leakage, especially in areas around joints.

f. Leakage:

1) The change in water surface elevation at each test location shall be averaged.

2) The total change in test water surface elevation shall then be adjusted by the average change in water surface elevation in evaporation-precipitation containers, if applicable.

3) Where averaged water temperature measurements vary by more than 3° F from start to completion of the test period, adjustment in tank volume shall be determined by change of water density resulting from the change in the average water temperature.

g. The leakage test shall be considered failed if there is any measurable drop in the water surface (after adjusting for evaporation and precipitation) during the 24-hour test period or if there is any visible leakage.

3. All openings in the tank shall be plugged and tanks shall be filled with water to the working capacity. Over a period of twenty-four (24) hours, there shall be no leakage from the tank.

4. Corrective Actions: In the event of leakage the Engineer may:

a. Require the Contractor to re-torque the flanges using bolting pattern as prescribed in RTP-1; or

b. Require the side manway installer to provide the personnel, materials, and equipment to perform the necessary repairs, if leakage is seen at the side manways.

c. Require the liner installation crew to provide personnel, materials and equipment to perform the necessary repairs, if leakage is seen due to the liner system.

5. Leakage tests shall be repeated for any repaired tank.

6. No additional payments will be made for tests or retests.

7. Passage of the leakage test does not relieve the Contractor from repairing leaks that may appear when the tanks are filled with the service liquid.

3.04 STARTUP / DEMONSTRATION

A. Furnish the services of a qualified manufacturer's representative to check and approve all installations before operation as well as conduct field testing, in accordance with the requirements of the Contract documents. In addition, the manufacturer representative shall:

1. Assist in the installation of the equipment;

2. Check the installation before the equipment is placed into operation;

3. Assist in the performance of field tests;

4. Verify that all work furnished and installed conforms to the requirements the Contract Documents.

B. At a minimum, the services of the manufacturer's representative and installers shall be provided as indicated, below. The time per tank and person-days per visit indicated below shall be understood as referring to the total required services for each individual tank provided under this Specification.

Visit	Purpose:	No. of Visits	Person-days per visit
1	Installation Checkout	3	1
2	Field Testing	3	1
3	Startup	1	1

C. The services provided shall be in accordance with the requirements of the Contract Documents. In addition:

1. Regardless of the time per tank and person-days per visit indicated, above, the Contractor shall provide the services of the manufacturer/installer's representative at such times and for such durations of time as needed to perform the tasks required of the representative as specified.
2. The Engineer reserves the right to require that any unused person-days from any visit will be applied to any other specified visit.
3. Person-days shall be understood only as days spent on-Site (not in transit).
4. Unless otherwise authorized by the Engineer, the manufacturer's representative shall be a direct employee of the equipment manufacturer, with at least 3 year experience in the installation, testing, and start-up of equipment of the type provided under this Specification. The manufacturer's sales and marketing personnel will not be accepted as manufacturer's representatives.
5. The manufacturer's representative shall sign in and out at the office of the Engineer each day they are at the Site.
6. Reports: The Contractor shall submit reports from the manufacturer for each visit to the Site of the manufacturer's representative as per the requirements specified herein.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SCHEDULE 43 41 13-1

EXISTING FRP TANK DETAILS

Tank Tags:	HYPO-T-1, HYPO-T-2, HYPO-T-3
Manufacturer:	Justin Tanks
Liquid contained:	15% Sodium Hypochlorite
Temperature range: (°F)	55 to 85°F
Viscosity:	5.4
Specific gravity:	1.2
Number of tanks:	3
Nominal capacity: (gal)	8,136
Usable volume: (gal)	7,322
Horizontal tank nominal diameter: (ft)	8
Horizontal tank length: (ft)	21
Type of resin and cure:	Vinyl ester resin with BPO-DMA cure
Glass reinforcement Type:	Derakane 411
Exterior color:	Beige

*Refer to Contract Drawings for details of all tank nozzles and orientation

INSPECTION REPORT

CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

VENDOR: VENDOR CONTACT NAME: SUB-VENDOR (if applicable): N/A SUB-VENDOR CONTACT (if applicable): N/A	ITEM / SPEC NUMBER: ASME RTP-1, ASTM INSPECTOR: Steven Hunt
INSPECTOR'S SIGNATURE:	MATERIAL INSPECTED: • FRP Storage Tank - Horizontal

ATTACHMENTS:	COA ☐	Material Logs ☐	Testing Report ☐	Mechanical Test Report ☐
	NCR's ☐	Inspection Checklist ☒	NDT Reports ☐	Other: ☐
ISSUES TO ADDRESS:	• None			

Reference: Inspection of FRP Tank – 4213-07

To Whom it may concern,

The following report will disclose the condition of the FRP equipment as it was at the time of my visit. This report should be added or kept on file to compare with future reports to monitor the vessel activity. While we attempt to discover all flaws, defects may be present that are undetectable by the inspector. These inspections are not an attempt to verify the adequacy of the original design, but rather an inspection of the current condition to suggest the most efficient and cost-effective route for repair or replacement, if needed. See the following inspection summary below.

Thank you for making me part of your inspection team. If you have any questions about this report please feel free to give me a call. I look forward to serving your inspection needs in the future.

Steve Hunt
740-808-1191
SteveHunt@Fibersurance.com

ENCLOSED: (1) INSPECTION REPORT

INSPECTION REPORT

CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

VENDOR:
VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt

Outside Temperature	36 º F	Relative Humidity	100 %
Inside Temperature	78° F	Barometer	

Equipment Information:
End user: Flushing Bay CSO Facility
Equipment: Manufacturer: Justin Tanks
Equipment: FRP Storage Tank
Design Pressure: Unlisted
Design Temperature: Unlisted
Weight Empty: Unlisted
Contents: Sodium Hypochlorite
Capacity: 8136 Gallons
Date Mfg.: 2003
Veil: Nexus
Liner Resin: Unknown
Structure Resin: Unknown

PURPOSE OF INSPECTION:

Inspection of current condition to assess suitability for use as these tanks are 20 years old. Located at the Flushing Bay CSO Chemical Storage Area

FINDINGS:

Egress is not ideal with the current arrangement, but manageable. A solid ladder was placed on the exterior to the manway, interior access made via rope ladder with retrieval line connected to the back D ring of safety harness. Rope ladder secured to manway rings. Continuous air monitoring with fresh air blower on hand as well as the SCBA system on hand as needed in case of emergency. There is a factory lifting lug for the tank directly beside the manway. This can easily support dead weight of a person for rescue, as an alternative to more costly options.

Upon inspection of this tank, I have found no defects that would require repair prior to use; per ASTM-D-2563. Resin rich surface is noted, where free of service buildup. There is buildup noted on the lower half of the tank. Some discoloration noted in secondary joints, patches from the factory.

The fit up of components, material placement and quality of the secondary welds are of acceptable visual quality. There is putty noted in the shell-to-shell joints. Joints overall are at minimum width.

INSPECTION REPORT

CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

VENDOR:
VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt

UV scanning performed on tank interior. Nexus coverage is acceptable over visible surface. Nexus overlaps vary in width, but are acceptable.

Barcol hardness readings were taken in random areas. All readings are acceptable with no cause for alarm. No areas noted with service content permeation.

Barcol readings			
Location	**Low reading**	**High Reading**	**Average reading**
L HEAD	24	28	25
SHELL	24	27	25
R HEAD	23	26	24
SECONDARYS	22	27	24

Tank exterior has no areas of concern. Saddles appear to be in tact with no cracking or defects noted.

RECOMMENDATIONS:

Tank can be placed into service immediately. Minor defects noted will not affect service life at this point.

The original drawings should be reviewed, if possible, to ensure the resin and catalyst used for this tank so that when repairs are needed, it is available.

Preventative Maintenance inspections are suggested. For this service, it is typical to have an inspection performed every 2-3 years over the service life. With the age of the fiberglass of this scrubber, it is recommended to inspect annually. Age is 20 years old.

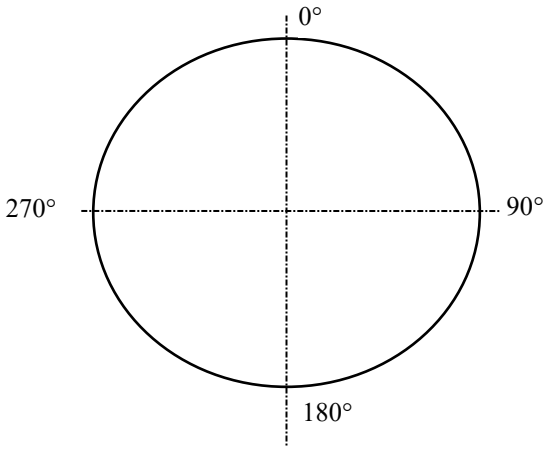
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CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

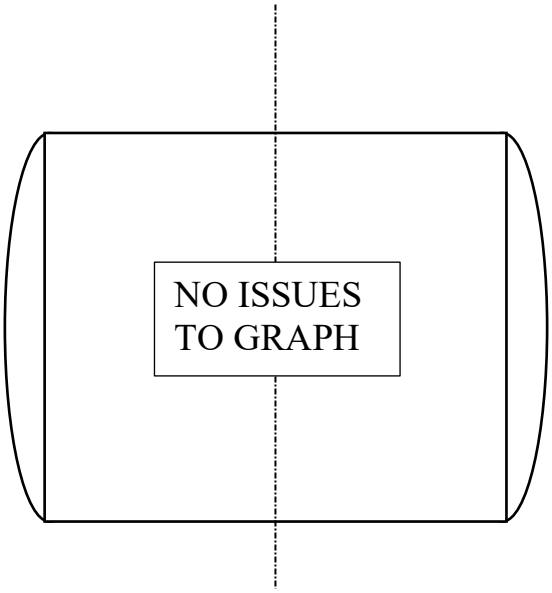
VENDOR:
VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



PLAN VIEW



ELEVATION VIEW

TANK OBSERVATIONS LOCATION MAP

TANK NUMBER: 4213-07 **DATE INSPECTED**: 01-09-2024
INSPECTOR: STEVE HUNT **LOCATION**: Flushing Bay

INSPECTION REPORT

CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

VENDOR:
VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



Tank number

INSPECTION REPORT

CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

VENDOR:
VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



Head view

INSPECTION REPORT

CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

VENDOR:
VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



Exterior – saddle under shell view ok

INSPECTION REPORT

CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

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VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



interior nozzles

Fibersurance

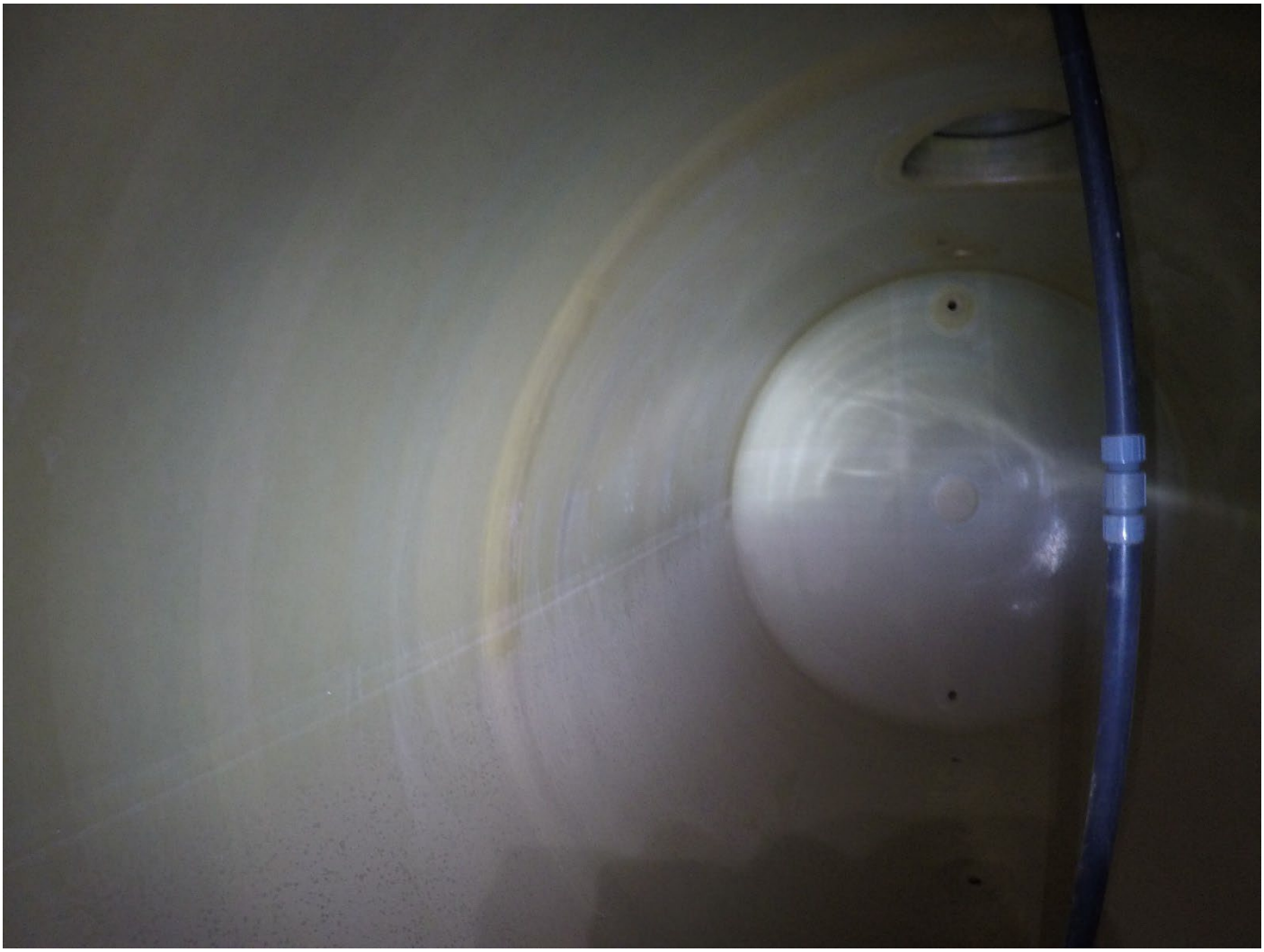
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VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



Left tank head

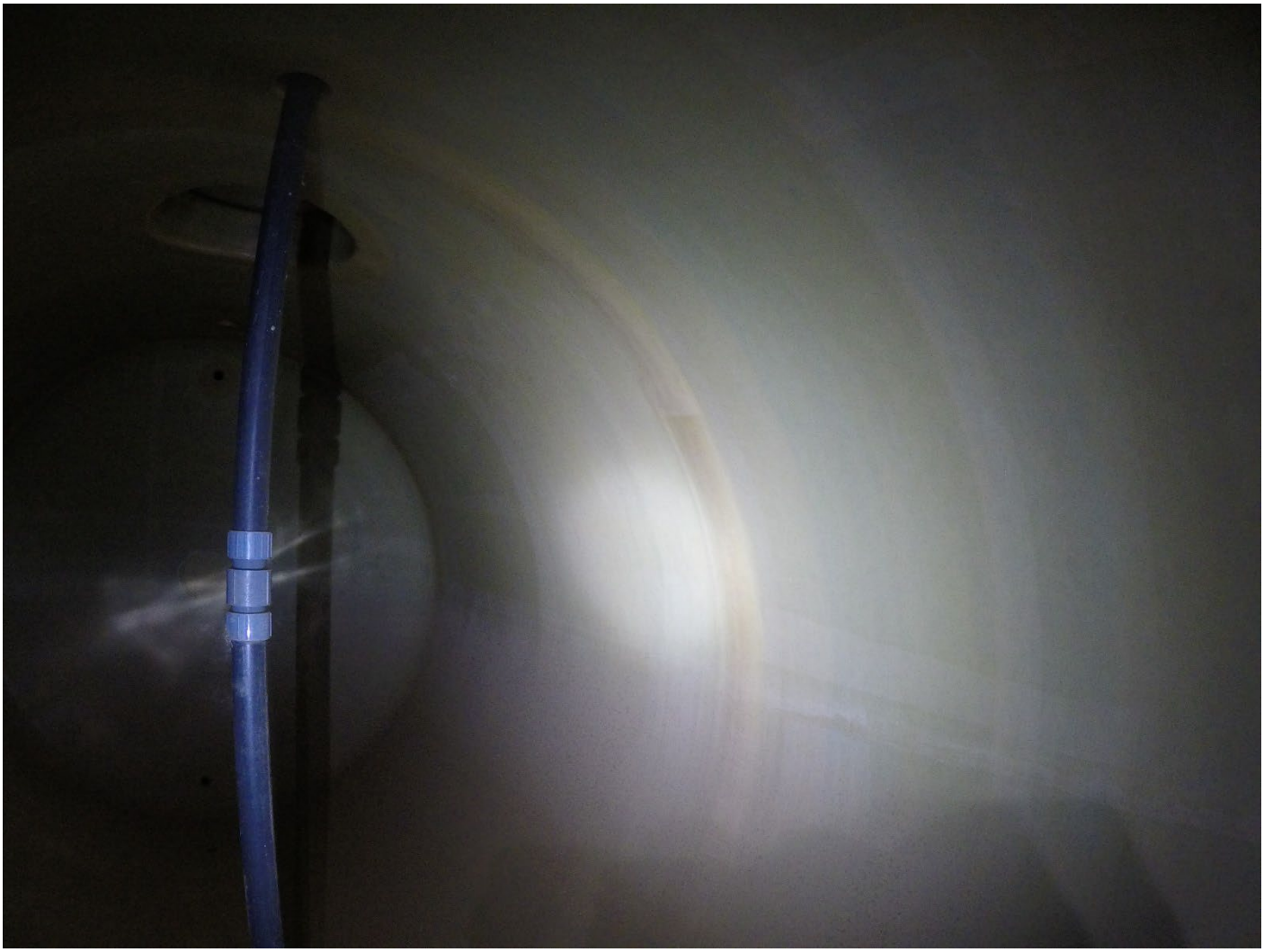
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VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



Right tank head

INSPECTION REPORT

CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

VENDOR:
VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



Nozzle view

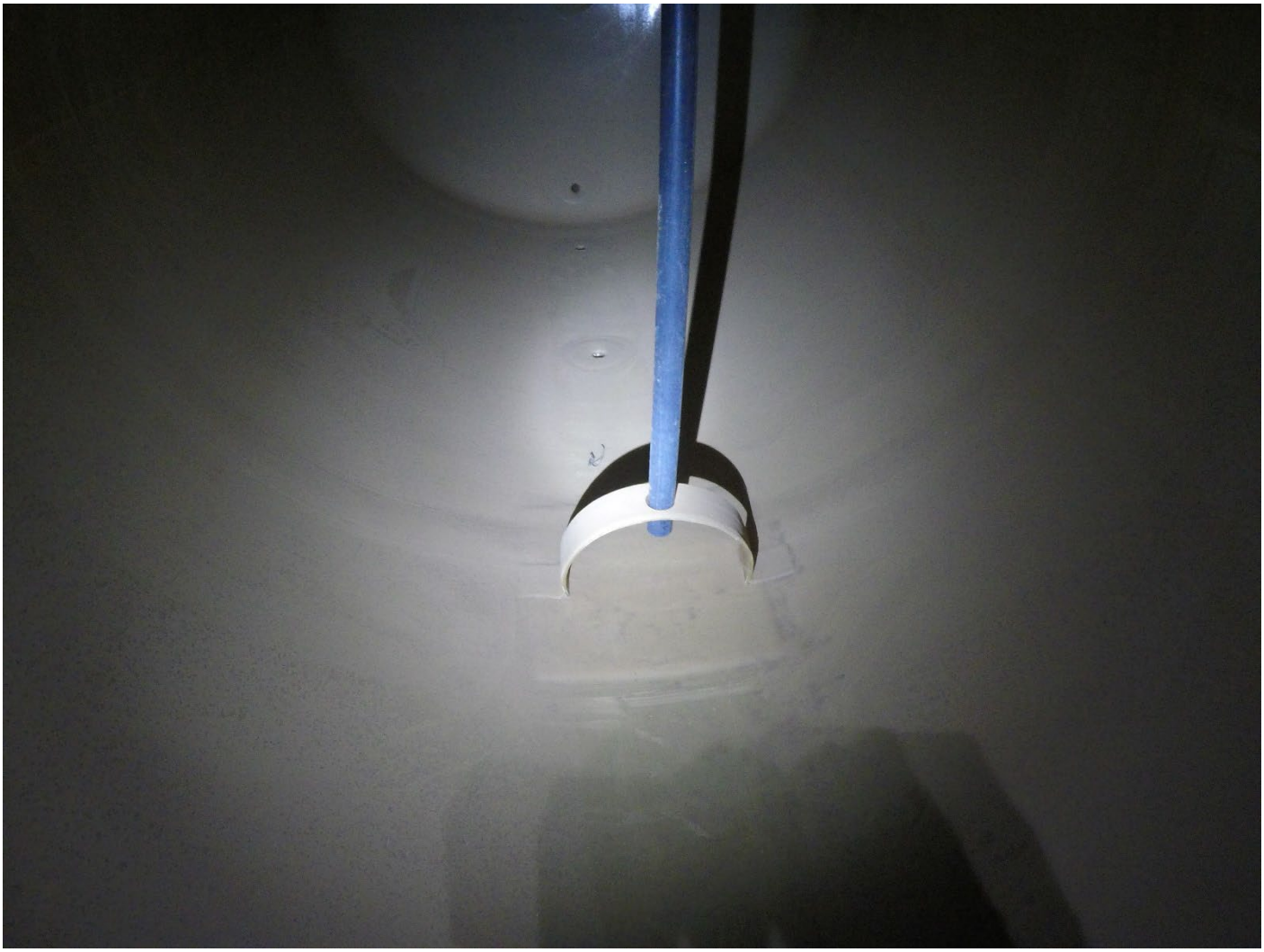
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VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



Agitator bracket

INSPECTION REPORT

CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

VENDOR:
VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



Shell to head joint ok

INSPECTION REPORT

CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

VENDOR:
VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



Shell to shell joint

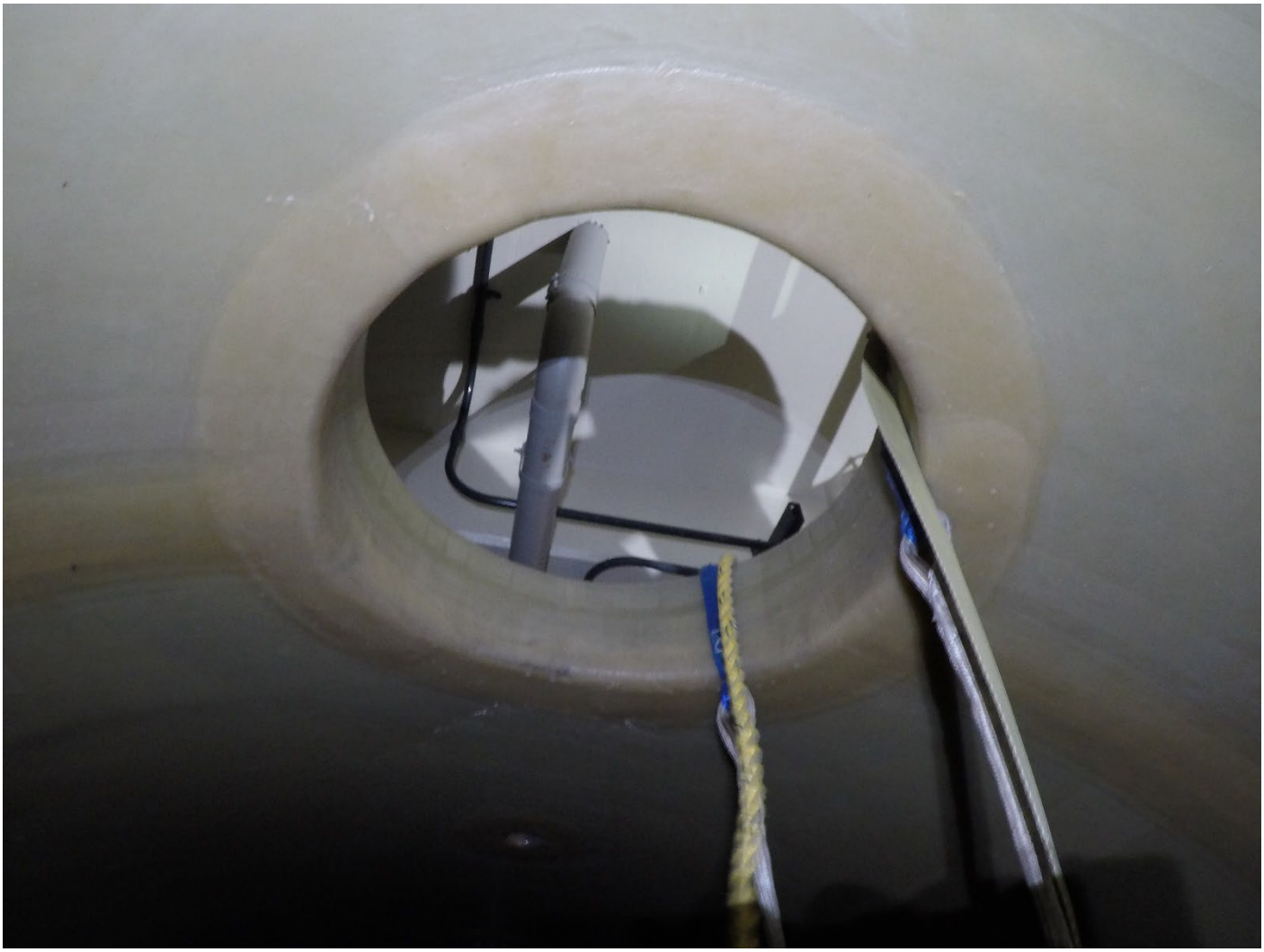
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VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



manway

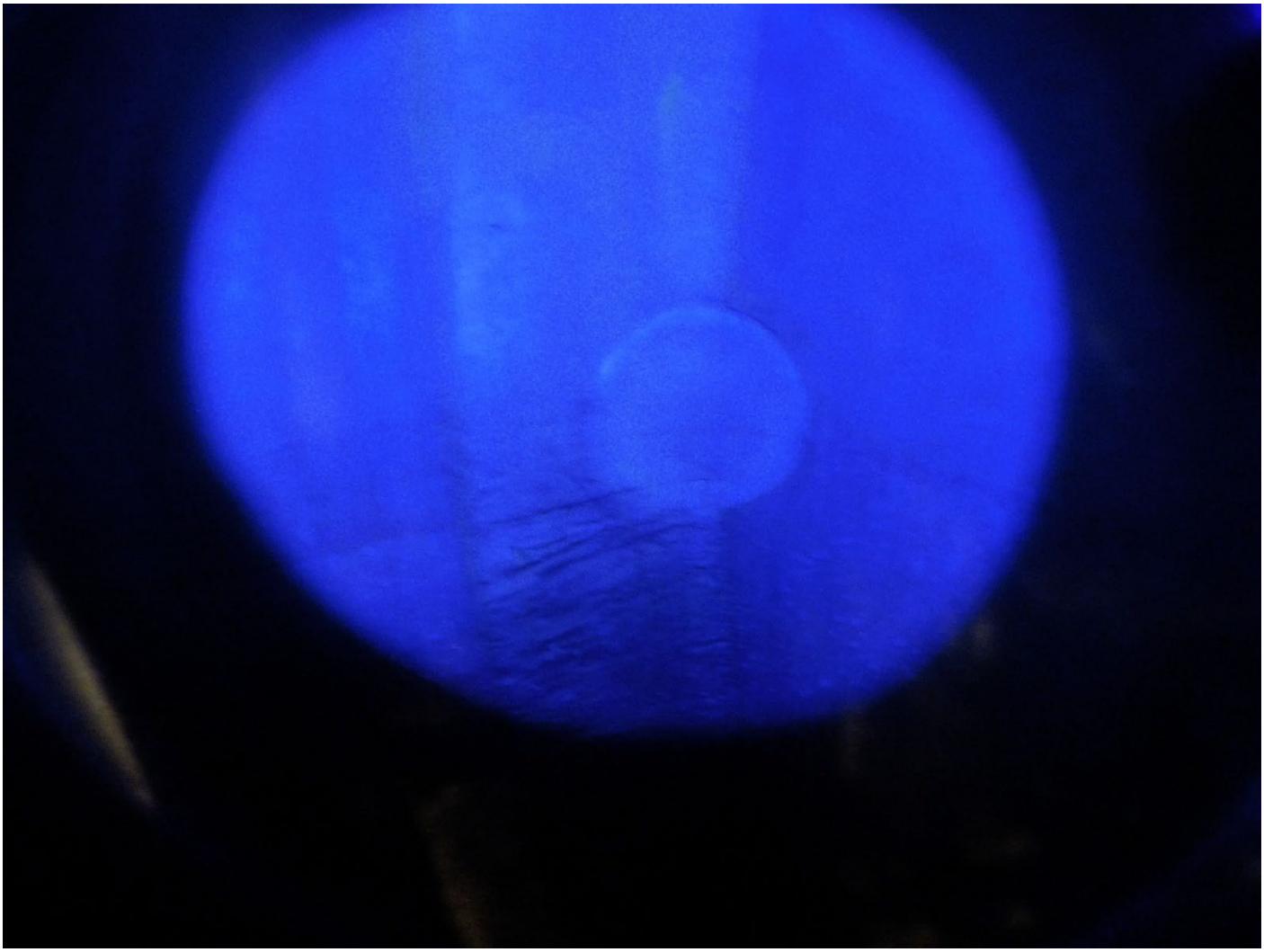
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ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



UV view no issues

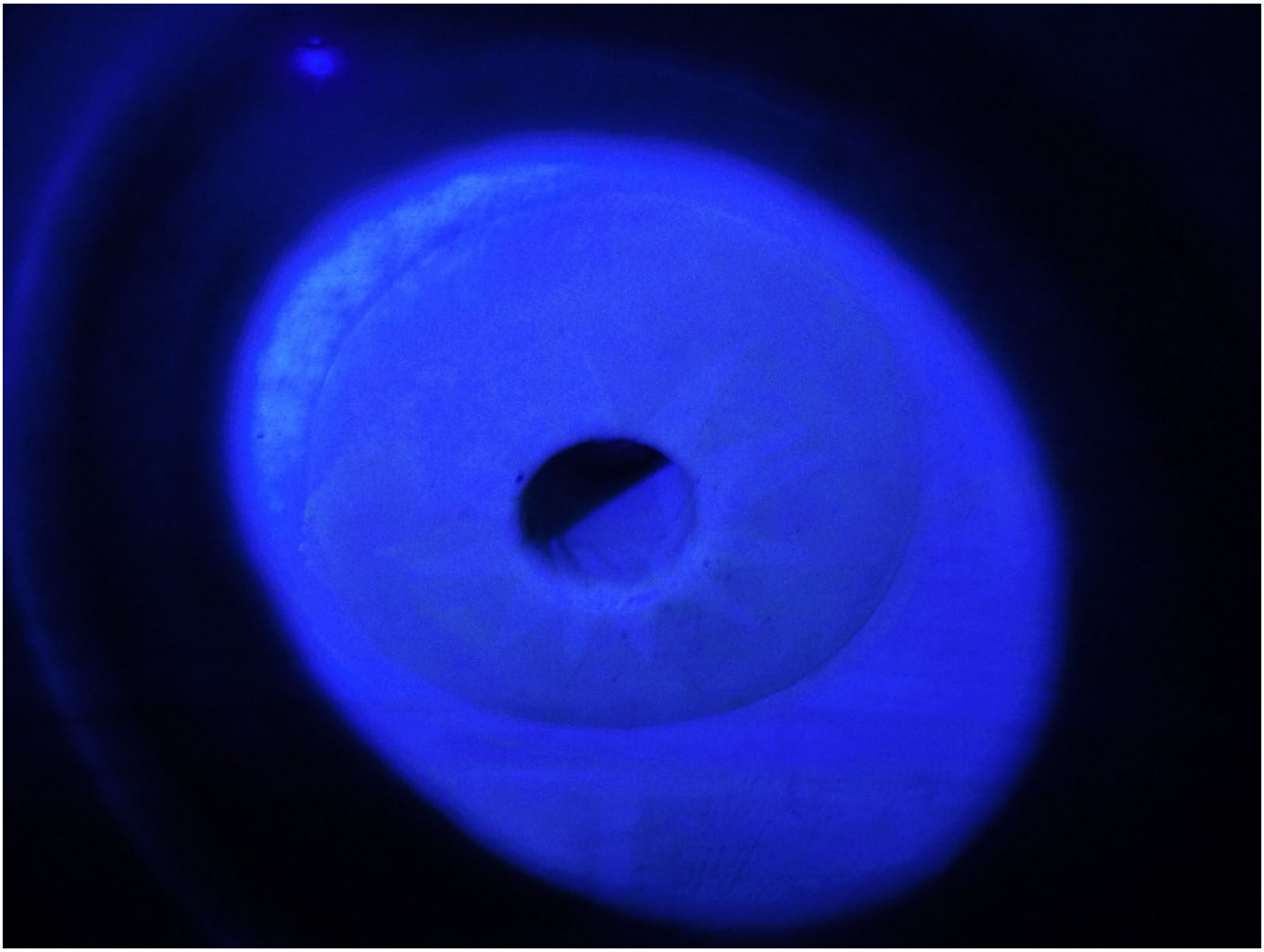
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ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



UV view no issues

INSPECTION REPORT

CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

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VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
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ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



Higher elevation nozzles overall

INSPECTION REPORT

CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

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VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
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ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



Sediment cleaned off lower elevation of shell- ok

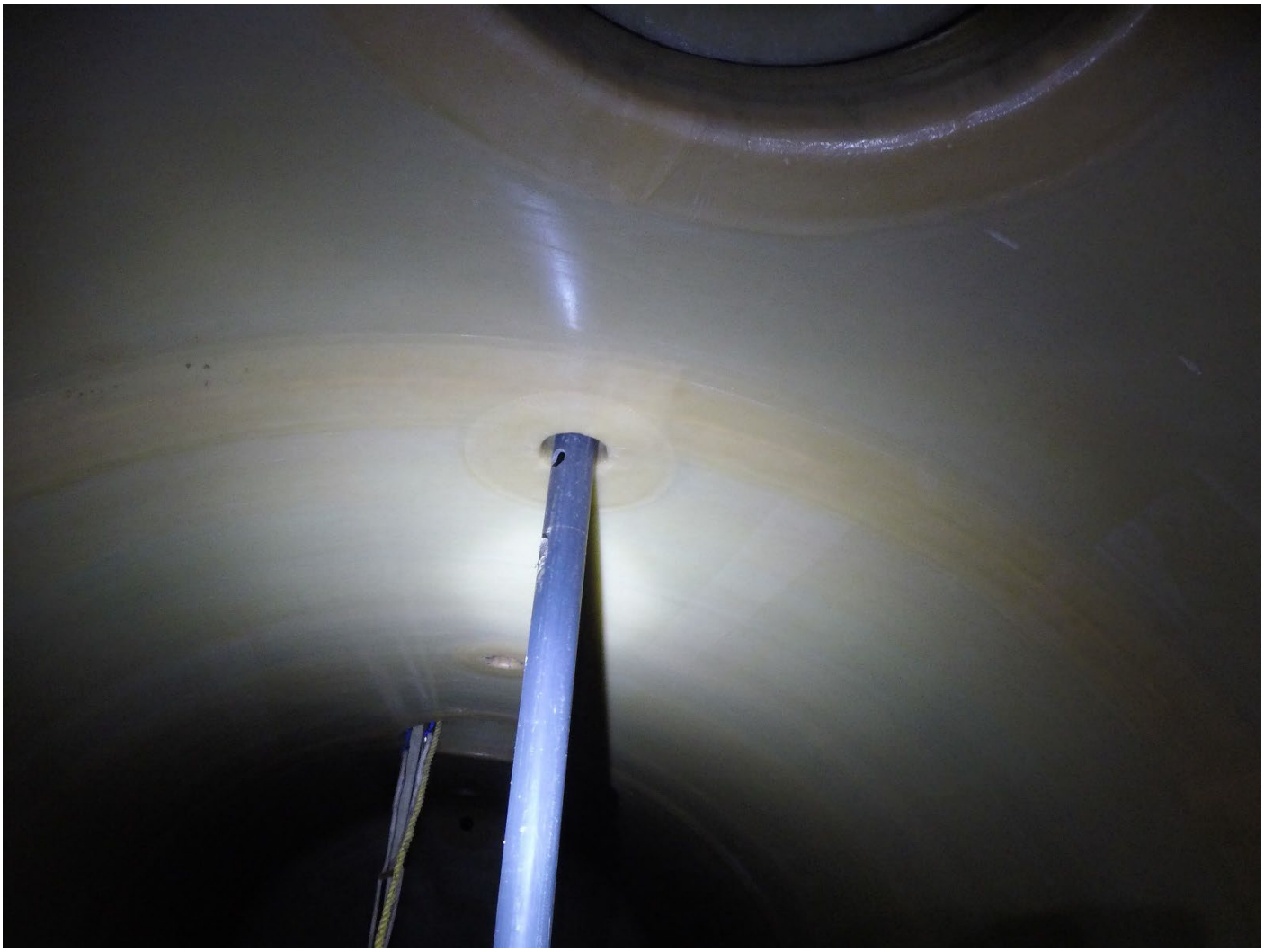
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VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



Upper view

INSPECTION REPORT

CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

VENDOR:
VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt

INSPECTION REPORT

CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

VENDOR: VENDOR CONTACT NAME: SUB-VENDOR (if applicable): N/A SUB-VENDOR CONTACT (if applicable): N/A	ITEM / SPEC NUMBER: ASME RTP-1, ASTM INSPECTOR: Steven Hunt
INSPECTOR'S SIGNATURE: 	MATERIAL INSPECTED: • FRP Storage Tank- Horizontal

ATTACHMENTS:	COA ☐	Material Logs ☐	Testing Report ☐	Mechanical Test Report ☐
	NCR's ☐	Inspection Checklist ☒	NDT Reports ☐	Other: ☐
ISSUES TO ADDRESS:	• None			

Reference: Inspection of FRP Tank – 4214-07

To Whom it may concern,

The following report will disclose the condition of the FRP equipment as it was at the time of my visit. This report should be added or kept on file to compare with future reports to monitor the vessel activity. While we attempt to discover all flaws, defects may be present that are undetectable by the inspector. These inspections are not an attempt to verify the adequacy of the original design, but rather an inspection of the current condition to suggest the most efficient and cost-effective route for repair or replacement, if needed. See the following inspection summary below.

Thank you for making me part of your inspection team. If you have any questions about this report please feel free to give me a call. I look forward to serving your inspection needs in the future.

Steve Hunt
740-808-1191
SteveHunt@Fibersurance.com



ENCLOSED: (1) INSPECTION REPORT

Fibersurance

INSPECTION REPORT

CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

VENDOR:
VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt

Outside Temperature	36 º F	Relative Humidity	100 %
Inside Temperature	78° F	Barometer	

Equipment Information:
End user: Flushing Bay CSO Facility
Equipment: Manufacturer: Justin Tanks
Equipment: FRP Storage Tank
Design Pressure: Unlisted
Design Temperature: Unlisted
Weight Empty: Unlisted
Contents: Sodium Hypochlorite
Capacity: 8136 Gallons
Date Mfg.: 2003
Veil: Nexus
Liner Resin: Unknown
Structure Resin: Unknown

PURPOSE OF INSPECTION:

Inspection of current condition to assess suitability for use as these tanks are 20 years old. Located at the Flushing Bay CSO Chemical Storage Area

FINDINGS:

Egress is not ideal with the current arrangement, but manageable. A solid ladder was placed on the exterior to the manway, interior access made via rope ladder with retrieval line connected to the back D ring of safety harness. Rope ladder secured to manway rings. Continuous air monitoring with fresh air blower on hand as well as the SCBA system on hand as needed in case of emergency. There is a factory lifting lug for the tank directly beside the manway. This can easily support dead weight of a person for rescue, as an alternative to more costly options.

Upon inspection of this tank, I have found no defects that would require repair prior to use; per ASTM-D-2563. A number of minor defects that would be outside the scope of ASME RTP-1 Table 6-1, however the tank is suitable to be used as is. From what is visible on each major component (head, shell, bottom), I suspect all of the internals generally meet level 2 visual quality. Resin rich surface is noted, where free of service buildup. There is buildup noted on the lower half of the tank. Some discoloration noted in secondary joints, patches from the factory.

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The fit up of components, material placement and quality of the secondary welds are of acceptable visual quality. There is putty noted in the shell-to-shell joints. Joints overall are at minimum width.

UV scanning performed on tank interior. Nexus coverage is acceptable over visible surface. Nexus overlaps vary in width, but are acceptable.

Barcol hardness readings were taken in random areas. All readings are acceptable with no cause for alarm. No areas noted with service content permeation.

Barcol readings			
Location	**Low reading**	**High Reading**	**Average reading**
L HEAD	23	29	26
SHELL	21	27	24
R HEAD	24	29	24
SECONDARYS	23	29	25

Tank exterior has no areas of concern. Saddles appear to be in tact with no cracking or defects noted.

RECOMMENDATIONS:

Tank can be placed into service immediately. Minor defects noted will not affect service life at this point.

The original drawings should be reviewed, if possible, to ensure the resin and catalyst used for this tank so that when repairs are needed, it is available.

Preventative Maintenance inspections are suggested. For this service, it is typical to have an inspection performed every 2-3 years over the service life. With the age of the fiberglass of this scrubber, it is recommended to inspect annually. Age is 20 years old.

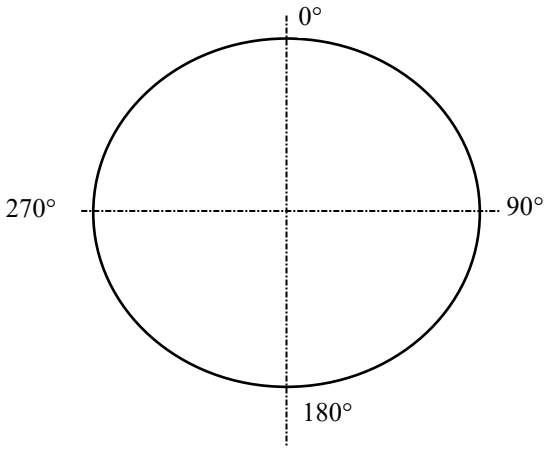
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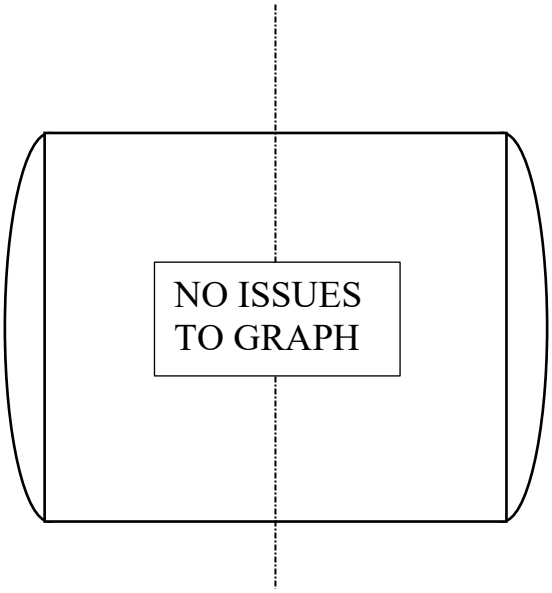
VENDOR:
VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



PLAN VIEW



ELEVATION VIEW

TANK OBSERVATIONS LOCATION MAP

TANK NUMBER: 4214-07 **DATE INSPECTED**:
INSPECTOR: STEVE HUNT **LOCATION**:

INSPECTION REPORT

CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024
VENDOR: VENDOR CONTACT NAME: SUB-VENDOR (if applicable): N/A SUB-VENDOR CONTACT (if applicable): N/A	ITEM / SPEC NUMBER: ASME RTP-1, ASTM INSPECTOR: Steven Hunt	



Tank number

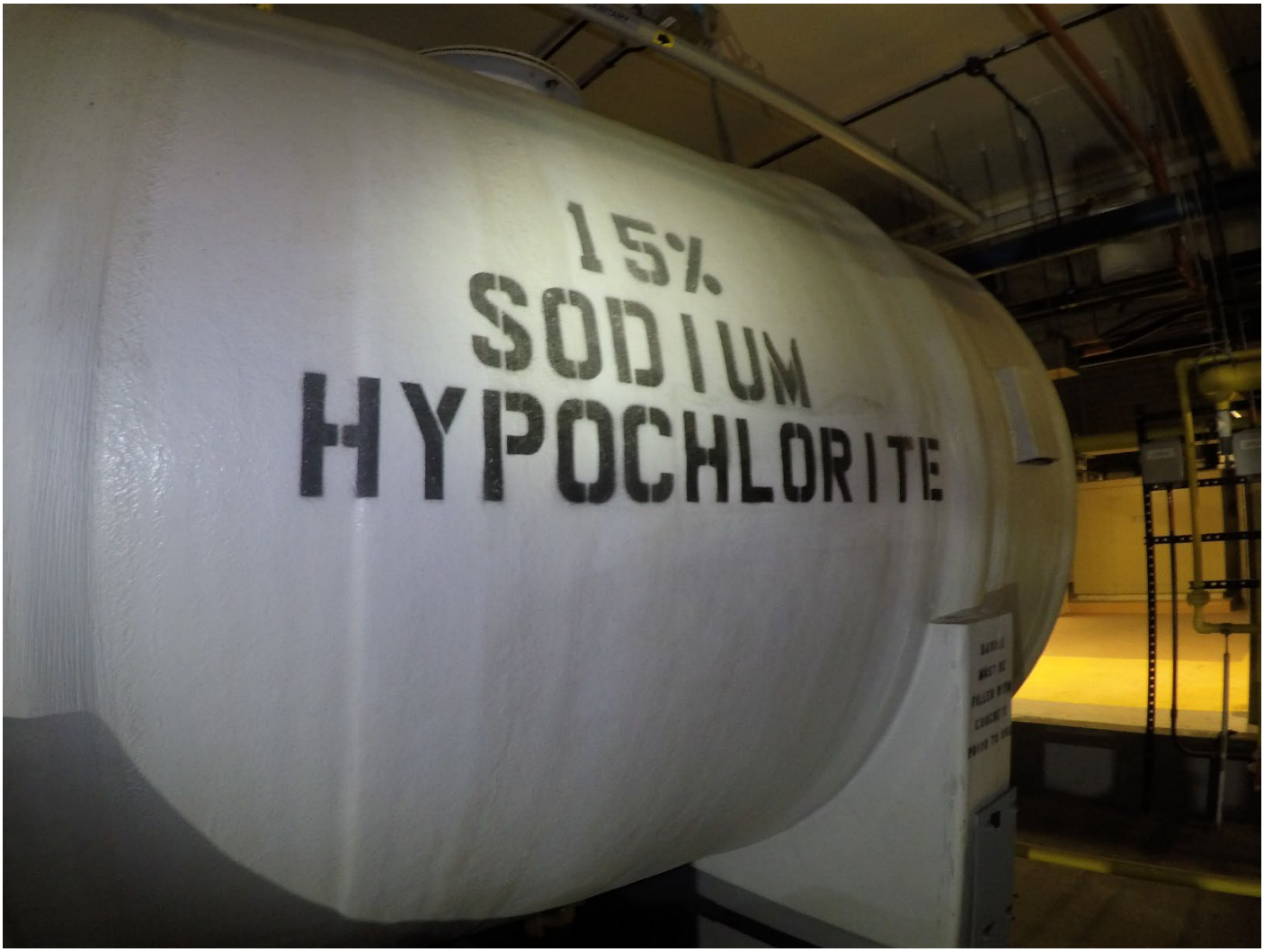
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ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



exterior

INSPECTION REPORT

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ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



Exterior – saddle under shell view ok

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ITEM / SPEC NUMBER: ASME RTP-1, ASTM

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exterior

INSPECTION REPORT

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interior nozzles

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Agitator support bracket in tact

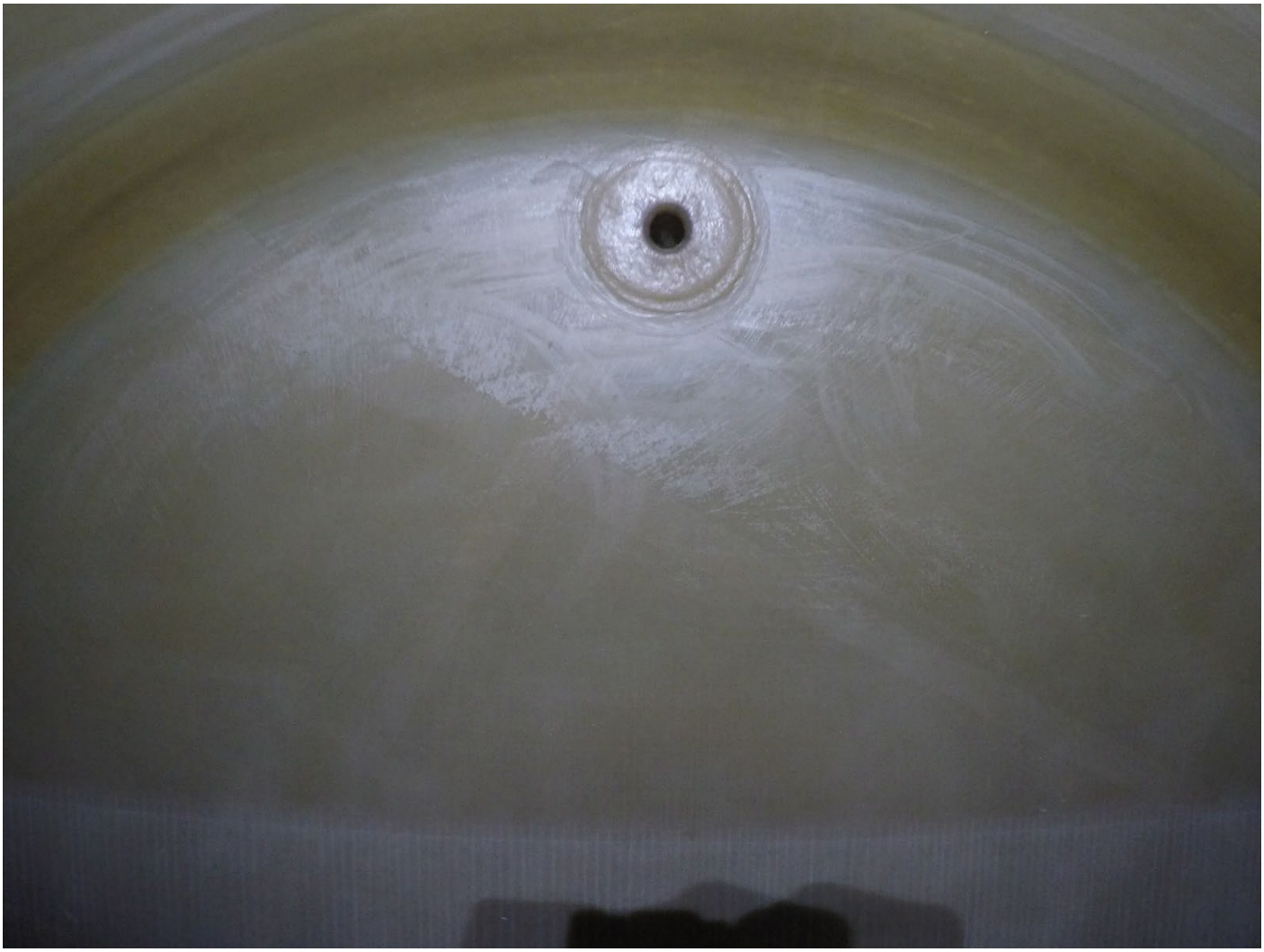
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Left tank head

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INSPECTOR: Steven Hunt



Right tank head

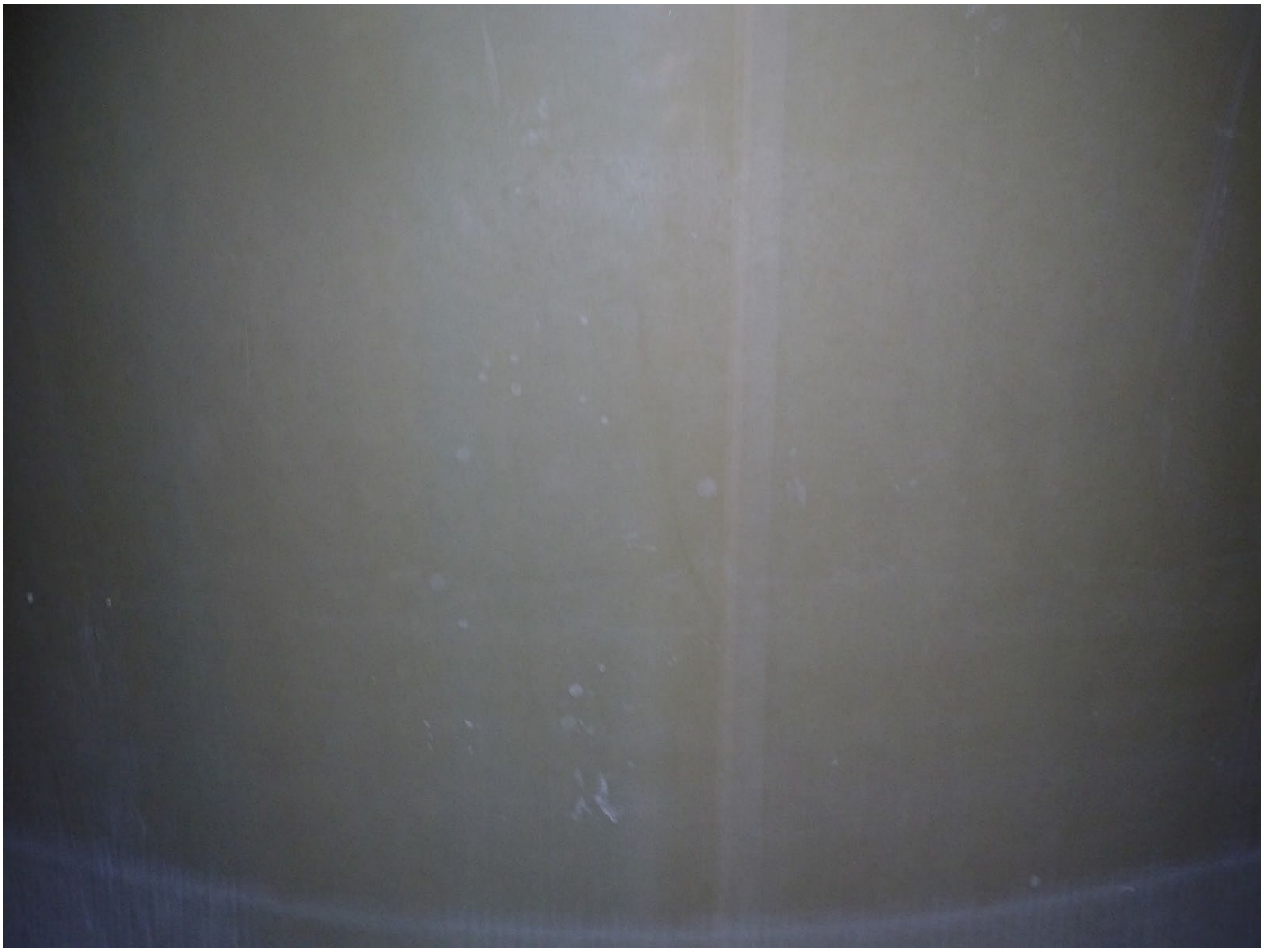
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shell view

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Shell to head joint ok

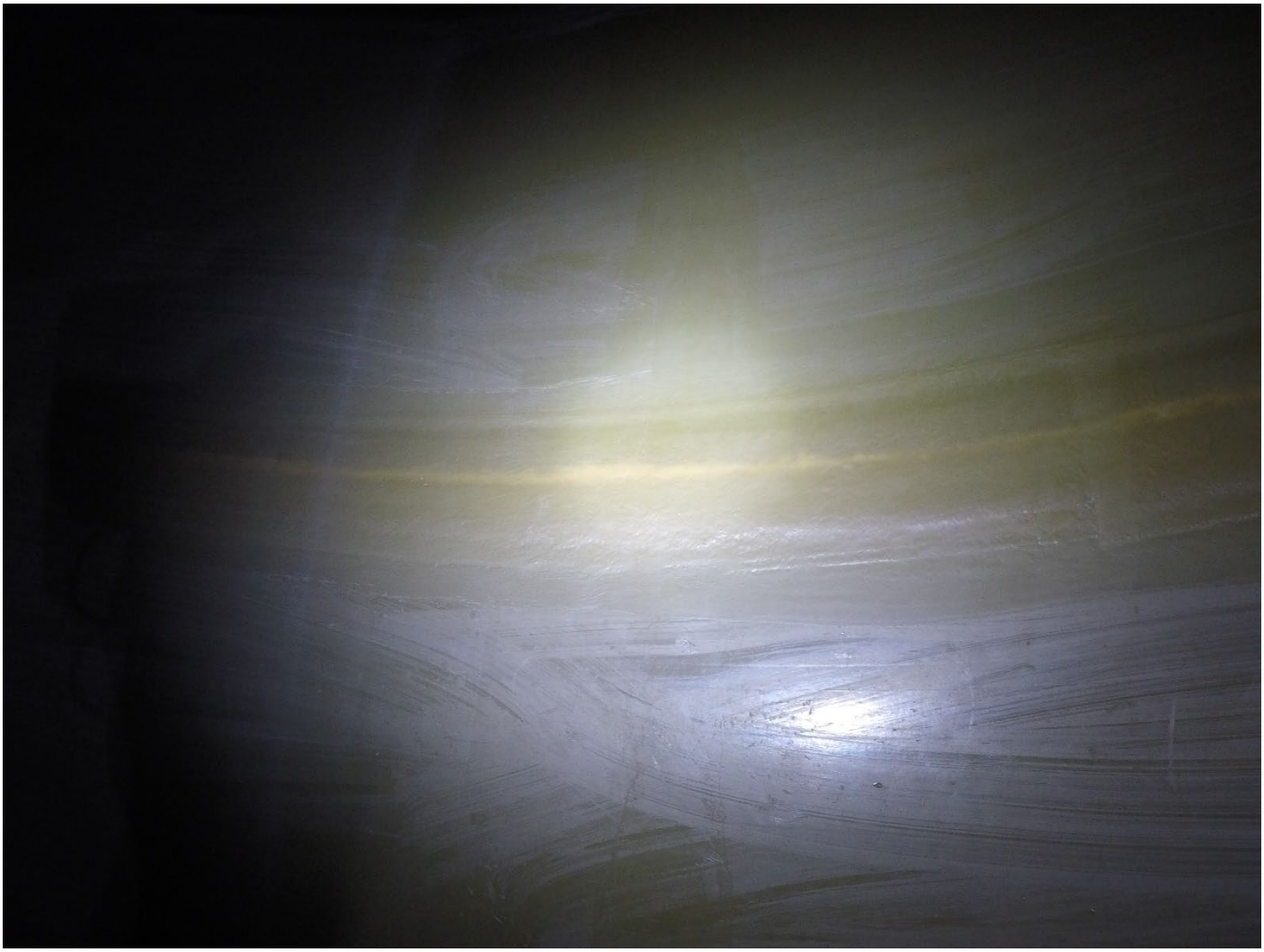
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Shell to shell joint

INSPECTION REPORT

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Shell wall

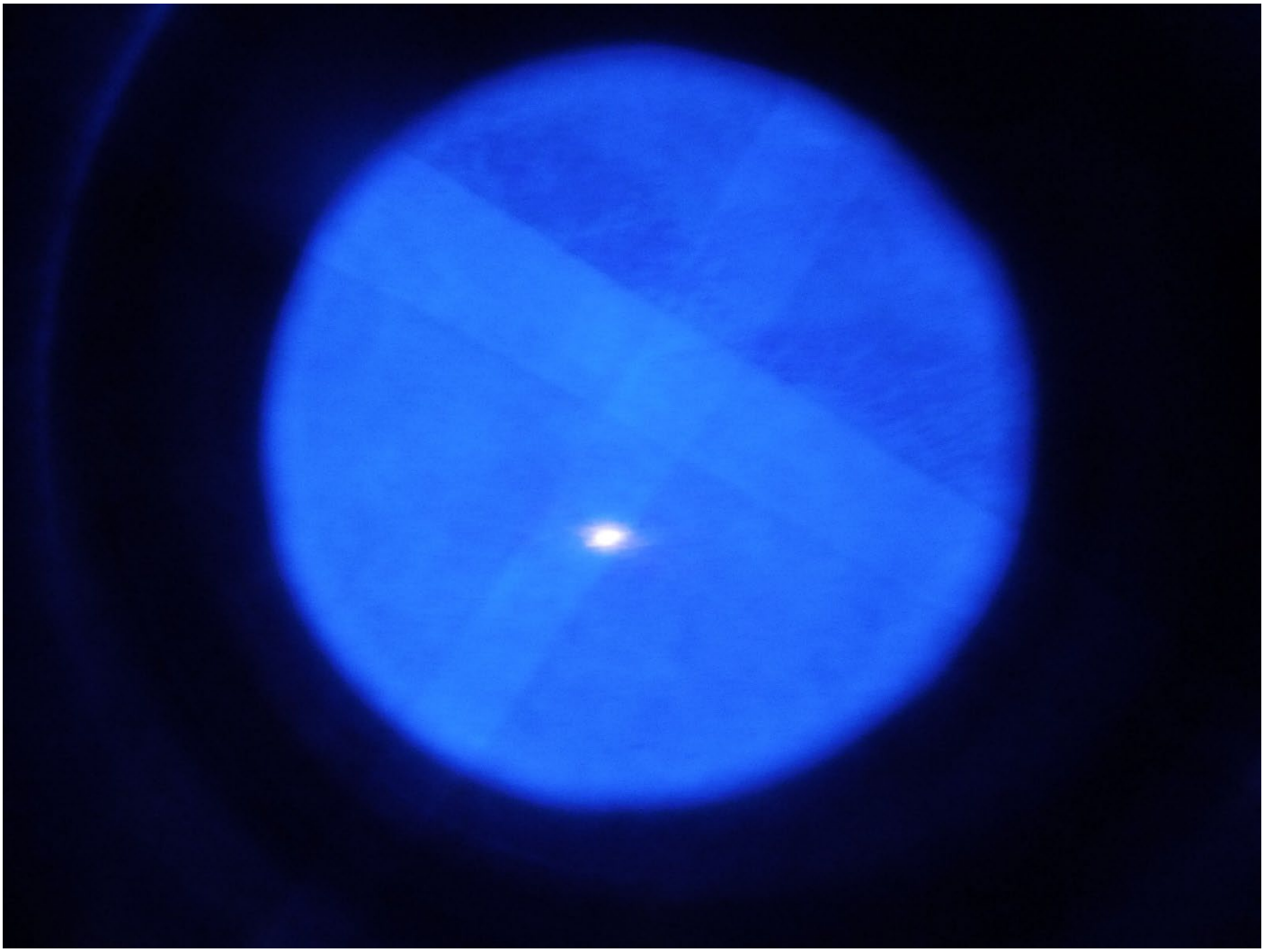
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UV view no issues

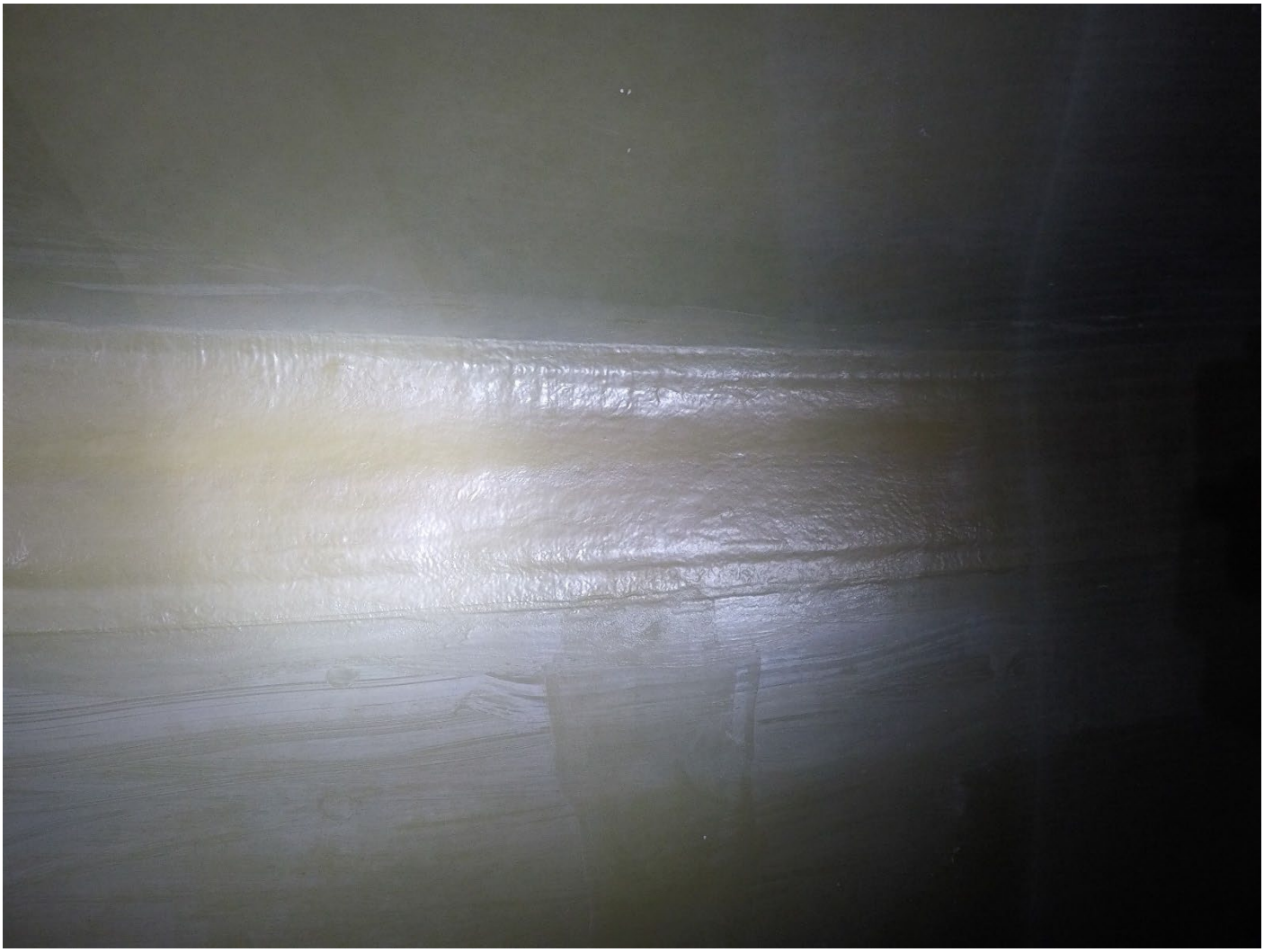
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ITEM / SPEC NUMBER: ASME RTP-1, ASTM

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Shell to shell joint

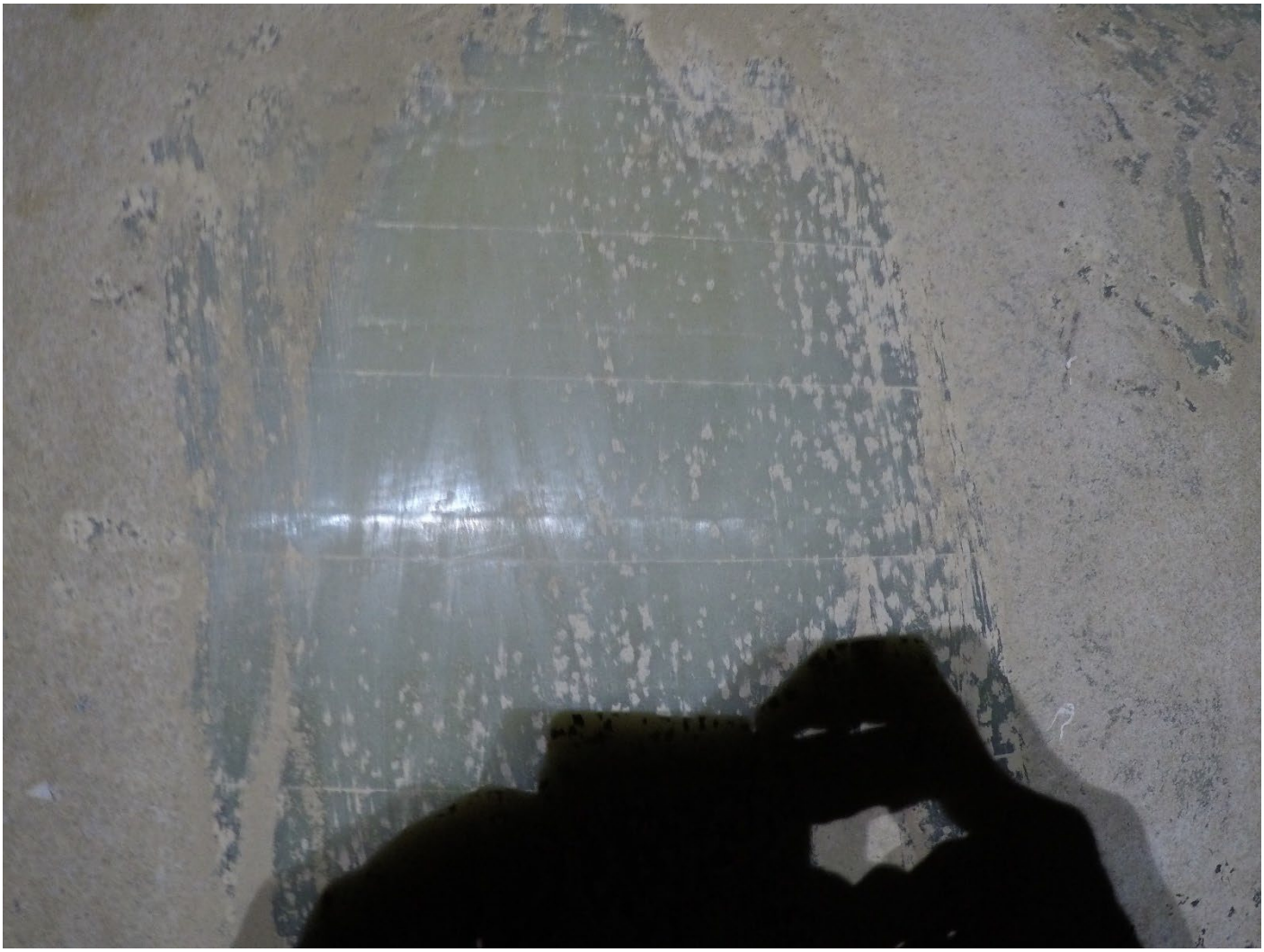
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Tank lower half with sediment removed

INSPECTION REPORT

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INSPECTOR'S SIGNATURE: 	MATERIAL INSPECTED: • FRP Storage Tank- Horizontal

ATTACHMENTS:	COA ☐	Material Logs ☐	Testing Report ☐	Mechanical Test Report ☐
	NCR's ☐	Inspection Checklist ☒	NDT Reports ☐	Other: ☐
ISSUES TO ADDRESS:	• None			

Reference: Inspection of FRP Tank – 4215-07

To Whom it may concern,

The following report will disclose the condition of the FRP equipment as it was at the time of my visit. This report should be added or kept on file to compare with future reports to monitor the vessel activity. While we attempt to discover all flaws, defects may be present that are undetectable by the inspector. These inspections are not an attempt to verify the adequacy of the original design, but rather an inspection of the current condition to suggest the most efficient and cost-effective route for repair or replacement, if needed. See the following inspection summary below.

Thank you for making me part of your inspection team. If you have any questions about this report please feel free to give me a call. I look forward to serving your inspection needs in the future.

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ENCLOSED: (1) INSPECTION REPORT

Fibersurance

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SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt

Outside Temperature	36 º F	Relative Humidity	100 %
Inside Temperature	78° F	Barometer	

Equipment Information:
End user: Flushing Bay CSO Facility
Equipment: Manufacturer: Justin Tanks
Equipment: FRP Storage Tank
Design Pressure: Unlisted
Design Temperature: Unlisted
Weight Empty: Unlisted
Contents: Sodium Hypochlorite
Capacity: 8136 Gallons
Date Mfg.: 2003
Veil: Nexus
Liner Resin: Unknown
Structure Resin: Unknown

PURPOSE OF INSPECTION:

Inspection of current condition to assess suitability for use as these tanks are 20 years old. Located at the Flushing Bay CSO Chemical Storage Area

FINDINGS:

Egress is not ideal with the current arrangement, but manageable. A solid ladder was placed on the exterior to the manway, interior access made via rope ladder with retrieval line connected to the back D ring of safety harness. Rope ladder secured to manway rings. Continuous air monitoring with fresh air blower on hand as well as the SCBA system on hand as needed in case of emergency. There is a factory lifting lug for the tank directly beside the manway. This can easily support dead weight of a person for rescue, as an alternative to more costly options.

Upon inspection of this tank, I have found no defects that would require repair prior to use; per ASTM-D-2563. A number of minor defects that would be outside the scope of ASME RTP-1 Table 6-1, however the tank is suitable to be used as is. From what is visible on each major component (head, shell, bottom), I suspect all of the internals generally meet level 2 visual quality. Resin rich surface is noted, where free of service buildup. There is buildup noted on the lower half of the tank. Some discoloration noted in secondary joints, patches from the factory.

The interior support for the agitator or fill header is misplaced from its holder. See picture below. This should be reset prior to placing this into service

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The fit up of components, material placement and quality of the secondary welds are of acceptable visual quality. There is putty noted in the shell-to-shell joints. Joints overall are at minimum width.

UV scanning performed on tank interior. Nexus coverage is acceptable over visible surface. Nexus overlaps vary in width, but are acceptable.

Barcol hardness readings were taken in random areas. All readings are acceptable with no cause for alarm. No areas noted with service content permeation.

Barcol readings			
Location	**Low reading**	**High Reading**	**Average reading**
L HEAD	27	31	28
SHELL	24	29	27
R HEAD	27	30	28
SECONDARYS	26	31	28

Tank exterior has no areas of concern. Saddles appear to be in tact with no cracking or defects noted.

RECOMMENDATIONS:

Tank can be placed into service immediately. Minor defects noted will not affect service life at this point.

The original drawings should be reviewed, if possible, to ensure the resin and catalyst used for this tank so that when repairs are needed, it is available.

Preventative Maintenance inspections are suggested. For this service, it is typical to have an inspection performed every 2-3 years over the service life. With the age of the fiberglass of this scrubber, it is recommended to inspect annually. Age is 20 years old.

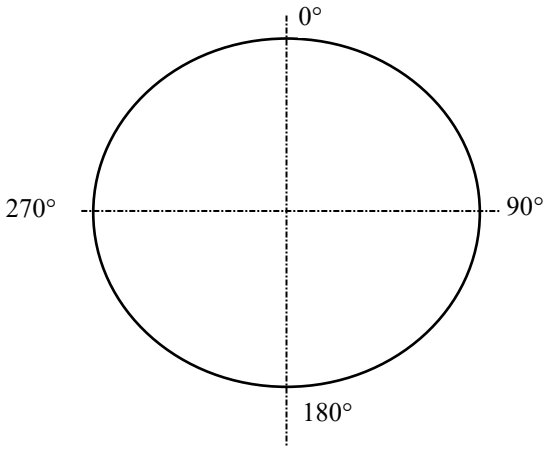
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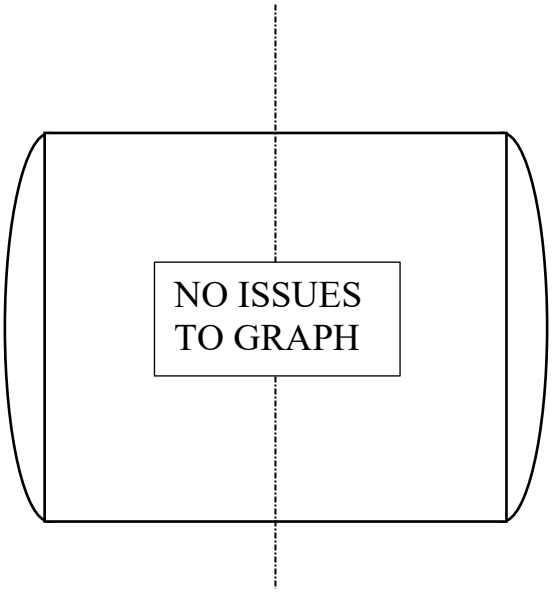
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SUB-VENDOR (if applicable): N/A
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ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



PLAN VIEW



ELEVATION VIEW

TANK OBSERVATIONS LOCATION MAP

TANK NUMBER: 4215-07 **DATE INSPECTED**:
INSPECTOR: STEVE HUNT **LOCATION**:

INSPECTION REPORT

CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

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Tank number

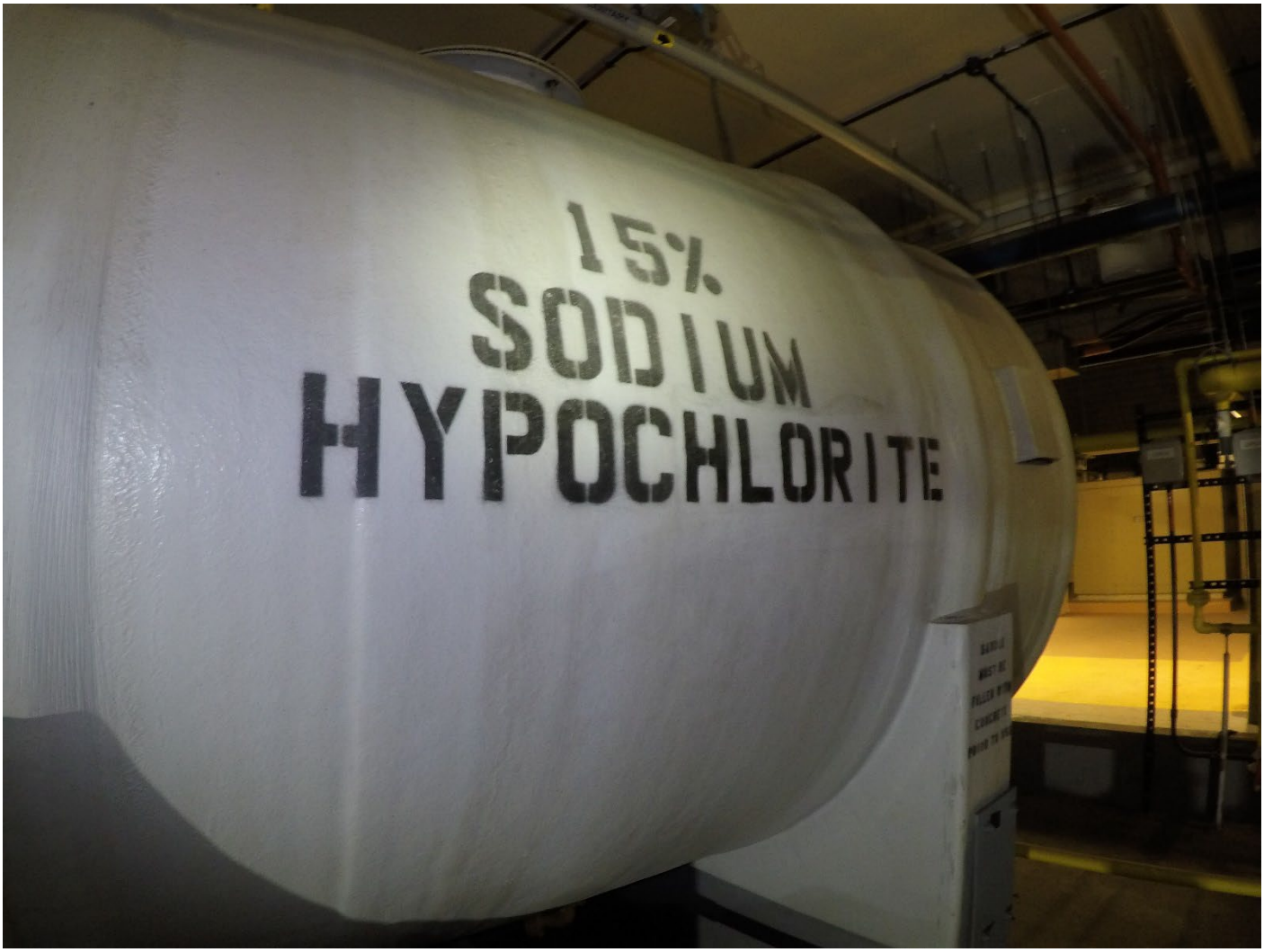
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exterior

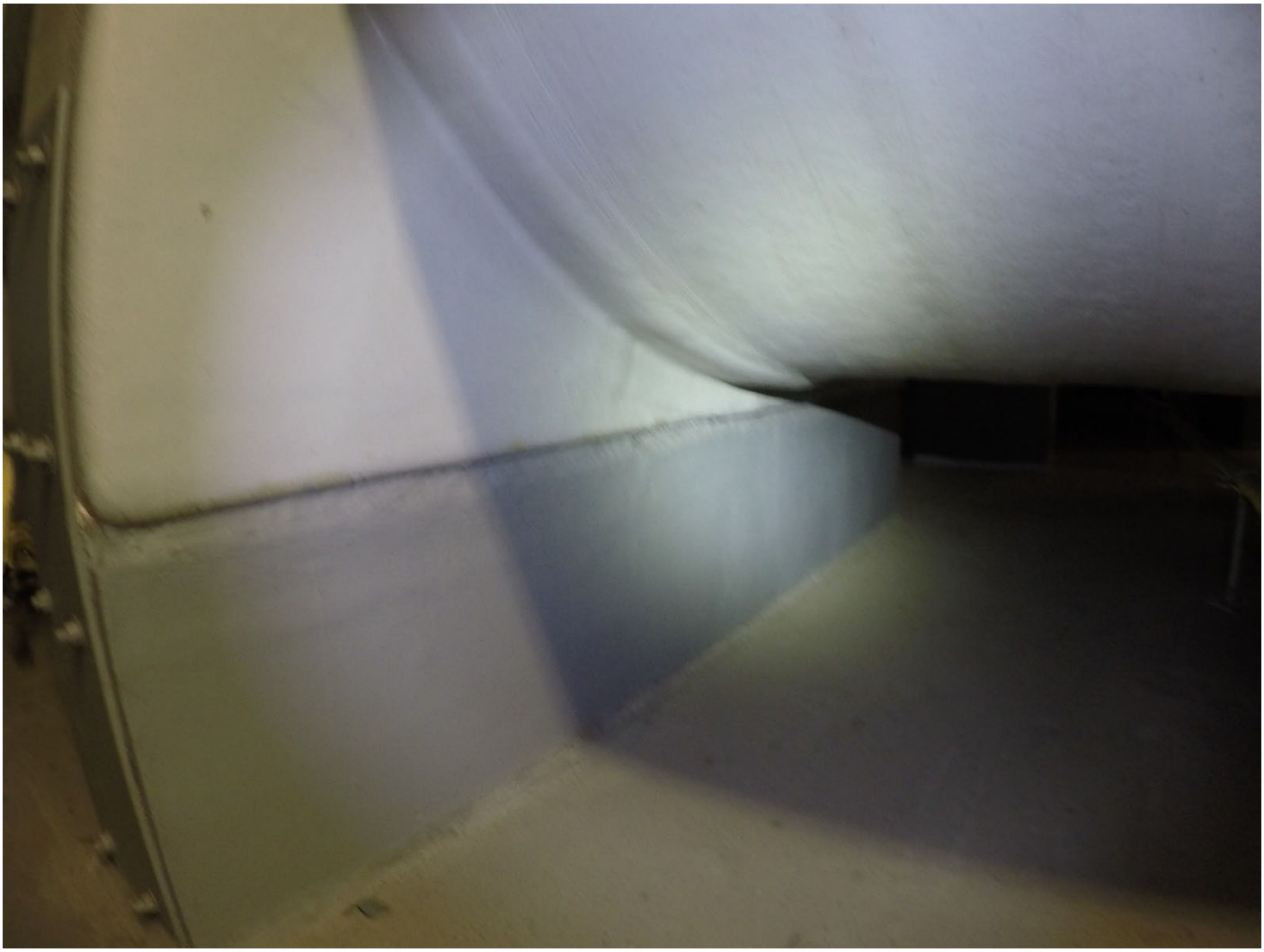
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Exterior – saddle under shell view ok

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exterior

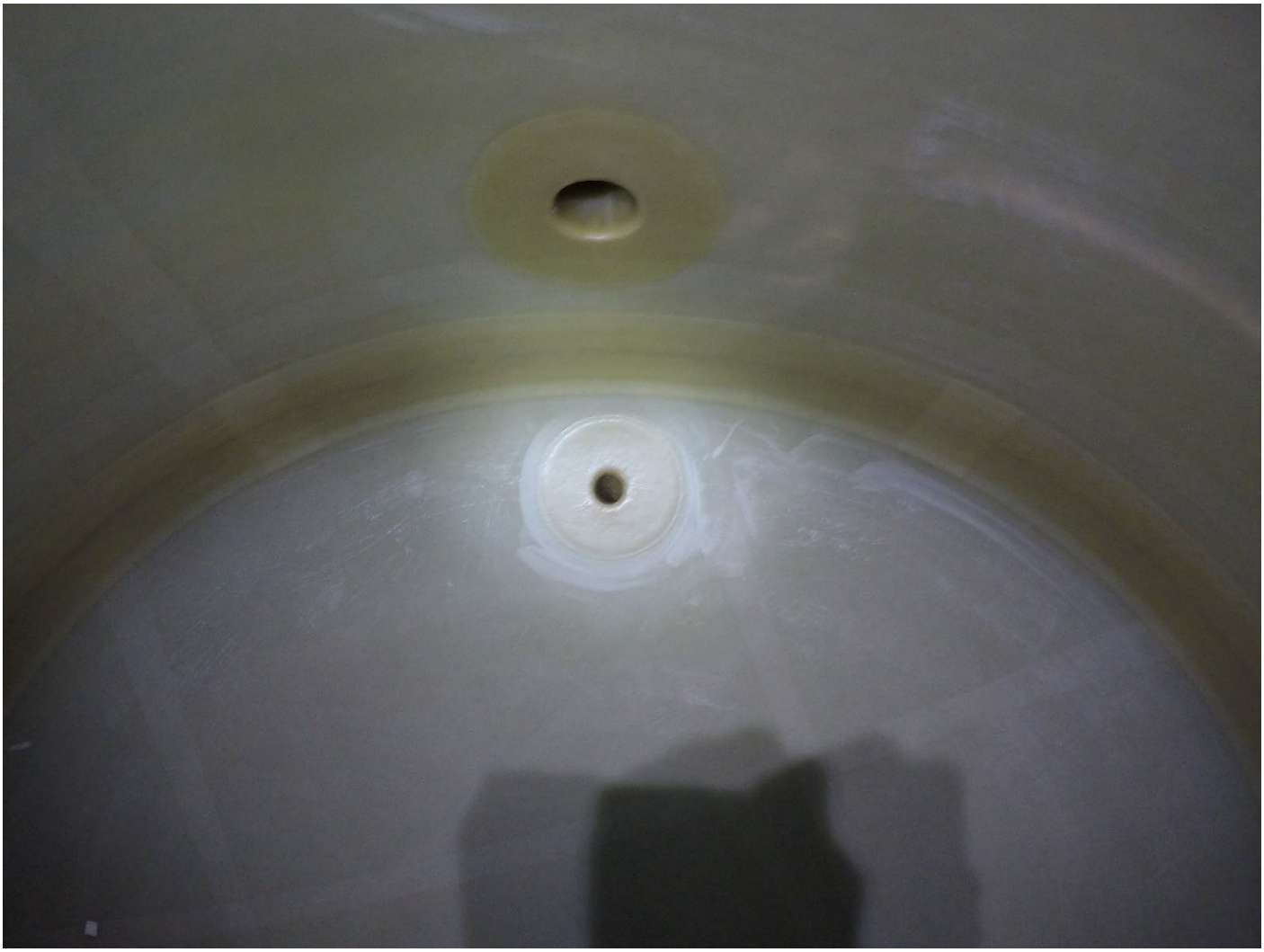
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interior nozzles

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Interior support bracket missed when installing

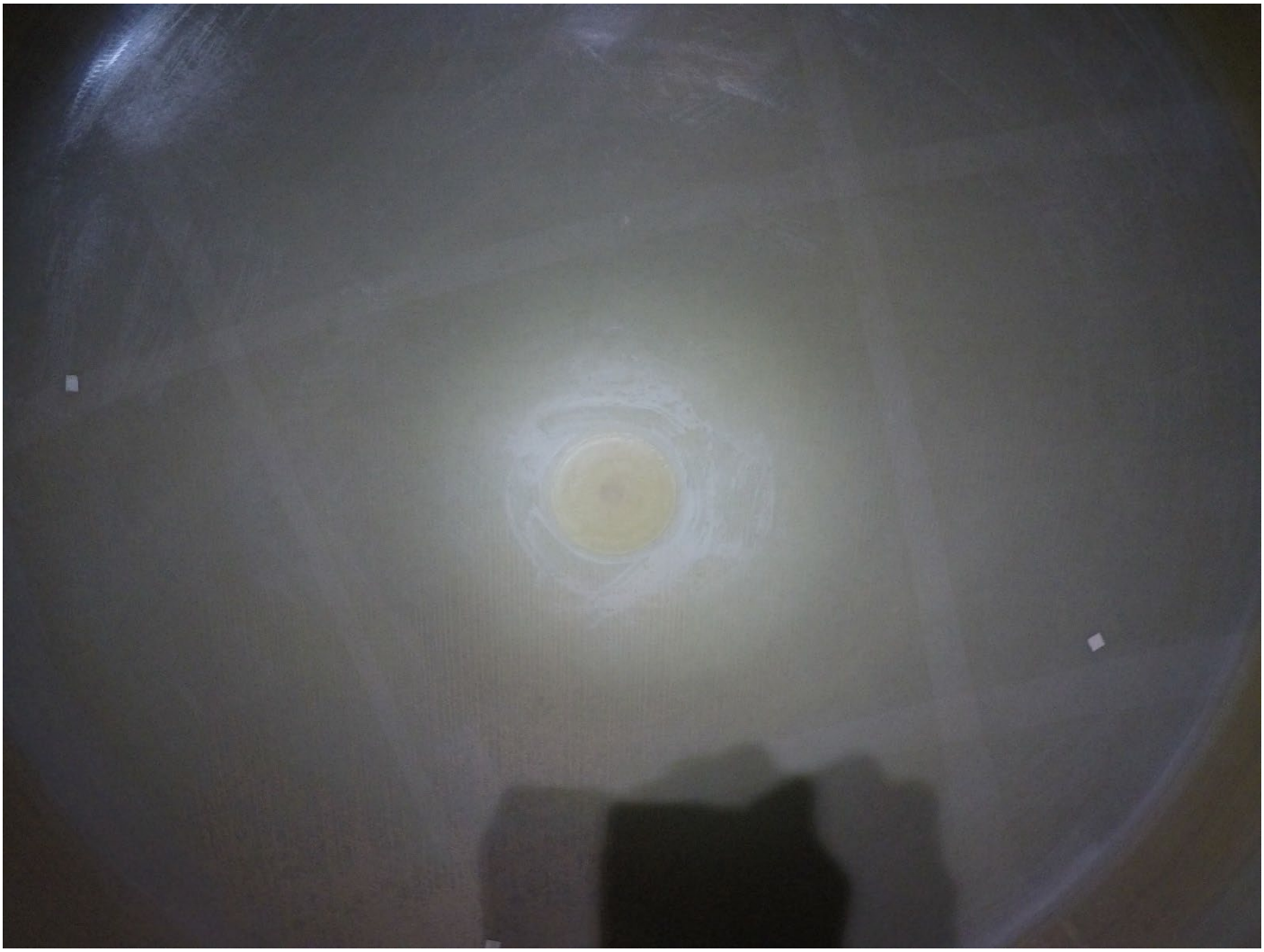
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Left tank head

Fibersurance

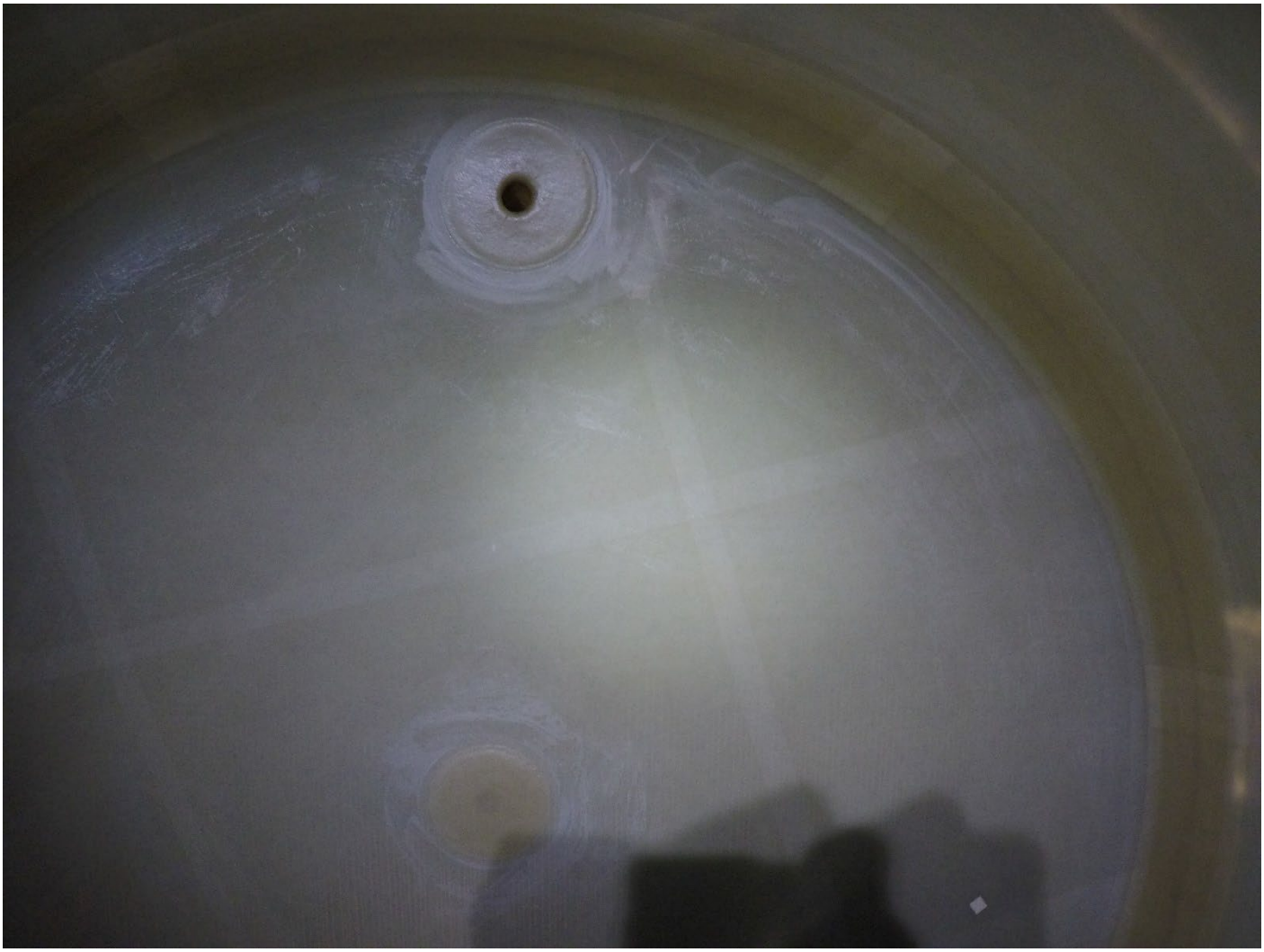
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Right tank head

INSPECTION REPORT

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shell view

INSPECTION REPORT

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Shell to head joint ok

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INSPECTOR: Steven Hunt



Shell to shell joint

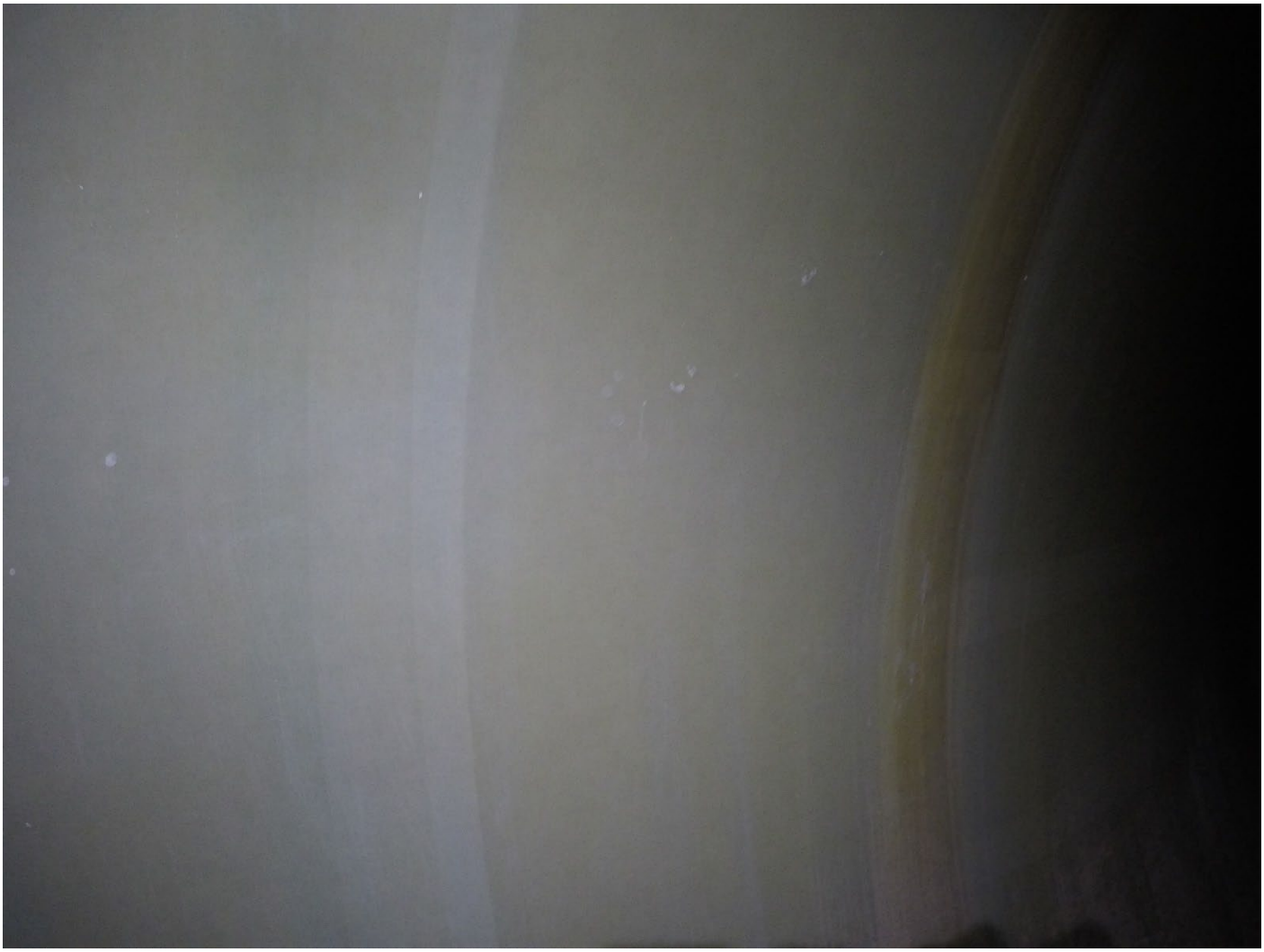
INSPECTION REPORT

CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

VENDOR:
VENDOR CONTACT NAME:
SUB-VENDOR (if applicable): N/A
SUB-VENDOR CONTACT (if applicable): N/A

ITEM / SPEC NUMBER: ASME RTP-1, ASTM

INSPECTOR: Steven Hunt



Shell wall

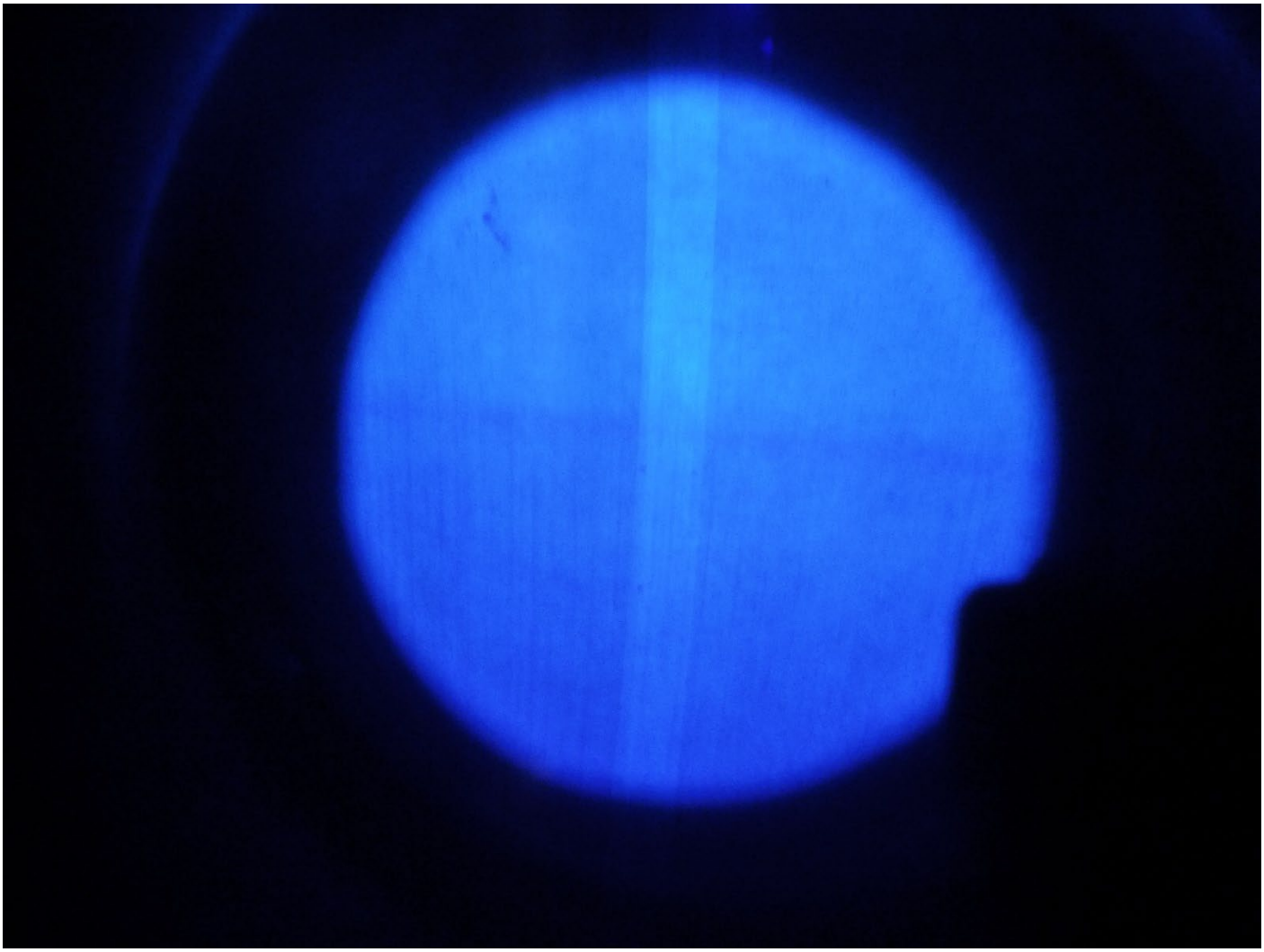
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CLIENT: ARCADIS	PROJECT: CSO-FC-DF-DES	INSPECTION DATE: 01-09-2024

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SUB-VENDOR (if applicable): N/A
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UV view no issues

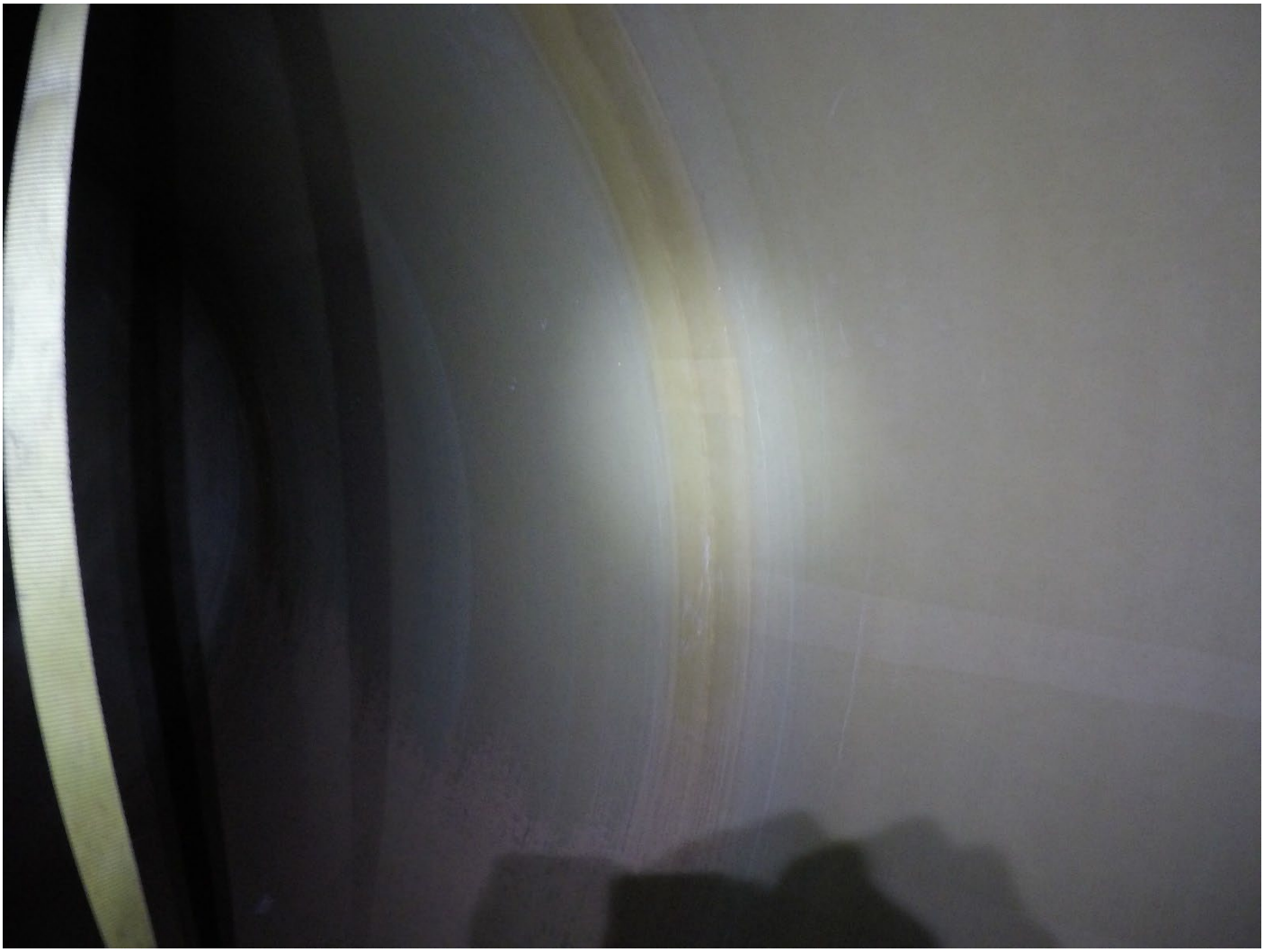
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Shell to shell joint

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Tank overall

INSPECTION REPORT

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THE CITY OF NEW YORK

DEPARTMENT OF

ENVIRONMENTAL PROTECTION

Invitation for Bids for Furnishing all Labor and Material Necessary and Required for:

CSO-FC-DF
CONSTRUCTION OF FLUSHING CREEK CSO DISINFECTION FACILITIES

Volume 2 of 2
Contract Terms and Specifications
(with separate Bid Booklet and Drawings)

AUGUST 2026