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(s): **OB-144A**

Description: **TRC Optimization at the Oakwood Beach Wastewater Recovery Facility**

Volume 3 of 3
Contract Terms and Specifications
(with separate Bid Booklet)

August 2026

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TRC Optimization at the Oakwood Beach
Wastewater Resource Recovery Facility
Borough of Staten Island, New York

VOLUME 3 OF 3

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SECTION 01 11 00 – SUMMARY OF WORK
CONTRACT OB-144A

PART 1 GENERAL

1.01 SUMMARY

A. 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

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. All Contract Documents, including all other specifications sections in the Contract, will apply to this Section.

1.04 REFERENCES

A. Not Used.

1.05 DESCRIPTION

A. Location of Work

1. Work is to be performed under this Contract at the Oakwood Beach Wastewater Resource Recovery Facility (WRRF) (the "Site").

a. The Site is in the Oakwood Beach area of the Borough of Staten Island at 683 Mill Road, Staten Island, NY 10306 and is bounded to the north by the Mill Road, to the south by the Great Kills Park, to the east by the Lower New York Bay, and to the west by the Delwit Avenue and Mill Road.

b. Access to the Site will be from Mill Road, at the intersection with Delwit Avenue.

B. Work Included in the Contract.

1. Contract Name: OB-144A - TRC Optimization at The Oakwood Beach WRRF.

2. Work Description: The Work includes all structural, mechanical, electrical, and instrumentation work for upgrades to the existing chlorination facilities at the Oakwood Beach WRRF. The following is a general description of Work only and shall not be construed as a complete description of the Work to be performed.

3. Chlorine Contact Tank (CCT) Modifications:

a. Remove old weirs and block openings in Landside (LS) CCT to prevent spillage into LS CCT while Seaside (SS) CCT is in use.

b. Relocation of pass windows, filling in of void spaces and demolition of non-structural walls/columns in LS CCT that may impede uniform flow.

c. Remove Parshall Flume and its influent sluice gate in LS CCT that may impede uniform flow.

d. Fill Cross Collector pit in LS CCT.

e. Remove tank drain sluice gates and replace them with mud valves, operators, and stems in LS CCT.

f. Replace mud valves, operators, and stems in SS CCT.

g. Restore expansion joints.

h. Various concrete repair and rehabilitation work.

4. Miscellaneous Improvements:

   a. Replace a 36”x36” slide gate and motorized actuators and a 24” butterfly valve and motorized actuator for the suction piping leading to effluent water system. Turn over the existing motorized actuator of 36”x36” slide gate to the DEP.

   b. Replace four (4) 84”x60” CCT influent sluice gates and motorized actuators with four (4) slide gates and motorized actuators of same size.

   c. Replace two (2) sodium hypochlorite transfer pumps and a sump pump in the Meter Building.

   d. Repair and replacement of effluent channel weirs, windows, and slide gates.

   e. Install a 6” potable water line and valve connecting RPZ-1 and RPZ-2 potable water loop.

5. Instrumentation and Controls to Optimize Total Residual Chlorine (TRC):

   a. Provide and install two (2) colorimetric TRC analyzers, electrical conduits & wires, two (2) sampling pumps and a weather controlled enclosure to house the analyzers. One (1) sampling pump installed in the common influent channel and the other in common effluent channel.

   b. Provide and install two (2) level sensors and electrical conduits & wires at the effluent weir of the Seaside (SS) and Landside (LS) Chlorine Contact Tanks (CCTs).

   c. Provide and install two (2) TSS sensors, electrical conduits & wires. One (1) sensor installed in the common influent channel and the other in common effluent channel.

   d. Provide and install electrical conduits & wires for four (4) existing amperometric TRC analyzers located at the influent and effluent of the SS and LS CCT.

   e. Provide and install Programmable Logic Controller (PLC) for chlorination main control panel.

   f. Provide and install Human-Machine Interface (HMI) and mount on the main control panel.

g. Provide and install control conduit and wiring for communication between new and existing field instruments/control panels to new chlorination main control panel.

h. Provide and install uninterruptible Power Supply (UPS) System for dosing equipment, controller and instrumentation.

i. Integration of automatic dosing controls with multiple dosing scenarios (flow pace, and flow pace with influent/effluent residual trim, and operator selectable). Flow signal for logic can be plant influent flow or CCT effluent flow, and operator selectable.

j. Chlorine Building modification resulting from integration of chlorination control.

k. Replace existing 5 hp induction mixer with a 10 hp mixer of the same type and shall be suited for the existing slide brackets and side rails.

C. Other Construction Contracts

1. Contract in Progress: The following contract is scheduled to be in progress on the starting date of the Contract:

Contract No.	Contract Name
OB-135	Headworks Improvements at Oakwood Beach WWTP

2. Contracts to be Started: The following contracts are scheduled to be started while this Contract is in progress:

Contract No.	Contract Name
OB-133	Sludge Thickening Improvements at Oakwood Beach WWTP
OB-134	Electrical Distribution Improvements at Oakwood Beach WWTP
OB-136	Oakwood Beach WWTP EQ-2022 Upgrades Project

3. The Contractor shall coordinate its Work with the prime contractors for the contracts listed above.

4. For contracts in progress, drawings, specifications and schedules will be available upon request.

5. For contracts to be started while this Project is in progress, the contract documents, when completed for bidding purposes, will be available for inspection by the Contractor upon request.

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 upon request. Access to the site for inspection purposes prior to bidding will only be on the date advertised for the pre-bid tour. The Contractor is cautioned that the available drawings may differ from what actually exists at the site. Therefore, all pertinent data and dimensions shall be field verified by the Contractor.

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. Geotechnical Investigation Report for the Construction of Dechlorination Facilities at the Owls Head and Oakwood Beach WWTPs, Contract OB-144, May 2018. Prepared by Matrix New World Engineering.

   b. Design of Dechlorination Facility at Oakwood Beach Wastewater Treatment Plant, Task 2.5e – Soil and Groundwater Sampling and Analysis Data Interpretive Report, June 15, 2018.

   c. Oakwood Beach Hazards Mitigation Report, Contract EE-RRC-DES-2, May 17, 2019. Prepared by Matrix New World Engineering.

   d. Radiation Scoping Surveys in Support of the Installation of New Fire Loop, Contract No. OB-144, July 8, 2024. Prepared by AECOM.

   e. Oakwood Beach Hazardous Materials Investigation, Contract OB-144A, September 2025. Prepared by ENTECH.

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.

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. 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. Datum Plane

1. All elevations indicated or specified refer to the site datum plane of NAVD 88.

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 OB-144A

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Normal Project Working Hours
2. Emission Control Technology for Non-Road Vehicles
3. Vehicle Idling Time
4. Compliance with Quality of Life Requirements
5. Bureau of Wastewater Treatment Checklists for Bulk Storage Tanks
6. City Fleet and Truck Safety
7. Environmentally Friendly Oils and Anti-Freeze

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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). 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.
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 H ours, 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. 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.

C. 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.

D. 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.

E. 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.

F. 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.

G. 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. On, or adjacent to, a reservoir, wetlands, streams, rivers, brooks, ponds, or other waterbody.

b. Adjacent to any storm water collection system.

c. 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. Chlorine Contact Tank (CCT) Shutdowns
    1. Each CCT shutdown shall be coordinated with plant operations.
    2. Only one CCT shall be shut down at a time.
    3. Seasonal limitations on CCT shutdowns:
        a. From April 1 through November 30, each CCT shutdown shall not exceed 60 days.
        b. From December 1 through March 31, each CCT shutdown shall not exceed 90 days.

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

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.

Page 1 of 2

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.**

Page 2 of 2

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 24 10 – VALUE ENGINEERING
CONTRACT OB-144A

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. Water/wastewater treatment process

   b. Plant or 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 OB-144A

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-3d)

3. Allowances (Contract Item A-1)

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:

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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 Temporary Barriers and Enclosures per Section 01 56 00 - Temporary Barriers and Enclosures.

5) Removals of the project information panel and its supports per Section 01 58 13 - Temporary Project Signage.

6) Final Cleaning per Section 01 74 17 - Cleaning and Site Maintenance.

7) Providing all Operations and Manuals as required under this Contract per Section 01 78 25 – Operation and Maintenance Manuals.

8) 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-3d have been provided on the Bid Schedule as unit prices for the Contract.

   a. Payment under Contract Items UP-1 through UP-3d 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 – Sampling and Testing of In-Situ Material

   a. Description: Under Contract Item UP-1, the Contractor shall perform sampling and analysis of in-situ material in accordance with Specification 02 24 20 – Soil Sampling and Analysis.

   b. Measurement for Payment: Under Contract Item UP-1, the Contractor shall be paid per sample collected and analyzed as specified in the Contract Documents and as ordered by the Engineer. The unit price per sample bid shall include all Work required to conduct sampling in conformance with the approved Field Sampling Plan (FSP) and to conduct laboratory analyses of the sample, which shall include all labor, material, equipment, and permits necessary to obtain and retrieve in-situ soil samples, to perform QA, data validation, and to meet all other requirements of Specification 02 24 20. Under this Item, the Contractor shall not be paid for the development of the FSP, the EH&S Drilling and Boring Checklist, and the Field Sampling Summary Report, which shall be included in the Contractor's lump sum bid items.

3. Contract Item UP-2a - Concrete Rehabilitation in Chlorine Contact Tanks and Parshall Flume – Crack Repair ≤ 1/8" width

   a. Description: Under Contract Item UP-2a, the Contractor shall use mortar or epoxy to perform concrete crack rehabilitation in the chlorine contact tanks (CCTs) and Parshall Flume for all cracks ≤

1/8" width in accordance with Specification 03 01 30.71 - Rehabilitation of Cast-In-Place Concrete.

b. Measurement for Payment: Under Contract Item UP-2a, the Contractor shall be paid per linear foot of concrete crack repair performed as directed by the Engineer and in accordance with the Contract Drawings and Specifications.

c. Contractor shall refer to the Contract Drawings, "Concrete Repair Type 5 Detail" for direction on repairs.

d. Crack Repair: The quantities in linear feet to be measured for payment shall be the actual length of cracks repaired by the methods and materials specified under:

1) Structural crack repair.

2) Epoxy crack repair.

3) Flexible polyurethane crack repair.

4) Rigid polyurethane crack repair.

4. Contract Item UP-2b - Concrete Rehabilitation in Chlorine Contact Tanks and Parshall Flume – Crack Repair > 1/8" width

a. Description: Under Contract Item UP-2b, the Contractor shall use mortar or epoxy to perform concrete crack rehabilitation in the CCTs and Parshall Flume for all cracks > 1/8" width in accordance with Specification 03 01 30.71 - Rehabilitation of Cast-In-Place Concrete.

b. Measurement for Payment: Under Contract Item UP-2b, the Contractor shall be paid per linear foot of concrete crack repair performed as directed by the Engineer and in accordance with the Contract Drawings and Specifications.

c. Contractor shall refer to the Contract Drawings, "Concrete Repair Type 4 Detail" for direction on repairs.

d. Crack Repair: The quantities in linear feet to be measured for payment shall be the actual length of cracks repaired by the methods and materials specified under:

1) Structural crack repair.

2) Epoxy crack repair.

3) Flexible polyurethane crack repair.

4) Rigid polyurethane crack repair.

5. Contract Item UP-2c - Concrete Rehabilitation in Chlorine Contact Tanks and Parshall Flume – Spall Repair ≤ 1" depth

a. Description: Under Contract Item UP-2c, the Contractor shall use mortar or epoxy to perform rehabilitation of concrete spalls in the CCTs and Parshall Flume that measure one inch or less in depth, in accordance with Specification 03 01 30.71 - Rehabilitation of Cast-In-Place Concrete.

b. Measurement for Payment: Under Contract Item UP-2c, the Contractor shall be paid per square foot for the rehabilitation of concrete spalls measuring one inch or less in depth, as directed by the Engineer and in accordance with the Contract Drawings and Specifications.

c. Contractor shall refer to the Contract Drawings, "Concrete Repair Type 1 Detail" for direction on repairs.

6. Contract Item UP-2d - Concrete Rehabilitation in Chlorine Contact Tanks and Parshall Flume – Spall Repair 1" – 3" depth

a. Description: Under Contract Item UP-2d, the Contractor shall use mortar or epoxy to perform rehabilitation of concrete spalls in the CCTs and Parshall Flume that measure between 1" and 3" in depth, in accordance with Specification 03 01 30.71 - Rehabilitation of Cast-In-Place Concrete.

b. Measurement for Payment: Under Contract Item UP-2d, the Contractor shall be paid per square foot for the rehabilitation of concrete spalls measuring between 1" and 3" in depth, as directed by the Engineer and in accordance with the Contract Drawings and Specifications.

c. Contractor shall refer to the Contract Drawings, "Concrete Repair Type 2 Detail" for direction on repairs.

7. Contract Item UP-2e - Concrete Rehabilitation in Chlorine Contact Tanks and Parshall Flume – Spall Repair 3" or greater

a. Description: Under Contract Item UP-2e, the Contractor shall use mortar or epoxy to perform rehabilitation of concrete spalls in the CCTs and Parshall Flume that measure 3" or greater in depth, in accordance with Specification 03 01 30.71 - Rehabilitation of Cast-In-Place Concrete.

b. Measurement for Payment: Under Contract Item UP-2e, the Contractor shall be paid per square foot for the rehabilitation of concrete spalls measuring 3" or greater in depth, as directed by the Engineer and in accordance with the Contract Drawings and Specifications.

c. Contractor shall refer to the Contract Drawings, "Concrete Repair Type Detail" for direction on repairs.

8. Contract Item UP-2f - Concrete Rehabilitation in Chlorine Contact Tanks and Parshall Flume – Foam Sealant

   a. Description: Under Contract Item UP-2f, the Contractor shall use hydroactive foam sealant to perform concrete rehabilitation in the CCTs and Parshall Flume in accordance with Specification 03 01 30.71 - Rehabilitation of Cast-In-Place Concrete.

   b. Measurement for Payment: Under Contract Item UP-2f, the Contractor shall be paid per linear foot of hydroactive foam sealant installed, as directed by the Engineer and in accordance with the Contract Drawings and Specifications.

9. Contract Item UP-3a - Water Main Connection – 6" Diameter Pipe (DI) Water Main and Restrained Joint

   a. Description: Under Contract Item UP-3a, the Contractor shall furnish and install a 6-inch diameter ductile iron restrained joint water main connecting two points in the existing WWRF fire loop, in accordance with the Contract Documents.

   b. The pipe shall be measured from the centerline of the beginning of the pipe to the centerline of the end of the pipe without deductions for connecting tees, fittings or other appurtenances along the alignment. The price per linear foot shall include all labor and equipment for: placement and maintenance of soil erosion and sediment controls measures; sawcutting, removal and disposal of asphalt/concrete; clearing and grubbing, trench excavation (excluding rock excavation, boulder removal) up to 6-ft depth; incidental restoration of curbs and sidewalks (to the nearest joint on each side); lawn restoration; exploratory excavation (potholing); utility protection/supports, and reconnection of utility services; furnishing and installing all specified bedding and backfill, including temporary storage, testing, drying and re-handling of material; dewatering regardless of means and methods; sheeting and shoring, or use of trench box; joints and jointing materials; compaction and compaction testing; testing of failed trenches; pressure testing; labor, equipment and other materials required for flushing, testing and disinfection; draining, cutting and capping of existing mains, and associated coordination including maintenance and protection of traffic; and other work and appurtenances required for the correct installation and operation of the water main in conformance with the specifications. The minimum width and depth of the pipe trench shall be as specified. All costs to complete the water main connection installation are included in the unit price per linear foot of water main, regardless of whether the Contractor uses sloped sides or shoring and sheeting when excavating the pipe trench. Payment under Contract Item UP-3a includes the installation of any necessary fittings for the installation of a 6-inch diameter

ductile iron restrained joint water main. The Contractor shall anticipate the need for field adjustments to the alignment, both horizontal and vertical, and maintain sufficient quantities of fittings on site.

c. Measurement for Payment: Payment under Contract Item UP-3a, the Contractor shall be paid per linear foot for the 6-inch restrained joint ductile iron water main connection, complete in place, in accordance with the Contract Drawings and Specifications.

10. Contract Item UP-3b - Water Main Connection – 6" Gate Valve and Valve Box

a. Description: Under Contract Item UP-3b, the Contractor shall furnish and install a 6-inch gate valve and valve box in accordance with the Contract Drawings and Specifications.

b. Measurement and Payment: Under Contract Item UP-3b, the Contractor shall be paid per gate valve and valve box installed.

11. Contract Item UP-3c - Water Main Connection – Temporary Paving

a. Description: Under Contract Item UP-3c, the Contractor shall furnish and install 6" crushed stone base course and 6" asphalt base course as directed by the Engineer or City in accordance with the Contract Drawings and Specifications.

b. The Contractor will not be paid multiple times under this Item to install temporary pavement in the same area for different activities. That is, if the trench has been paved, the Contractor will not be paid for any other activities that disturb the same area, requiring additional temporary paving.

c. Payment under Contract Item UP-3c does not include final paving inside of the WRRF property.

d. Payment under Contract Item UP-3c includes all associated costs for maintenance and protection of traffic inside the WRRF property during temporary paving.

e. Measurement and Payment: Under Contract Item UP-3c, the Contractor shall be paid per square feet of temporary paved trench as directed by the Engineer or City. For purposes of measurement for payment under this payment item, the linear foot of the temporary pavement is defined as the linear foot of the 6" Water Main Connection as indicated on the Contract Drawings as the appropriate length of trench where paving is required (500 LF). The linear foot shall be measured for the 6" Water Main Connection pipe from the centerline of the beginning of the pipe to the centerline of the end of the pipe without deductions for connecting tees, fittings or other appurtenances along the alignment. The payment limit for

temporary pavement width shall be 2.5 ft center to the 6" Water Main Connection Pipe.

12. Contract Item UP-3d Water Main Connection – Final Paving – Mill and Overlay

a. Description: Under Contract Item UP-3d, the Contractor shall mill the existing surface and furnish and install paving material inside of the WRRF property, as directed by the Engineer or City in accordance with the Contract Drawings and Specifications.

b. This pay item shall include all costs related to this Work including but not limited to milling, removal of asphalt, new asphalt surface, striping, and other necessary appurtenances. The Contractor is responsible for phasing Work associated with Final Paving.

c. Payment under Contract Item UP-3d does not include final pavement restoration in locations where the fire loop water main passes through areas that are to be restored under other payment items.

d. Payment under Contract Item UP-3d includes all associated costs for maintenance and protection of traffic inside the WRRF property during final paving.

e. Measurement for Payment: Under Contract Item UP-3d, the Contractor shall be paid per square feet of milling and overlay inside of the WRRF property. For purposes of measurement for payment under this payment item, the linear foot of the temporary pavement is defined as the linear foot of the 6" Water Main Connection as indicated on the Contract Drawings as the appropriate length of trench where paving is required (500 LF). The linear foot shall be measured for the 6" Water Main Connection pipe from the centerline of the beginning of the pipe to the centerline of the end of the pipe without deductions for connecting tees, fittings or other appurtenances along the alignment. The payment limit for final pavement width shall be 4.5 ft center to the 6" Water Main Connection Pipe.

C. Allowances

1. Allowance Contract Item A-1

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. 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 Material Remediation.

   a. Description: Unforeseen hazardous material remediation, as described in Specification 01 35 45 – Hazardous Materials Control, 02 82 05 – Asbestos Management, 02 84 10 – Mercury Management, 02 83 05 – Lead Management, and 02 84 05 – PCB Management.

   b. Payment: Payment for unforeseen hazardous material remediation constitutes full compensation including but not limited to all labor, materials, equipment, personal protective equipment (PPE), hazard communication, air monitoring, sampling, testing, transport, and disposal fees, excluding sampling and testing covered under UP-1. Payment applications shall include but not limited to copies of chain-of-custody records, hazardous waste manifests, certified weight tickets, and disposal facility receipts.

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 OB-144A

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:

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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 TRC Consent Order

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 OB-144A is subject to: the Second and Thirds Modified Orders on Consent for Total Residual Chlorine (TRC) DEC File No. R2-20120604-312, dated June 30, 2022 and October 8, 2024; Approval of Basis of Design Report: Oakwood Beach Total Residual Chlorine Optimization (Project OB-144A), dated March 2023, between New York City Environmental Protection and New York State Department of Environmental Conservation; and any amendments or modifications thereto. Within the Consent Judgment, a State-mandated milestone date exists for completion of Construction Completion by July 31, 2030.

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. Not Used.

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 OB-144A

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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1.09	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	Installation	4
3.03	Field Testing / Quality Control	4
3.04	Startup / Demonstration	4
3.05	Adjusting / Protection / Cleanup	4

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

NO TEXT ON THIS PAGE

TABLE 1
PRELIMINARY SCHEDULE OF VALUES
(Major Work Results)

I. CONTRACT OB-144A

1. LS-1 Mobilization
2. LS-2 Work Result
    a. Area/Process/Location
        i. Site Construction (Division 02) to Process Gas and Liquid Handling, Purifications, and Storage Equipment (Division 43) as required
3. LS-3 De-Mobilization

TABLE 2
FINAL SCHEDULE OF VALUES
(Minimum Detail Required for Contracts ###-G, H, P, E)

I. Lump Sum 01 - Mobilization

II. Lump Sum 02 – Work Result

a. Area/Process/Location

1. Existing Conditions.....Div. 02
   a. Soil Sampling and Analysis
   b. Demolition and Removals
   c. Asbestos Management
   d. Lead Management
   e. PCB Management
   f. Mercury Management
2. Concrete .....Div. 03
   a. Rehabilitation of Cast-In-Place Concrete
   b. Concrete Forming and Accessories
   c. Reinforcing Steel
   d. Cast-In-Place Concrete
3. Metals.....Div. 05
   a. Welding
   b. Miscellaneous Metal Fastenings
   c. Schedules for Stainless Steel Work
   d. Structural Steel Framing
4. Wood, Plastics and Composites.....Div. 06
   a. Fiberglass Reinforced Hydraulic Elements
5. Finishes .....Div. 09
   a. Painting
6. Specialties .....Div. 10
   a. Detailed Work Results as required
7. Electrical .....Div. 26
   a. General Electrical Requirements
   b. Low-Voltage Wires, Cables, and Accessories
   c. Grounding
   d. Hangers and Supports for Electrical Systems
   e. Raceways and Boxes for Electrical Systems
   f. Underground Ducts Manholes and Raceways for Electrical System
   g. Vibration and Seismic Controls for Electrical Systems
   h. Identification for Electrical Systems
   i. Low-Voltage Electric Motors
   j. General Electrical Testing
   k. Low-Voltage Distribution Transformers
   l. Enclosed Controllers
8. Communications .....Div. 27

a. Fiber Optic Cables
9. Earth Work.....Div. 31
   a. Excavation
   b. Dewatering
   c. Fill
   d. Dust, Soil Erosion and Sediment Control
10. Exerior Improvements .....Div. 32
   a. Asphalt Paving
11. Utilities.....Div. 33
   a. Buried Piping Installation
   b. Leakage Testing for Buried Piping
   c. Schedule for Buried Piping
12. Process Interconnections.....Div. 40
   a. Exposed Piping Installation
   b. Hangers and Supports for Process Piping
   c. Ductile Iron Process Pipe
   d. Thermoplastic Process Pipe
   e. Process Valves Four-Inch Diameter and Larger
   f. Process Valves, Smaller than Four-Inch Diameter
   g. Stainless Steel Slide Gates
   h. Stop Logs (Aluminum)
   i. Identification for Process Equipment
   j. Schedule for Exposed Piping
   k. Process Piping Insulation
   l. PMCS General Requirements
   m. PMCS Training
   n. PMCS Input Output List
   o. PMCS Instrument Index
   p. PMCS Monitoring and Control Criteria
   q. PMCS Control Strategies
   r. PMCS Programmable Logic Controllers
   s. PMCS Panels and Enclosures
   t. Measurement
   u. PMCS Panel Mounted Instruments and Devices
   v. PMCS Field Instruments
   w. PMCS Factory Testing
   x. PMCS Startup and Field Testing
13. Process Gas and Liquid Handling, Purifications, and Storage Equipment.... .....Div. 43
   a. Common Work Results for Pumping Units
   b. Magnetic Driven Centrifugal Return Pumping Units
   c. Sample Pump
   d. Chemical Sump Pumps

III. Lump Sum 03 – De-Mobilization

SECTION 01 31 10 – PROJECT PARTNERING
CONTRACT OB-144A

PART 1 GENERAL

1.01 SUMMARY

A. The Prime Contractor shall participate in "project partnering" along with DEP and its consultants for this project. Each Prime 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(s) 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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3.05	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. Not Used

1.04 REFERENCES

A. "Partnering" refers to the team-building required to create mutual trust among the prime contractor(s), 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 prime contractor(s) 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 for Contract OB-144A 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 for Contract OB-144A shall employ a Partnering Facilitator who will help establish and monitor the Partnering relationship. The Contractor for Contract OB-144A 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 for Contract OB-144A 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(s) shall meet to discuss the establishment of the formal Partnering process.

b. The Contractor for Contract OB-144A shall propose up to three (3) candidates to select from as Partnering Facilitator.

c. The City and the Contractor(s) 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 for Contract OB-144A 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

PART 1 GENERAL

1.01 SUMMARY

A. The following index of this Section is presented for convenience:

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PART 3	EXECUTION	4
3.01	Examination / Preparation	4
3.02	Installation	4
3.03	Field Testing / Quality Control	4
3.04	Startup / Demonstration	4
3.05	Adjusting / Protection / Cleanup	4

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 32 10 – Progress Scheduling

C. Section 01 35 27 – Environmental Health and Safety Requirements

D. Section 01 35 45 – Hazardous Materials Control

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.

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 31 25 – WEB-BASED PROJECT MANAGEMENT INFORMATION SYSTEM
CONTRACT OB-144A

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 OB-144A

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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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 2**, 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 quantity 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 1** 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
OB-144A	**OB-144A – TRC OPTIMIZATION AT THE OAKWOOD BEACH WRRF**
OB-144A.CO	OB-144A – TRC OPTIMIZATION AT THE OAKWOOD BEACH WRRF – Contract
OB-144A.CO.CO	OB-144A – TRC OPTIMIZATION AT THE OAKWOOD BEACH WRRF – Site Construction
OB-144A.CO.CO.STE	Site Work
OB-144A.CO.CO.STE.DEM	Demolition
OB-144A.CO.CO.STE.PAC	Pavings and Curbs
OB-144A.CO.CO.STE.WAS	Water Service
OB-144A.CO.CO.STE.STD	Site Drainage
OB-144A.CO.CO.STE.MEF	Metal Fabrications
OB-144A.CO.CO.STE.CIR	Circuitry
OB-144A.CO.CO.CCT	Chlorine Contact Tanks
OB-144A.CO.CO.CCT.FDP	Field Personnel
OB-144A.CO.CO.CCT.COA	Construction Aides
OB-144A.CO.CO.CCT.CWM	Cleaning and Waste Management
OB-144A.CO.CO.CCT.MIS	Miscellaneous Requirements
OB-144A.CO.CO.CCT.CRR	Concrete Restoration and Repair
OB-144A.CO.CO.CCT.MEF	Metal Fabrications
OB-144A.CO.CO.CCT.FSS	Foundation Support Systems
OB-144A.CO.CO.CCT.GTS	Gates
OB-144A.CO.CO.CCT.PMP	Pumps
OB-144A.CO.CO.CCT.ELD	Electrical Demolition
OB-144A.CO.CO.CCT.CIR	Circuitry
OB-144A.CO.CO.CCT.ELR	Electrical Requirements
OB-144A.CO.CO.CCT.ISC	Instrumentation and Control
OB-144A.CO.CO.CHB	Chlorination Building
OB-144A.CO.CO.CHB.HAZ	Hazardous Materials
OB-144A.CO.CO.CHB.ELD	Electrical Demolition
OB-144A.CO.CO.CHB.ELE	Electrical Equipment
OB-144A.CO.CO.CHB.CIR	Circuitry
OB-144A.CO.CO.CHB.ELR	Electrical Requirements
OB-144A.CO.CO.CHB.FDA	Fire Detection and Alarms
OB-144A.CO.CO.CHB.ISC	Instrumentation and Control
OB-144A.CO.CO.MEB	Meter Building
OB-144A.CO.CO.MEB.MED	Mechanical Equipment Demolition

OB-144A.CO.CO.MEB.PP	Process Piping
OB-144A.CO.CO.MEB.PMP	Pumps
OB-144A.CO.CO.MEB.ELD	Electrical Demolition
OB-144A.CO.CO.MEB.ELE	Electrical Equipment
OB-144A.CO.CO.MEB.CIR	Circuitry
OB-144A.CO.CO.MEB.ELR	Electrical Requirements
OB-144A.CO.CO.MEB.FDA	Fire Detection and Alarms
OB-144A.CO.CO.MEB.ISC	Instrumentation and Control

EXHIBIT 2 – ACTIVITY ID FORMAT

1. Activity ID format: Activity ID's shall be preceded by the Contract identifier: OB-144A
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- OB-144A; April 30, 2027.
2. Mobilization- OB-144A; September 17, 2027.
3. Construction Start (start of installation of permanent Work in the field – OB-144A); October 8, 2027.
4. Substantial Completion- OB-144A; May 26, 2029.
5. Project Close Out – OB-144A; March 26, 2030.
6. Or other Milestones as directed by the Engineer.

EXHIBIT 4 -- PROPOSED ACTIVITY CODES

1. **OB-144A _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 Prime Contractor
HVC	6	HVAC Prime Contractor
PLB	7	Plumbing Prime Contractor – Not Used

2. **OB-144A _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. **OB-144A _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
WRRF	1	Oakwood Beach Wastewater Resource Recovery Facility

4. **OB-144A _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
OBLS	1	–OBWW – Landside Chlorine Contact Tank
OBSS	2	OBWW – Seaside Chlorine Contact Tank
OBMB	3	OBWW – Meter Building

VALUE	SEQUENCE	TITLE
OBYA	4	OBWW – General Yard Area

5. **OB-144A _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
18	18	Doors and Windows
19	19	Finishes
20	20	Specialties
21	21	Equipment
22	22	Furnishings
23	23	Special Construction

VALUE	SEQUENCE	TITLE
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. **OB-144A _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. **OB-144A _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	4	G002 – General Change Order No.2 Description
Continued – to be updated by Contractor in each Progress Schedule		

8. **OB-144A _Contractor** General Contractor. This Activity Code field should be defined as being seven digits in length.

VALUE	SEQUENCE	TITLE
G1	1	General Contractor
Continued – to be updated by Contractor in each Progress Schedule		

9. OB-144A **_Point of Contact** DEP Accountable Manager. This Activity Code field should be defined as being seven digits in length.

VALUE	SEQUENCE	TITLE
SU	1	Stella Uwaechie
Continued – to be updated by Contractor in each Progress Schedule		

10. **OB-144A _Key Milestones** Optional Field for DEP use. This Activity Code field should be defined as being seven digits in length.

11. **OB-144A _Standard Milestones** Optional Field for DEP use. This Activity Code field should be defined as being seven digits in length.

12. **OB-144A _Temporary** Optional Field for DEP use. This Activity Code field should be defined as being seven digits in length.

13. **OB-144A _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. OB-144A_5D1S - 5 days per week and one shift per day
2. OB-144A_5D2S - 5 days per week and two shifts per day
3. OB-144A_5D3S - 5 days per week and three shifts per day
4. OB-144A_7D3S - 7 days per week and one shift per day

NO TEXT ON THIS PAGE

SECTION 01 32 30 – JOB PHOTOGRAPHS AND VIDEOS
CONTRACT OB-144A

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 100 Photographs and make a 45 minute video showing existing conditions of the entire project site and any adjacent areas which could possibly be disturbed during construction.

2. Three 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 50 Photographs for the project and to visit the site when directed by the Engineer to tape a total of 1 hour 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 2 Aerial Photographs shall be taken with 2 views, at 1 phase 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 50 Photographs and make a 45 minute video showing the completed Work, the entire Project Site and any adjacent areas which were disturbed during construction.

2. Four Aerial Photographs shall be taken showing the completed Work, the entire project site and any adjacent areas which were disturbed during construction.

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 12 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. Photograph of different views of the new enclosure.

   b. Photograph of different views of the Chlorine Contact Tanks for both Landside and Seaside.

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 OB-144A

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 10 - 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: TRC OPTIMIZATION AT THE OAKWOOD BEACH WRRF
Contract Number: OB-144A
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 OB-144A

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 02 24 20 – Soil Sampling and Analysis

B. Section 31 23 16 - Excavation

1.04 REFERENCES

A. Definitions

1. "Competent Person" means one who is capable of identifying existing and predictable 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.

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

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: _____

SECTION 01 35 44 – WORKING IN HAZARDOUS (CLASSIFIED) LOCATIONS
CONTRACT OB-144A

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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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. All areas of excavation.

b. Main Building, Basement Level.

c. Sludge Storage Tank Building Basement and Sludge Pipe Gallery.

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 OB-144A

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 Identified LBPs & LCPs
2. Table 2 - Asbestos Analytical Results
3. Table 3 - Lead Analytical Results
4. Table 4 - PCB Analytical Results

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. 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.

3. 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

Table 1: Summary Of Identified LBPs & LCPs

Sample ID #	Sample Date	Survey Location	Sample Description & Location	Lead (% wt)[1]	Photo ID
LBP-01	08/9/2025	Meter Building 43000B	Gray Paint on Concrete Floor at 1st Floor	*0.0088*	01
LBP-02	08/9/2025	Meter Building 43000B	Beige Paint on Concrete Wall at 1st Floor	*0.017*	03
LBP-03	08/9/2025	Meter Building 43000B	Yellow Paint on Metal Magmeter Flange at 1st Floor	*0.012*	06
LBP-05	08/9/2025	Meter Building 43000B	Gray Paint on Metal Pipe at 1st Floor	*0.050*	10
LBP-06	08/9/2025	Operating Gallery/ Microstrainer Building Interior	White Paint on Metal Pipe	*0.025*	14
LBP-07	08/9/2025	Operating Gallery/ Microstrainer Building Interior	White Paint on Concrete Wall	*0.041*	15
LBP-08	08/9/2025	Operating Gallery/ Microstrainer Building Interior	White Paint on Concrete Ceiling	*0.035*	16
LBP-09	08/9/2025	Operating Gallery/ Microstrainer Building Interior	Gray Paint on Concrete Lower Wall	**0.60**	18
LBP-12	08/11/2025	Chlorine Building	White Paint on Concrete Ceiling/Rolling Gate Header	*0.024*	24

Table 2: Asbestos Analytical Results

Sample ID #	Sample Date	Survey Location	Sample Description & Location	Asbestos (%)[1,2] [PLM Friable]	Asbestos (%)[1,2] [PLM NOB/TEM NOB]	Photo ID
1-1	08/8/2025	Meter Building 43000B	Gray Paint on Floor at 1st Floor	Not Analyzed	None Detected	01
1-2				Not Analyzed	None Detected	
1-3				Not Analyzed	None Detected	
2-1	08/8/2025	Meter Building 43000B	Cinder Block Mortar on Wall at 1st Floor	None Detected	Not Analyzed	02
2-2				None Detected	Not Analyzed	
2-3				None Detected	Not Analyzed	
3-1	08/8/2025	Meter Building 43000B	Beige Paint on Wall at 1st Floor	Not Analyzed	None Detected	03
3-2				Not Analyzed	None Detected	
3-3				Not Analyzed	None Detected	
4-1	08/8/2025	Meter Building 43000B	Pipe Insulation Wrap at Lower Level	None Detected	Not Analyzed	04
4-2				None Detected	Not Analyzed	
4-3				None Detected	Not Analyzed	
5-1	08/8/2025	Meter Building 43000B	Pipe Insulation Elbow at Lower Level	None Detected	Not Analyzed	05
5-2				None Detected	Not Analyzed	
5-3				None Detected	Not Analyzed	
6-1	08/8/2025	Meter Building 43000B	Yellow Paint on Magmeter Flange at 1st Floor	Not Analyzed	None Detected	06
6-2				Not Analyzed	None Detected	
6-3				Not Analyzed	None Detected	
7-1	08/8/2025	Meter Building 43000B	Red Fire Stop on Wall at 1st Floor	Not Analyzed	None Detected	07
7-2				Not Analyzed	None Detected	
7-3				Not Analyzed	None Detected	
8-1	08/8/2025	Meter Building 43000B	Cementitious Patch on Stairwell at 1st Floor	None Detected	Not Analyzed	08
8-2				None Detected	Not Analyzed	
8-3				None Detected	Not Analyzed	

Sample ID #	Sample Date	Survey Location	Sample Description & Location	Asbestos (%)[1,2] [PLM Friable]	Asbestos (%)[1,2] [PLM NOB/TEM NOB]	Photo ID
9-1	08/8/2025	Meter Building 43000B	Gray Paint on Wall of Stairwell at 1st Floor	Not Analyzed	None Detected	09
9-2				Not Analyzed	None Detected	
9-3				Not Analyzed	None Detected	
10-1	08/8/2025	Meter Building 43000B	Gray Paint on Pipe at 1st Floor	Not Analyzed	None Detected	10
10-2				Not Analyzed	None Detected	
10-3				Not Analyzed	None Detected	
11-1	08/8/2025	Meter Building 43000B	Conduit Penetration Caulk at Lower Level	Not Analyzed	None Detected	11
11-2				Not Analyzed	None Detected	
11-3				Not Analyzed	None Detected	
12-1	08/8/2025	Meter Building 43000B	Pipe Penetration Wrap at Ceiling at 1st Floor	None Detected	Not Analyzed	12
12-2				None Detected	Not Analyzed	
12-3				None Detected	Not Analyzed	
13-1	08/8/2025	Operating Gallery/Microstrainer Building Interior	Pipe Insulation Wrap	Not Analyzed	None Detected	13
13-2				Not Analyzed	None Detected	
13-3				Not Analyzed	None Detected	
14-1	08/8/2025	Operating Gallery/Microstrainer Building Interior	White Paint on Pipe	Not Analyzed	None Detected	14
14-2				Not Analyzed	None Detected	
14-3				Not Analyzed	None Detected	
15-1	08/8/2025	Operating Gallery/ Microstrainer Building Interior	White Paint on Wall	Not Analyzed	None Detected	15
15-2				Not Analyzed	None Detected	
15-3				Not Analyzed	None Detected	
16-1	08/8/2025	Operating Gallery/Microstrainer Building Interior	White Paint on Ceiling	Not Analyzed	None Detected	16
16-2				Not Analyzed	None Detected	
16-3				Not Analyzed	None Detected	
17-1	08/8/2025	Operating Gallery/ Microstrainer Building Interior	Pump Motor Insulation Wrap	Not Analyzed	None Detected	17
17-2				Not Analyzed	None Detected	
17-3				Not Analyzed	None Detected	
18-1	08/8/2025	Operating Gallery/ Microstrainer Building Interior	Gray Paint on Lower Wall	Not Analyzed	None Detected	18
18-2				Not Analyzed	None Detected	
18-3				Not Analyzed	None Detected	
19-1	08/11/2025	Operating Gallery/ Microstrainer Building Interior	Blue Paint on Metal Post Pipe Stand	Not Analyzed	None Detected	19
19-2				Not Analyzed	None Detected	
19-3				Not Analyzed	None Detected	
20-1	08/11/2025	Chlorine Building	Beige Ceramic Brick Mortar on Wall	None Detected	Not Analyzed	20
20-2				None Detected	Not Analyzed	
20-3				None Detected	Not Analyzed	
21-1	08/11/2025	Chlorine Building	Gray Paint on Floor	Not Analyzed	None Detected	21
21-2				Not Analyzed	None Detected	
21-3				Not Analyzed	None Detected	

Sample ID #	Sample Date	Survey Location	Sample Description & Location	Asbestos (%)[1,2] [PLM Friable]	Asbestos (%)[1,2] [PLM NOB/TEM NOB]	Photo ID
22-1	08/11/2025	Chlorine Building	Cementitious Patch on Wall	None Detected	Not Analyzed	22
22-2				None Detected	Not Analyzed	
22-3				None Detected	Not Analyzed	
23-1	08/11/2025	Chlorine Building	Red Fire Stop on Wall	Not Analyzed	None Detected	23
23-2				Not Analyzed	None Detected	
23-3				Not Analyzed	None Detected	
24-1	08/11/2025	Chlorine Building	White Paint on Ceiling	Not Analyzed	None Detected	24
24-2				Not Analyzed	None Detected	
24-3				Not Analyzed	None Detected	

Table 3: Lead Analytical Results

Sample ID #	Sample Date	Survey Location	Sample Description & Location	Lead (% wt)[1]	Photo ID
LBP-01	08/9/2025	Meter Building 43000B	Gray Paint on Concrete Floor at 1st Floor	*0.0088*	01
LBP-02	08/9/2025	Meter Building 43000B	Beige Paint on Concrete Wall at 1st Floor	*0.017*	03
LBP-03	08/9/2025	Meter Building 43000B	Yellow Paint on Metal Magmeter Flange at 1st Floor	*0.012*	06
LBP-04	08/9/2025	Meter Building 43000B	Brown Paint on Concrete Wall of Stairwell at 1st Floor	<0.0064	09
LBP-05	08/9/2025	Meter Building 43000B	Gray Paint on Metal Pipe at 1st Floor	*0.050*	10
LBP-06	08/9/2025	Operating Gallery/ Microstrainer Building Interior	White Paint on Metal Pipe	*0.025*	14
LBP-07	08/9/2025	Operating Gallery/ Microstrainer Building Interior	White Paint on Concrete Wall	*0.041*	15
LBP-08	08/9/2025	Operating Gallery/ Microstrainer Building Interior	White Paint on Concrete Ceiling	*0.035*	16
LBP-09	08/9/2025	Operating Gallery/ Microstrainer Building Interior	Gray Paint on Concrete Lower Wall	**0.60**	18
LBP-10	08/11/2025	Operating Gallery/ Microstrainer Building Interior	Blue Paint on Metal Post Pipe Stand	<0.0064	19
LBP-11	08/11/2025	Chlorine Building	Gray Paint on Concrete Floor	<0.0064	21
LBP-12	08/11/2025	Chlorine Building	White Paint on Concrete Ceiling/Rolling Gate Header	*0.024*	24

Table 4: PCB Analytical Results

Sample ID #	Sample Date	Survey Location	Sample Description & Location	PCBs (mg/kg)[1]	Photo ID
PCB-01	08/9/2025	Meter Building 43000B	Gray Paint on Floor at 1st Floor	ND	01
PCB-02	08/9/2025	Meter Building 43000B	Beige Paint on Wall at 1st Floor	ND	03
PCB-03	08/9/2025	Meter Building 43000B	Yellow Paint on Magmeter Flange at 1st Floor	ND	06
PCB-04	08/9/2025	Meter Building 43000B	Brown Paint on Wall of Stairwell at 1st Floor	ND	09
PCB-05	08/9/2025	Meter Building 43000B	Gray Paint on Pipe at 1st Floor	ND	10
PCB-06	08/9/2025	Meter Building 43000B	White Caulking Conduit Penetration at Lower Level	ND	11
PCB-07	08/9/2025	Operating Gallery/ Microstrainer Building Interior	White Paint on Pipe	ND	14
PCB-08	08/9/2025	Operating Gallery/ Microstrainer Building Interior	White Paint on Wall	ND	15
PCB-09	08/9/2025	Operating Gallery/ Microstrainer Building Interior	White Paint on Ceiling	ND	16
PCB-10	08/11/2025	Operating Gallery/ Microstrainer Building Interior	Gray Paint on Lower Wall	ND	18
PCB-11	08/11/2025	Operating Gallery/ Microstrainer Building Interior	Blue Paint on Metal Post Pipe Stand	ND	19
PCB-12	08/11/2025	Chlorine Building	Gray Paint on Floor	ND	21
PCB-13	08/11/2025	Chlorine Building	White Paint on Ceiling/Rolling Gate Header	0.26	24

SECTION 01 35 63.01 – SUSTAINABILITY REQUIREMENTS
CONTRACT OB-144A

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the sustainability requirements of this Project.

B. The intent is for sustainability 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.

1. Third party sustainability verification will not be pursued for this Project. The Institute for Sustainable Infrastructure's (ISI) Envision Rating System will be used as a guiding framework for achieving the sustainability goals identified for this Project.

C. Attachments

1. Attachment A: Sustainability Construction 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 74 20 – Construction Waste Management

C. Section 03 01 30.71 – Rehabilitation of Cast-in-Place Concrete

D. Section 03 10 00 – Concrete Forming & Accessories

E. Section 03 30 00 – Cast-in-Place Concrete

F. Section 03 32 00 – Joints in Concrete

G. Section 05 12 00 – Structural Steel Framing

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I. Section 05 53 01.02 – Stainless Steel Floor Gratings

J. Section 09 91 00 – Painting

K. Section 31 23 23 – Fill

L. Section 31 25 10 – Dust, Soil Erosion and Sediment Control

M. Section 32 12 16 – Asphalt Paving

1.04 REFERENCES

A. ISI's Envision Version 3 (V3) as released on April 17, 2018, is the Envision framework used and referenced herein.

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 Sustainability Construction Documentation.

2. The Contract Documents are not intended to limit alternative means of achieving sustainability 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 designate a Sustainability Coordinator on staff who shall be responsible for sustainability compliance and coordination.

1. The Sustainability Coordinator should preferably be an Envision Sustainability Professional (ENV SP). The Sustainability Coordinator shall be responsible for sustainability considerations described in this section, including the New Materials Sustainable Implementation Plan and the Sustainability Construction 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. Sustainability Construction Documentation

1. The Sustainability Coordinator shall prepare and submit the initial, monthly and final Sustainability Construction 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 Sustainability Construction 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. Sustainability Coordinator duties:

1. The Sustainability Coordinator shall attend a minimum of three (3) on-site coordination meetings. The Sustainability Coordinator shall make available for review at each meeting a set of Contract Drawings and Specifications, the New Materials Sustainable Implementation Plan and the updated Sustainability Construction Documentation.

    a. The first meeting will be a preconstruction meeting to review the New Materials Sustainable Implementation Plan, and establish roles including the Sustainability Coordinator and the Engineer.

    b. The second meeting will be a pre-closeout meeting to review the Sustainability Construction 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 Sustainability Construction Documentation.

3.04 STARTUP / DEMONSTRATION

A. Not used.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not used.

END OF SECTION

Attachment A

Sustainability Construction Documentation

Indicator	Minimum Required Level[1]	Envision Credit Reference	Reporting Template
Recycled Material	50%[2]	RA1.2	Attachment B
Regional Material	100%[3]	-	Attachment B
Sustainable Procurement	99%[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
Soil Reuse	100%	RA1.5	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

SECTION 01 41 00 – REGULATORY REQUIREMENTS
CONTRACT OB-144A

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

J. The following index of this Section is presented for convenience:

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1.02	Payment	1
1.03	Related Sections	2
1.04	References	2
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1.08	Delivery, Storage, and Handling	5
1.09	Spare Parts, Special Tools, and Supplies	5
1.10	Warranty	5
PART 2	PRODUCTS	6
2.01	Manufacturers	6
2.02	Materials / Equipment	6
2.03	Fabrication / Assembling / Finishes	6
2.04	Source Quality Control / Shop Tests	6
PART 3	EXECUTION	6
3.01	Examination / Preparation	6
3.02	Installation	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 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 State Department of Environmental Conservation (NYSDEC) – Tidal Wetlands Permit

2) NYSDEC – Freshwater Wetlands Permit

3) NYSDEC - United States Environmental Protection Agency (USEPA) Identification Number

4) DEP – City Environmental Quality Review (CEQR) Type II Memo

5) DEP – Stormwater Pollution Prevention Plan (SWPPP) Approval

6) New York City Public Design Commission Approval

7) New York City Department of Buildings (DOB) – Work Plan Approval

b. Permits to be initiated and acquired for construction include, but are not limited to the following:

1) NYSDEC – Waste Transporter Permit

2) New York State Department of Transportation (NYSDOT) - Divisible Load Overweight Permit

3) NYSDOT – Special Hauling Permit

4) DOB – Work Permit

5) DOB - Construction Safety Enforcement/Compliance Unit Pre-Demolition Inspection Application

6) DOB - Application for Construction Safety Enforcement/Compliance Unit Recommendation for Mechanical Means Demolition

7) DOB – Electrical Permit

8) DEP - Not an Asbestos Project Notification (Form ACP5)

9) New York City Department of Transportation (NYCDOT) – Oversize-Overweight Vehicle Permit

10) New York City Fire Department (FDNY) – Construction Phase Permits

11) New York City Department of Sanitation (DSNY) – Certification of Load Data

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 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 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 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

SECTION 01 42 00 – REFERENCES
CONTRACT OB-144A

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:

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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

TABLE 01 42 00-1
LIST OFABBREVIATIONS
(Continued)

feet per second	fps, or ft/sec
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

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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 OB-144A

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

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 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. 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 OB-144A

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:

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1.08	Delivery, Storage, and Handling	5
1.09	Spare Parts, Special Tools, and Supplies	5
1.10	Warranty	5
PART 2	PRODUCTS	5
2.01	Manufacturers	5
2.02	Materials / Equipment	5
2.03	Fabrication / Assembling / Finishes	6
2.04	Source Quality Control / Shop Tests	6
PART 3	EXECUTION	6
3.01	Examination / Preparation	6
3.02	Implementation	6
3.03	Field Testing / Quality Control	8
3.04	Startup / Demonstration	8
3.05	Adjusting / Protection / Cleanup	8

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.

"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"

3. 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.)

4. 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.

5. 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.

6. 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.

7. 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.

D. 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	Miscellaneous Metal Fastenings
05 12 00	Structural Steel Framing	Structural Steel Framing
05 12 13.05	Welded Pipe Railings (Stainless Steel)	Welded Pipe Railings (Stainless Steel)
05 53 01.02	Stainless Steel Floor Gratings	Stainless Steel Floor Gratings
40 05 06	Couplings, Adapters, and Specials for Process Piping	Couplings, Adapters, and Specials for Process Piping
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
40 05 59.05	Stainless Steel Slide Gates	Stainless Steel Slide Gates For the four (4) CCT Influent (80”x60”) and one (1) Plant Water Influent (36”x36”)
40 05 59.16 01	Stop Logs (Aluminum)	Stop Logs (Aluminum)

NO TEXT ON THIS PAGE

SECTION 01 43 15 – WITNESS SHOP TESTING
CONTRACT OB-144A

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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PART 2	PRODUCTS	5
2.01	Manufacturers	5
2.02	Materials / Equipment	5
2.03	Fabrication / Assembling / Finishes	6
2.04	Source Quality Control / Shop Tests	6
PART 3	EXECUTION	6
3.01	Examination / Preparation	6
3.02	Application	6
3.03	Field Testing / Quality Control	6
3.04	Startup / Demonstration	6
3.05	Adjusting / Protection / Cleanup	6

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 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

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	Chlorination Building Control Panel (LCP-4200)
40.05.59.05	Stainless Steel Slide Gates	84”x60” slide gates (4)
40.05.59.05	Stainless Steel Slide Gates	36”x36” slide gate (1)
40.05.53	Process Valves Four-Inch Diameter and Larger	24” butterfly valve (1)

NO TEXT ON THIS PAGE

SECTION 01 43 20 – APPROVAL OF PRODUCT MANUFACTURERS
CONTRACT OB-144A

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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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. 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 51 11 – TEMPORARY WATER AND SANITARY SERVICES
CONTRACT OB-144A

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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2.03	Fabrication / Assembling / Finishes	3
2.04	Source Quality Control / Shop Tests	3
PART 3	EXECUTION	3
3.01	Examination / Preparation	3
3.02	Implementation	3
3.03	Field Testing / Quality Control	3
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 (portable) 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, including bottled water coolers/ dispensers.

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 OB-144A

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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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. 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 OB-144A

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 service shall have provisions for meter connections for the Contractor on the worksite and the Engineer's field office. The service shall be branched and metered using circuit breakers or fused switches and meters.
    a. The distribution from each meter to the Contractor's field office and shops at the site shall be the responsibility of the Contractor.
    b. The distribution from one (1) meter to Engineer's field office shall be the responsibility of the Contractor.
    c. The distribution from one (1) meter to the construction temporary light, power, and security system shall be the responsibility of the Contractor.
4. The Contractor shall be responsible for making arrangements with the Utility to have a sealed meter installed and for payment of same.
5. The energy charges for the Contractor's field office and shop usage shall be the responsibility of the Contractor.

6. 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.

7. The Contractor requiring additional temporary power and light, beyond that provided under by the Contractor as specified herein, shall arrange with the utility for such additional temporary power and light and shall bear the costs of all material and ancillary equipment necessary. Removal of such additional temporary power and light shall be at the expense 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 described in this specification 24 hours per day, 7 days per week, for the duration of the Contract.

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.

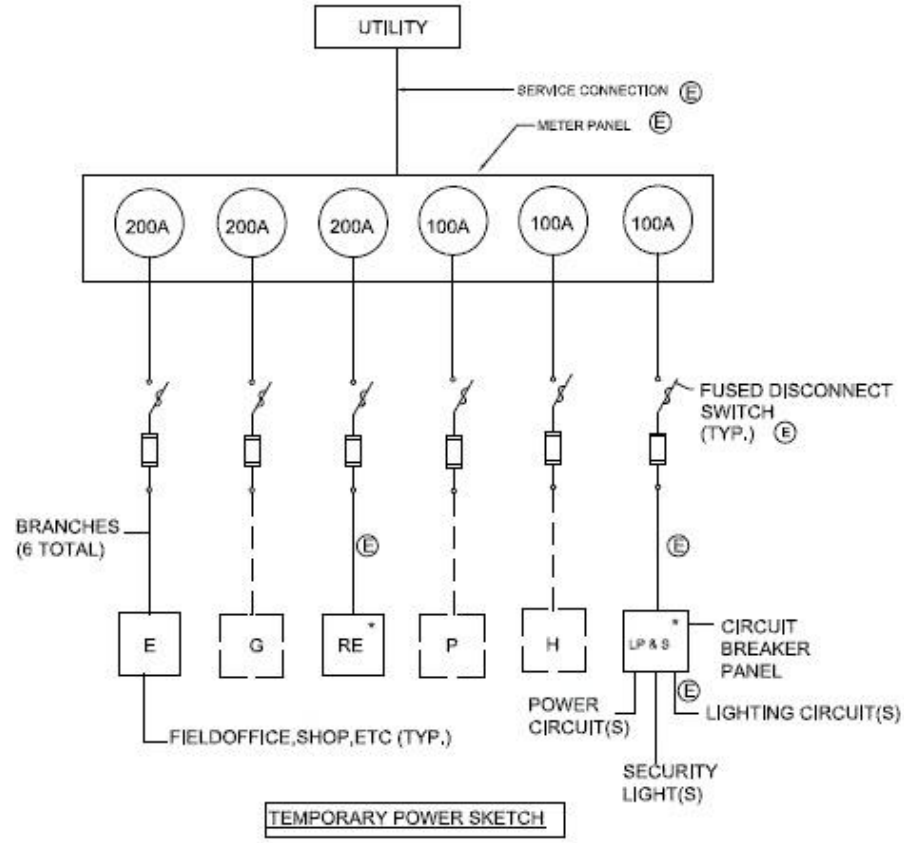
B. Removal

1. At the conclusion of the work, when directed by the Engineer, the temporary system shall be removed by the 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

Note: Below is the general temporary electrical arrangement diagram. OB-144A is a single prime contractor Contract. The Contractor shall provide power to all trailers.



——— BY ELECTRICAL CONTRACTOR
— — BY OTHERS
E - ELECTRICAL CONTRACTOR
G - GENERAL CONTRACTOR
RE - RESIDENT ENGINEER
P - PLUMBING CONTRACTOR
H - HEATING, VENTILATION & AIR CONDITIONING CONTRACTOR
* - SUPPLY WITH MAIN BREAKER

SECTION 01 52 10 – TEMPORARY FIELD OFFICE TRAILERS
CONTRACT OB-144A

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 offsite 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, and are to be coordinated with DEP prior to mobilization.

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. Contractor shall provide interior design of Resident Engineer's Field Office suitable for accommodating 5 full-time individuals and 3 part-time individuals while performing construction management and inspection duties.

3. Data sheets for all products to be furnished under this Section.

4. 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. Provide a minimum of 720 square feet (SF)
   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. Resident Engineer's Room 12' x 12'

b. One (1) inspector bathrooms with toilet and sink 9' x 9'

7. Parking: Parking is not available onsite. All Contractor's parking shall be off-site.

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.

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).

E. Bathrooms

1. The bathrooms shall be properly ventilated and shall be equipped with the following:

Item	Quantity
Flush toilet	1
Sink with hot and cold running water	1
Mirror	1
Medicine cabinet	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 (approved equals allowed)

Description	Quantity
55-gallon trash bin	One (1)
55-gallon paper recycling bin	One (1)
55-gallon metal/plastic recycling bin	One (1)
Dry chemical fire extinguishers, UL listed 1A-10BC	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	8
Office Chairs	
Nightingale 6800MABA/6800BA	8
Folding tables, 60 inches by 30 inches	1
Five-drawer vertical file cabinet, legal size with lock	1

TABLE 2
KITCHEN ITEMS

Description	Quantity
Wood kitchen cabinets with Formica counter tops	6 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)
Microwave oven, XXX cubic feet	One (1)
Automatic drip coffee maker	One (1)
Refrigerator, XXX cubic feet	One (1)
Overhead kitchen cabinets	6 linear feet
Tables, 60 inches long by 30 inches wide	1

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SECTION 01 52 40 – FIELD OFFICE EQUIPMENT AND SUPPLIES
CONTRACT OB-144A

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 office.

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) Telephones

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. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Provide all furnishings and equipment specified herein new and unused.

B. 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.

C. 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.
        1) Provide one (1) 802.11ac access point that includes the following: Complete facility coverage
        2) Minimum combined throughput of 101MBps per AP
        3) Conference Rooms should be planned for full capacity seating of 8 and 150Mbps / user
    d. Individual offices and cubicle spaces planned for minimum 150Mbps/use 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.
    e. 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. Telephone Service:

a. Provide quantity -- (##) VoIP Telephones.

b. Each telephone shall be a full feature push button telephone set with multiple lines and all equipment necessary for its operation.

c. All telephones will be connected to a central switchboard having a minimum of ten independent touch-tone phone service lines.

d. The phones and phone service shall be furnished and installed by the Contractor.

e. Make arrangements and bear all costs for the installation of cables and for supplying telephone service during the Contract period.

f. The telephone lines shall be separate from the facsimile line specified herein.

4. Facsimile Machine:

a. Provide one (1) facsimile machine to be installed on an independent touch-tone VoIP service line.

b. Provide a service contract and all necessary supplies (toner, paper, etc.) for the system for the duration of the Contract.

D. 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 copy machine and computer.

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. Telephone and Internet service:

a. Provide telephone service, including all calling charges for the Resident Engineer's field offices, for the duration of the Contract.

b. Provide internet service (cable or fiber optic – satellite is not acceptable) in order to adequately service the offices.

c. Provide separate lines for telephone service and alarm monitoring systems.

d. Install all telephone cables required for supplying telephone service.

e. The Contractor shall pay the costs for installation of the telephone cables and for supplying and maintaining telephone, 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

SECTION 01 55 00 – VEHICULAR ACCESS AND PARKING
CONTRACT OB-144A

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. Not Used

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. 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.

3. 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.

4. 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.

5. The Contractor shall perform the Work required in this Contract in accordance with applicable traffic and safety rules, regulations, ordinances, and permit conditions.

6. 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).

7. 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.

8. 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.

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

SECTION 01 56 00 – TEMPORARY BARRIERS AND ENCLOSURES
CONTRACT OB-144A

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

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 NYCDOT Standard Highway Specifications and Details of Construction. 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.

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 OB-144A

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

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 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 the Lower New York Bay.

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.

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. 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 58 13 – TEMPORARY PROJECT SIGNAGE
CONTRACT OB-144A

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 – Environmental Facilities Corporation (EFC) Construction Sign Schematic: Drinking Water State Revolving Fund (DWSRF)

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. 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 twenty-one (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 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 projects that are not funded through the New York State Revolving Fund, the information and lettering shown below the sample rendering in Figure 1 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 as season YYYY;
    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 Figure 1.

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)/Drinking Water State Revolving Fund (DWSRF) 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 2 - 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) For DWSRF projects only: The New York State Department of Health (DOH) logo available at https://nysefc.app.box.com/v/EFC-DOH-black
      3) 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 and DWSRF projects, incorporate the following language: This project is jointly funded by the New York State [Clean Water/Drinking Water] State Revolving Fund and the U.S. Environmental Protection Agency. The [CWSRF/DWSRF] is administered by the New York State Environmental Facilities Corporation [with its partner the New York State Department of Health (*for DWSRF projects only*)]. Other language as shown on Figure 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 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. The panel shall be replaced in its entirety for updates to information, names, or at the direction of the Engineer.

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

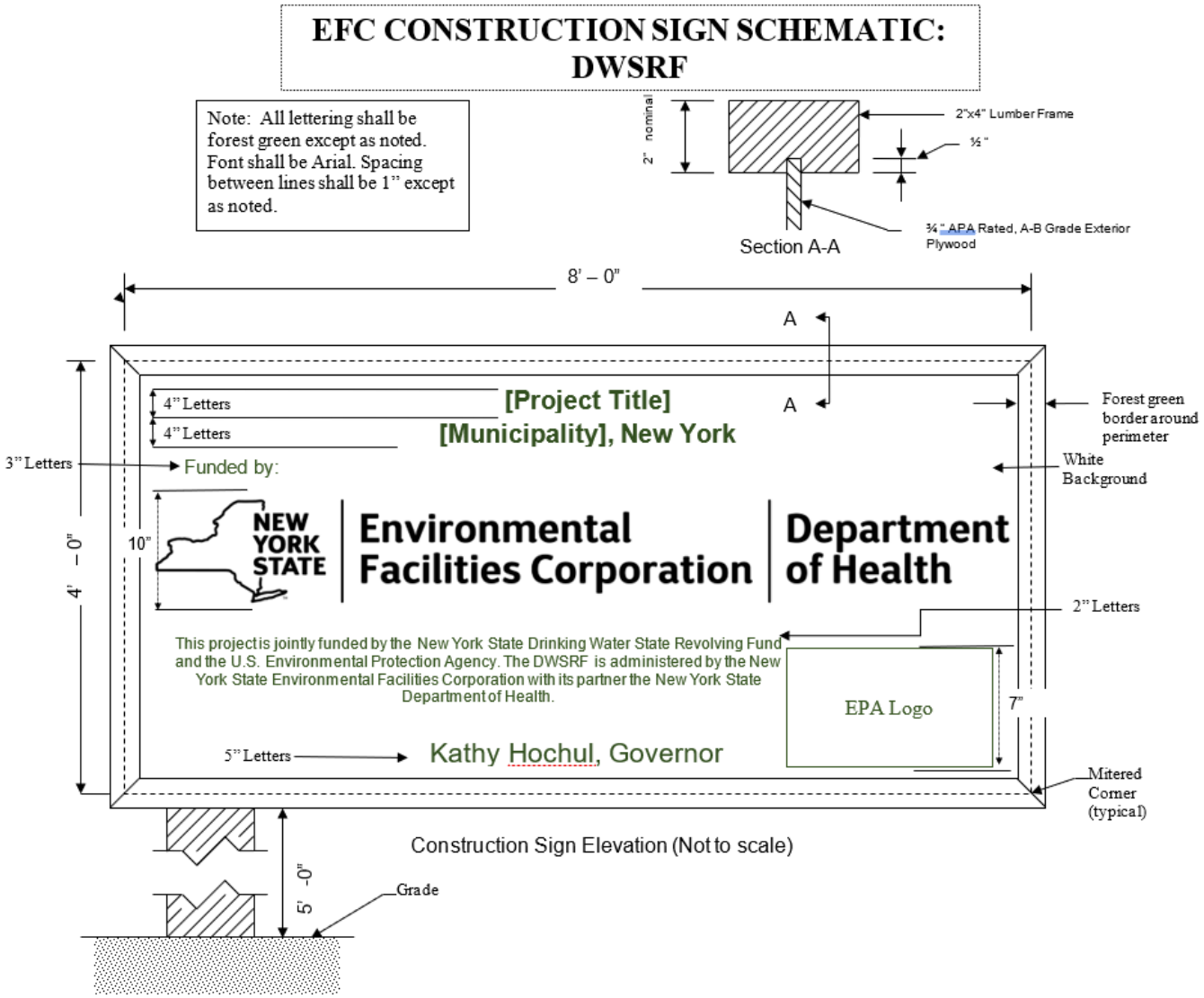
END OF SECTION

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


EFC CONSTRUCTION SIGN SCHEMATIC: DWSRF
Note: All lettering shall be forest green except as noted. Font shall be Arial. Spacing between lines shall be 1" except as noted.
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:
Forest green border around perimeter
White Background
10"
NEW YORK STATE
Environmental Facilities Corporation
Department of Health
4' – 0"
2" Letters
This project is jointly funded by the New York State Drinking Water State Revolving Fund and the U.S. Environmental Protection Agency. The DWSRF is administered by the New York State Environmental Facilities Corporation with its partner the New York State Department of Health.
EPA Logo
7"
5" Letters
Kathy Hochul, Governor
Mitered Corner (typical)
Construction Sign Elevation (Not to scale)
5' -0"
Grade

SECTION 01 61 50 – GENERAL PRODUCT REQUIREMENTS
CONTRACT OB-144A

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

N. The following index of this Section is presented for convenience:

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3.04 Startup / Demonstration 7
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. 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. 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 OB-144A

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 scheduled 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 OB-144A

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 of the Contract.
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 OB-144A

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 OB-144A

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 corrected 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 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 73 12 – MAINTENANCE OF OPERATIONS AND CONSTRUCTION STAGING
CONTRACT OB-144A

PART 1 GENERAL

1.01 SUMMARY

A. Maintenance of Site operations

B. General criteria and restrictions

C. Construction staging

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 32 10 – Progress Scheduling

C. Section 01 56 00 – Temporary Barriers and Enclosures

D. 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 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 conduits, channels, and pipes 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 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, conduits, or tanks to perform the Work.

g. The Contractors shall install and maintain temporary drainage and containment, to the satisfaction of the Engineer, where the existing drainage and containment has been removed due to construction progress until the permanent replacement drainage and containment system has been installed.

h. 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 until replaced.

c. Plumbing Facilities: All building plumbing systems such as sanitary facilities, roof and floor drains, pumping, 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.

e. All site drainage flows shall not be interrupted.

f. 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.

g. Sump Pumps and Sumps: All existing sumps shall be maintained in an operable condition with either existing pumps or temporary pumps. Interim piping, power and controls shall be provided as required.

h. Drainage Pipes and Conduits:

1) Unless otherwise specified, the contents of all pipes, conduits, pits or other liquid containing structures shall be transferred to a location approved by the Engineer using hoses, piping or pumps if hydraulic conditions so require them. The Contractor, whose work requires the draining, shall provide the pumps, piping and hoses.

2) If a drain is not available on the pipe to be drained, then a wet tap shall be made using a tapping saddle and valve. No uncontrolled spillage of a pipe's contents shall be allowed, nor shall a pipe's contents be discharged to a sump.

3) Any spillage shall be immediately washed down and the floor drains, sumps and sump pump discharge piping flushed out to prevent clogging and odors.

i. 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.

j. 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 56 00 – Temporary Barriers and Enclosures, and

4) 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 on 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. 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 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 73 17 – INSTALLATION OF EQUIPMENT
CONTRACT OB-144A

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 OB-144A

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

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. Not Used

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

NO TEXT ON THIS PAGE

SECTION 01 74 20 – CONSTRUCTION WASTE MANAGEMENT
CONTRACT OB-144A

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 verification 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 100% 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) Aluminum
2) Asphalt
3) Cast iron
4) Concrete
5) Concrete Precast
6) Concrete (Structural)
7) Copper wiring
8) Ductile iron
9) Epoxy Coating
10) Equipment (Hydraulic Gate, pumps, induction mixer, valves, electrical)
11) Piping
12) Plastic (RFP/GRFP, PVC)
13) Steel (all types: stainless, galvanized, etc.)
14) Tank Residuals
15) Wood (Lumber)

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 ensure proper function in completed work.

B. Periodically inspect stored products to ensure 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

NO TEXT ON THIS PAGE

SECTION 01 75 10 – PRELIMINARY AND FINAL FIELD TESTS
CONTRACT OB-144A

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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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 32 10 - Progress Scheduling

B. Section 01 43 05 - Contractor's Work Quality

C. Section 40 61 96 - PMCS Control Strategies

D. Section 40 80 82 - PMCS Startup and Field Testing

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. Integration of automatic dosing controls with multiple dosing scenarios (flow pace, and flow pace with influent/effluent residual trim including TSS readings, and operator selectable). Flow signal for logic can be plant influent flow or CCT effluent flow, and operator selectable.

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. Items to be completed
2. Final record documents
3. Special tools and appliances
4. Spare parts and maintenance materials
5. Lubricants
6. Piping and equipment identification

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 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. Computerized Maintenance Management System (CMMS) Equipment List

1. The Contractor shall submit a list of all installed equipment per BWT guidelines on the latest version of the standard Computerized Maintenance Management System (CMMS) form to the Engineer for approval as part of the Shop Drawing submittals.

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 OB-144A

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 hand held 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 OB-144A 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 OB-144A

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:

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	2
1.06	Quality Assurance	6
1.07	Submittals	6
1.08	Delivery, Storage, and Handling	6
1.09	Spare Parts, Special Tools, and Supplies	6
1.10	Warranty	6
PART 2	PRODUCTS	6
2.01	Manufacturers	6
2.02	Materials / Equipment	6
2.03	Fabrication / Assembling / Finishes	6
2.04	Source Quality Control / Shop Tests	6
PART 3	EXECUTION	6
3.01	Examination / Preparation	6
3.02	Implementation	6
3.03	Field Testing / Quality Control	7
3.04	Startup / Demonstration	7
3.05	Adjusting / Protection / Cleanup	7

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 OB-144A

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 25 – Operation and Maintenance Manuals

E. Section 01 78 40 – Records in Paper Formats

F. Section 01 78 42 – Records in Electronic Formats

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 in .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 .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 Services 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 OB-144A, 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 .DWG 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. The O&M Manuals shall include all materials used during training, such as lesson plans.

3. 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.

4. 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 & AutoCAD)	4 sets (PDF/A & AutoCAD)	2 sets
Final Copy Shop Drawings	1 set (PDF/A & AutoCAD)	4 sets (PDF/A & AutoCAD)	1 set
Conformed Drawings	1 set (PDF/A & AutoCAD	4 sets (PDF/A & AutoCAD)	NA
Bid Set Drawings	1 set (PDF/A & AutoCAD)	4 sets (PDF/A & AutoCAD)	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 OB-144A

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:

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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 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 OB-144A

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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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 OB-144A

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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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

SECTION 02 24 20 – SOIL SAMPLING AND ANALYSIS
CONTRACT OB-144A

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. 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.

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 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 [must meet] [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). If these criteria cannot be met, such material must meet Section 360.12(d), Case-specific beneficial use determinations - general.

b. Under 6 NYCRR Part 360, Section 360.13, soil may be determined by the Contractor's QEP to be suitable for reuse onsite, without sampling, if any of the following criteria can be satisfied:

1) Excavated material originates from a location outside of the City of New York with no evidence of historical contamination based on site use, reported spill events, or visual and other indications (odors, etc.) of chemical or physical contamination discovered prior to excavation, or that no visual indication of chemical or physical contamination is discovered during excavation, as referenced in Part 360.13(d)(2).

2) "Fill material originates from a location within the City of New York unless the quantity of fill material does not exceed ten cubic yards from one site and the ten cubic yards or less of material does not exhibit historical evidence of contamination based on site use, reported spill events, or visual or other indicators (odors, etc.) of chemical or physical contamination" as referenced in Part 360.13(d)(1).

3) Excavated material used to backfill the same excavation or as grade adjustment in areas of similar physical characteristics on the site of generation under 6 NYCRR Part 360, Section 360.12(c)(1)(iv)(a).

c. Sampling, pursuant to 6 NYCRR Part 360, Section 360.13(d), is required when the above criteria cannot be met as determined by the Contractor's QEP. Fill material samples shall be analyzed for, at a minimum, metals, PCBs/pesticides, and SVOCs as listed in 6 NYCRR Part 375, Subdivision 375-6.8(b) per 6 NYCRR Part 360.13(e)(2)(i) In addition, and only if site conditions warrant, fill material shall also be analyzed for additional parameters as referenced in Part 360.13(e)(2)(ii-iv).

d. Sampling is performed within the planned excavation boundaries at frequencies as defined in 6 NYCRR Part 360, Section 360.13(e)(1), Table 1: Minimum Analysis Frequency for Fill, unless otherwise required by the beneficial use facility / treatment, storage, and disposal facility (TSDF).

e. Analytical data is used to determine acceptable fill material uses (Fill Types 1, 2, 3, 4 and 5), as defined in 6 NYCRR Part 360, Section 360.13(f), Table 2: Fill Beneficial Use.

f. If it is determined by the Contractor's QEP during construction that soils cannot be reused in New York State, additional sampling shall be performed to meet the out-of-state beneficial use facility / TSDF requirements.

g. When sampling is necessary for offsite, 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 if 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 for on-site reuse as per 6 NYCRR Part 360, Section 360.13, or Section 360.12, or 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) When VOC analysis is required, two (2) discrete (biased worst case) VOC samples will 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 on-site per 6 NYCRR Part 360.13(e)(2), if the exemption for onsite reuse of soil does not apply or there are excess soils, shall include the following:

a. Total metals, Semi-volatile organic compounds (SVOCs), Volatile organic compounds (VOCs), and pesticides and herbicides;

b. RCRA characteristics, including ignitability, corrosivity, reactivity, and Toxicity Characteristic Leaching Procedure (TCLP) for metals, SVOCs, VOCs, and pesticides and herbicides;

c. Polychlorinated biphenyls (PCBs); and

d. Asbestos.

e. Volume of physical contaminants, if present.

2. 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.

3. 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

SECTION 02 41 10 – DEMOLITION AND REMOVALS
CONTRACT OB-144A

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, walls, doors, windows, structural steel, metals, roofs, 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

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 monitor the atmosphere inside the aeration tanks, in particular for the presence of hazardous gases, in accordance with the requirements of this Contract and all applicable laws and regulations.

7. The Contractor shall provide adequate fire protection in accordance with local Fire Department requirements.

8. 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.

9. 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.

10. 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.

11. 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.

12. 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.

13. 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.

14. The Contractor shall make such investigations, explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal.

15. 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 accordance 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.

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. Building Demolition:

    a. Unless otherwise approved by the Engineer the Contractor shall: proceed with demolition from the top of the structure to the ground. Complete demolition work above each floor or tier before disturbing supporting members of lower levels.

    b. Demolish concrete and masonry in small sections.

    c. Remove structural framing members and lower to ground by means of hoists, derricks, or other suitable methods.

    d. Break up and remove foundations and slabs-on-grade, unless otherwise shown to remain.

    e. Locate equipment used for demolition work, and remove demolished materials, so as not to impose excessive loads on supporting walls, floors or framing.

    f. Regrade in accordance with Section 31 23 16 - Excavation.

13. 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.

14. 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.

15. 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

SECTION 02 82 05 – ASBESTOS MANAGEMENT
CONTRACT OB-144A

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 on Table Nos. 1-4, 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.

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:

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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.

B. At the completion of abatement activities, the Contractor is responsible for submitting all of the documentation required herein. Payment to abate and dispose of 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.

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

SECTION 02 83 05 – LEAD MANAGEMENT
CONTRACT OB-144A

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 Nos. 1-4, 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.

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. 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:

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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.

B. 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.

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 $\mu g/m^3$ 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 Nos. 1-4, 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.

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. 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. If the material is caulking or has a bitumastic coating, the material shall also be classified as asbestos-containing.

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.

B. Payment for the disposal of 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.

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 OB-144A

PART 1 GENERAL

1.01 SUMMARY

A. This Section details the requirements for construction and demolition activities affecting materials containing mercury, as shown on Table Nos. 1-4, 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.

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.

B. 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.

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

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 OB-144A

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 03 32 00 - Joints in 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 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

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. Structural crack repair material shall be:

1. Sikatop 123 Plus as manufactured by Sika Corp., Lyndhurst, NJ;

2. CR 735 Trowel-Grade Mortar as manufactured by Sto Concrete Restoration Division, Atlanta, GA;
3. Duraltop Gel as manufactured by Tamms Industries, Kirkland, IL;
4. Or an approved equal.

D. 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.

E. 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.

F. Hydrophobic injection grout shall be:

1. Hydro-Active Cut as manufactured by De Neef Construction Chemicals, Houston, TX;
2. Prime Flex 920 as manufactured by Prime Resins, Conyers, GA;
3. Sikafix HH as manufactured by Sika Corp., Lyndhurst, NJ;
4. Or approved equal.

G. 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.

H. 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.

I. Spall repair mortar requiring formwork shall be:

1. Sikatop 111 Plus as manufactured by Sika Corp., Lyndhurst, NJ;

2. CR 730 as manufactured by Sto Concrete Restoration Division, Atlanta, GA;

3. Duraltop Flowable Grout as manufactured by Tamms Industries, Kirkland, IL;

4. Or an approved equal.

J. Waterproof membrane patch sealing system shall be:

1. Sikadur Combiflex as manufactured by Sika Corp., Lyndhurst, NJ;

2. Or an approved equal.

K. Cement based textured coating shall be:

1. Sikatop 144 as manufactured by Sika Corp., Lyndhurst, NJ;

2. Duraltop Coating as manufactured by Tamms Industries, Kirkland, IL;

3. Thoroseal/Acryl 60 as manufactured by Thoro System Products, Folcroft, PA;

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. Structural Crack Repair Material

1. Structural crack repair material shall be a two-component, polymer-modified cementitious mortar and shall conform to EPA/USPHS standards for surface contact with potable water supplies.

F. 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.

G. 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.

H. Rigid Polyurethane Hydrophobic Injection Grout Crack Repair Material

1. Rigid polyurethane crack repair material shall be a one-component, water-activated polyurethane hydrophobic injection grout capable of 700 percent expansion. Polyurethane grout shall form a tough rigid foam seal that is impenetrable to water.

I. 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.

2. All spall repair materials shall conform to EPA/USPHS standards for surface contact with potable water supplies.

J. Spall Repairs Mortar Requiring Formwork

1. All spall repairs requiring formwork shall be repaired using a two-component, polymer-modified cementitious mortar/pea gravel mixture and shall have a minimum 28-day compressive strength of 6000 psi. Each unit of mortar shall be mixed with Saturated Surface Dry (SSD) pea gravel to form the repair material following the manufacturer's recommendations.

2. All spall repair materials shall conform to EPA/USPHS standards for surface contact with potable water supplies.

K. Waterproof Membrane Patch

1. Waterproof membrane patch shall be a hypalon sealing strip secured to the concrete substrate with an epoxy adhesive.

2. Sealing system shall be installed per 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. Structural Crack Repair

1. As directed by the Engineer, all existing structural cracks 1/16 inch and wider to be repaired shall utilize a structural crack repair material. Rout crack to 3/4 inch wide by 3/4 inch deep V-notch to expose sound concrete.

2. Where rebar has deteriorated, crack shall be routed to expose 3/4 inch all around rebar. The resulting void in concrete shall be patched flush with the existing concrete surface using structural crack repair material.

E. 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.

F. Rigid and 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 or hydrophobic 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 or hydrophobic injection grout using pressure injection equipment as directed by the manufacturer.

G. 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.

H. Expansion Joint Repair

1. Remove all sealant and breaker and joint filler.

2. Remove all unsound concrete on the joint faces as directed by the Engineer.

3. Remove all laitance and provide a clean dry surface.

4. Prepare an epoxy mortar by combining epoxy crack repair binder with aggregate following manufacturer's instructions.

5. Restore surface to original dimensions by trowelling epoxy mortar onto the existing substrate in a manner to ensure bonding following manufacturer's instructions.

6. Cure repair following manufacturer's instructions.

7. Replace joint filler and sealant as indicated on the Contract Drawings.

I. Waterproof Membrane Patch

1. As directed by the Engineer, existing concrete areas requiring a textured patch shall be thoroughly cleaned and the waterproof membrane patch applied according to manufacturer's recommendations.

J. Cement Based Textured Coating

1. As directed by the Engineer, existing concrete areas requiring a textured coating shall be thoroughly cleaned and the cement based textured coating applied according to manufacturer's recommendations.

2. All other concrete rehabilitation work as directed by the Engineer shall be completed prior to applying coating.

K. 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 OB-144A

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 00 - 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 00- 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 and, if applicable, ACI 303.

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. Form liners shall be as manufactured by:

1. Dura-Tex; Symons Corporation, Des Plaines, IL.
2. Or approved equal.

F. 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. Inserts

1. Galvanized cast steel or galvanized welded steel inserts, complete with anchors to concrete and fittings such as bolts, wedges and straps shall be provided.

G. 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.

H. 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.

I. 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.

J. 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.

K. 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.

L. Form Liners

1. Form liners shall be provided as specified herein and/or shown on the Contract Drawings.

M. 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. Earth cuts shall not be used as forms for vertical surfaces, unless noted on the Contract Drawings.

3. 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. Forms shall be fabricated for easy removal without hammering concrete surfaces. Provide crush or wrecking plates where stripping may damage concrete surfaces. Provide chamfer strips on external corners of beams, joists, and columns,

3. 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.

4. 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.

5. 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.

6. 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.

7. 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.

8. Edge forms or bulkheads and intermediate screed strips for slabs shall be set to obtain required elevations and contours in the finished slab surface.

9. Forms shall be set sufficiently to prevent joints in wood forms from opening prior to concrete pour.

10. Cutting form ties back from the face of the concrete shall not be permitted.

11. 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.

12. 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.

13. Excess form coating material shall not be allowed to accumulate in the forms.

14. Form coatings shall not be allowed to come in contact with construction joints or reinforcing steel.

15. 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.

16. Wood forms shall be constructed for wall openings to facilitate loosening and to counteract swelling of the forms.

17. All sleeves, inserts, anchors, and embedded items required for adjoining work or for support of joining work shall be placed prior to concreting.

18. Architectural Formwork:

    a. Form liners and rustication strips shall be installed in strict accordance with the manufacturer's written instructions and recommendations. The ends of the form liner pattern shall be clogged and all form joints and edges shall be taped using 1/8-inch thick by 3/4-inch wide foam tape centered on the joints, then caulked in accordance with the manufacturer's recommendations each time forms are set. A representative of the manufacturer shall be present at the site to supervise the installation of the form liner for the entire project.

    b. Forms for smooth concrete shall be installed in such a manner that there will be no horizontal form joints, and the forms shall be aligned so that vertical joints occur only at "V-Groove" rustications. Form ties shall be spaced in a uniform pattern vertically and horizontally. Form ties shall be positioned in smooth concrete bands and in panels between "reveal" rustications, if any.

    c. Beam and girder soffits shall be erected in accordance with ACI 117 and sufficiently braced, shored, and wedged to prevent deflection. Column sides shall be clamped in accordance with this specification with metal column clamps, spaced according to the manufacturer's directions.

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 00 - 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

NO TEXT ON THIS PAGE

SECTION 03 21 00 – REINFORCING STEEL
CONTRACT OB-144A

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.	AWS D1.4	-	Structural Welding Code - Reinforcing Steel
5.	ASTM A82	-	Steel Wire, Plain, for Concrete Reinforcement
6.	ASTM A184	-	Fabricated Deformed Steel Bar Mats 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.	ASTM A767	-	Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
15.	ASTM A775	-	Epoxy-Coated Reinforcing Steel Bars.
16.	CRSI DA4	-	Concrete Reinforcing Steel Institute Manual of Standard Practice
17.	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 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. Provide accurate templates for column dowels to secure their position and to ensure their proper placement in concrete, unless otherwise approved by the Engineer.

1. To obtain approval to place column dowels without using templates, the Contractor must submit:

a. Request for such approval with details on how column dowels will be secured in their position; and

b. Placing drawings as specified herein.

2. The Engineer reserves the right to grant approval to place column dowels without using templates based on review of the placing drawing submittal. The Engineer's determination on use of templates will be final, and the Contractor shall abide by such determination.

F. 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.

1. Reinforcement coating shall be removed in the area of the mechanical connection, if so required by the connection manufacturer.

2. After installation of mechanical connections on zinc-coated (galvanized) or epoxy-coated reinforcing bars, coating damage shall be repaired in accordance with the requirements of this Section. All external parts of mechanical connections used on coated bars, including steel splice sleeves, bolts and nuts shall be coated with the same material used for repair of coating damage.

G. 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.
    5. Description of reinforcing weld locations and weld procedures.

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 for placement of column dowels without the use of templates.
    5. 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. Coating damage zinc-coated (galvanized) reinforcing bars due to handling, shipping and placing shall be repaired in accordance with the requirements of this Section.

C. Equipment for handling epoxy-coated reinforcing bars shall have protected contact areas. Bundles of coated bars shall be lifted at multiple pickup points to prevent bar-to-bar abrasion from sags in the bundles. Coated bars or bundles of coated bars shall not be dropped or dragged. Coated bars shall be stored on protective cribbing. Coating damage due to handling, shipping and placing shall be repaired in accordance with the requirements of this Section.

D. 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.

E. Reinforcing steel shall at all times be protected from conditions conducive to corrosion until concrete is placed around it.

F. 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. 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. 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, 03 41 00 - Precast Structural Concrete, 03 45 00 - Precast Architectural Concrete and the New York City Building Code.

2. Coated Reinforcing Bars:

a. Furnish and install coated reinforcing bars for structural concrete Work wherever shown and/or noted on the Contract Drawings.

b. Reinforcing bars shall be zinc-coated (galvanized) or epoxy-coated. The reinforcing bars to be coated shall conform to the requirements of this Section.

1) Zinc-Coated (Galvanized) Reinforcing Bars: Zinc-coated (galvanized) reinforcing bars shall conform to ASTM A767. Supplementary requirements S1 and S2 shall apply when fabrication after galvanization includes cutting and bending. Supplementary requirement S2 shall apply when fabrication after galvanization includes only bending. Repair of damaged zinc coating when required shall be made with a zinc-rich formulation conforming to ASTM A767. Repair shall be done in accordance with the material manufacturer's recommendations.

2) Epoxy-Coated Reinforcing Bars: Epoxy-coated reinforcing bars shall conform to ASTM A775. Coating damaged due to shipping, handling and placing need not be repaired in cases where the damaged area is 0.1 square inches or smaller. Repair damaged areas larger than 0.1 square inches with patching material conforming to ASTM A775 and in accordance with the material manufacturer's recommendations. The maximum amount of damage including repaired and unrepaired areas shall not exceed 2 percent of the surface area of each bar. Fading of the coating color will not be cause for rejection of epoxy-coated reinforcement.

3. Bar Mats:

a. Furnish and install bar mats for structural concrete Work where shown and/or noted on the Contract Drawings.

b. Bar mats shall be of the clipped type conforming to ASTM A184 and shall be fabricated from reinforcing bars that conform to the requirements of this Section.

1) Bar mats shall be fabricated from zinc-coated (galvanized) reinforcing bars. Metal clips shall be zinc-coated (galvanized). Non-metallic clips may be used. Coating damage at the clipped intersections shall be repaired in accordance with the requirements of this Section.

2) Bar mats shall be fabricated from epoxy-coated reinforcing bars. Metal clips shall be epoxy-coated. Non-metallic clips may be used. Coating damage at the clipped intersections shall be repaired in accordance with the requirements of this Section.

4. 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.

5. 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.

6. Spirals:

a. As indicated in the Contract Documents, spirals shall be fabricated from reinforcing bars or wire.

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. Coated Wire Reinforcement Supports

1. Epoxy-Coated Reinforcement:

a. Use wire reinforcement supports coated with dielectric material including epoxy or other polymer for a minimum distance of 2 inches from the point of contact with epoxy-coated reinforcement.

2. Zinc-Coated Reinforcement:

a. Use galvanized wire reinforcements supports or wire reinforcement supports coated with dielectric material with zinc-coated reinforcement.

D. Precast Concrete Reinforcement Supports

1. Concrete supports used for supporting reinforcement shall be not less than 4 inches square having a compressive strength equal to or greater than the specified compressive strength of the concrete being placed.

E. 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, welding of crossing bars (tack welding) for assembly 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.

3. After completion of welding on zinc-coated (galvanized) or epoxy-coated reinforcing bars, coating damage shall be repaired in accordance with the requirements of this Section. All welds and all steel splice members when used to splice bars shall be coated with the same material used for repair of coating damage.

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:	±1/4
a. Members 8 inches deep or less	-1/4, +1/2
b. Members more than 8 inches deep but less than 24 inches deep	1/4, +1
c. Members 24 inches deep or greater	
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:	
1) No. 5 bars and smaller	1-1/2
2) No. 6 through No. 18 bars	2

Item	Minimum Cover, Inches
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:	
1) Stirrups and ties	2
2) Principal reinforcement	2-1/2
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
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. For bundled bars, minimum concrete cover shall be equal to the equivalent diameter of the bundles but need not be greater than 2 inches; except for concrete deposited against and permanently in contact with ground, minimum cover shall be 3 inches. The equivalent diameter of the bundle shall be based on a single bar of a diameter derived from the equivalent total area.

4. Unless otherwise indicated on the Contract Documents, reinforcement supported from the ground or mud mat shall rest on precast concrete blocks not less than 4 inches square and having a compressive strength equal to or greater than the specific compressive strength of the concrete being placed. Other means of support may be used if accepted by the Engineer.

5. 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.

6. Zinc-coated (galvanized) reinforcing bars supported from formwork shall rest on galvanized wire bar supports coated with dielectric material or on bar supports made of dielectric material or other acceptable materials. All other reinforcement and embedded steel items in contact with galvanized

reinforcing bars or within a minimum clear distance of 2 inches from galvanized reinforcing bars unless otherwise required or permitted shall be galvanized.

7. Epoxy-coated reinforcing bars supported from formwork shall rest on coated wire bar supports or on bar supports made of dielectric material or other acceptable materials. Wire bar supports shall be coated with dielectric material for a minimum distance of 2 inches from the point of contact with the epoxy-coated reinforcing bars. Reinforcing bars used as support bars shall be epoxy coated. In walls having epoxy-coated reinforcing bars, spreader bars, where specified, shall be epoxy coated. Proprietary combination bar clips and spreaders used in wall with epoxy-coated reinforcing bars shall be made of corrosion-resistant material or coated with dielectric material.

8. Zinc-coated (galvanized) reinforcing bars shall be fastened with zinc-coated tie wire or non-metallic-coated tie wire or other acceptable materials.

9. Epoxy-coated reinforcing bars shall be fastened with nylon-epoxy or plastic-coated tie wire; or other acceptable materials.

10. 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.

11. 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.

3. When zinc-coated (galvanized) or epoxy-coated reinforcing bars are field bent, coating damage shall be repaired in accordance with the applicable requirements of the Section.

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

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. 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 207.1R Guide to Mass Concrete

4. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete

5. ACI 214R Guide to Evaluation of Strength Test Results of Concrete

6. ACI 301 Specifications for Concrete Construction

7. ACI 302.1R Guide to Concrete Floor and Slab Construction

8. ACI 304R Guide for Measuring, Mixing, Transporting and Placing Concrete
9. ACI 305R Guide to Hot Weather Concreting
10. ACI 306R Guide to Cold Weather Concreting
11. ACI 308.1 Specification for Curing Concrete
12. ACI 309R Guide for Consolidation of Concrete
13. ACI 311.4R Guide for Concrete Inspection
14. ACI 318 Building Code Requirements for Structural Concrete and Commentary on Building Code Requirements for Structural Concrete
15. ACI 350 Code Requirements for Environmental Engineering Concrete Structures and Commentary
16. ACI 347R Guide to Formwork for Concrete
17. ACI 506R Guide to Shotcrete
18. ACI 506.2 Specification for Shotcrete
19. ACI MNL-2 ACI Manual of Concrete Inspection
20. 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 C845 Standard Specification for Expansive Hydraulic Cement
28. ASTM C 881 Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
29. ASTM C 882 Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear
30. ASTM C 979 Standard Specification for Pigments for Integrally Colored Concrete
31. ASTM C 989 Standard Specification for Slag Cement for Use in Concrete and Mortars
32. ASTM C 1064 Standard Test Method for Temperature of Freshly Hydraulic-Cement Concrete
33. ASTM C 1077 Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
34. ASTM C 1141 Specification for Admixtures for Shotcrete
35. ASTM C 1157 Standard Performance Specification for Hydraulic Cement
36. ASTM C 1240 Standard Specification for Silica Fume Used in Cementitious Mixtures
37. ASTM C 1260 Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
38. ASTM C1293 Standard Test Method for Determination of Length Change of Concrete due to Alkali-Silica Reaction
39. 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
40. ASTM C 1480 Packaged, Pre-Blended, Dry, Combined Materials for Use in Wet or Dry Shotcrete Application
41. ASTM C 1567 Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
42. ASTM C1602 Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete

43. 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. National Ready Mixed Concrete Association (NRMCA)

I. New York State Department of Transportation (NYS DOT) - Standard Specifications

J. Portland Cement Association (PCA) – "The Design and Control of Concrete Mixtures"

K. Definitions

1. 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.

2. 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.

3. 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.

4. 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.

3. Class 45 - use for all concrete unless indicated otherwise.
    a. Class 45 concrete with a corrosion inhibitor and crystalline waterproofing in the mix design.
4. Class 45F - use as an alternate to Class 45 for:
    a. Foundations
    b. Walls greater than or equal to 18 inches in thickness
5. Class 45PG – use for non-structural applications.
6. Class 45M - use for mass concrete.
7. Class 45HES- use for High Early Strength concrete, minimum 4,500 psi at 7 days with corrosion inhibitor and crystalline waterproofing.

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 except Class 45M.

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 ±3 degrees F and 50 percent ±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.

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 for underwater placement.

10. Proposed method of measuring concrete surface temperature changes.
11. Detailed procedures and materials for repair of defective concrete.
12. Detailed procedures for removing stains, rust, efflorescence, and surface deposits.
13. Materials and procedures to be used to plug tie holes, other than for Portland cement mortar.
14. 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.
15. 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.
16. 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.

3. Crystalline waterproofing shall be one of the following:

a. ADMIX as manufactured by Penetron International, East Setauket, NY;

b. Sika WT-215P as manufactured by Sika Corp., Lyndhurst, NJ;

c. MasterLife 300 C or 300D or 300L as manufactured by Master Builders Solutions, MBCC Group, Beachwood, OH;

d. Krystol Internal Membrane (KIM) as manufactured by Kryton, Vancouver, British Columbia, Canada;

e. Xypex C-Series as manufactured by Xypex, Richmond, British Columbia, Canada;

f. 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. All materials used in concrete or the curing and repair of concrete, which can contact potable water, shall be certified as meeting the requirements of ANSI/NSF 61 for contact with potable water when in the finished concrete.

B. Materials listed in this Section apply to all concrete unless specified otherwise in the Contract.

C. Cementitious Materials
1. Cement:
    a. Portland cement, Blended hydraulic cement, ASTM C595 Type IL (5-15” limestone). 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.

c. Fly ash and natural pozzolans used in concrete that contacts potable water shall be certified as meeting the requirements of ANSI/NSF 61.

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.

d. GGBF slag used in concrete that contacts potable water shall be certified as meeting the requirements of ANSI/NSF 61.

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.

D. 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. 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.

   f. The requirements of Article 2.02, Paragraph D.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).

E. 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.

F. 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.

G. 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.

H. 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.

I. 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.

J. 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.

K. 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. The mix design shall be submitted using the Mix Design Submittal Form at the end of this Section.

2. 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

3. 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.
4. 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. Shrinkage limitations shall not apply to Class 25 and 40LW concrete, unless indicated otherwise.
   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.
5. 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.
6. 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 are 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 performs 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. Free fall of concrete should not be more than 3-4 feet.

d. Place concrete for beams, girders, brackets, column capitals, haunches, and drop panels at the same time as concrete for slabs.

e. When underwater placement is required or permitted, place concrete by a method acceptable to the Engineer. Deposit the fresh concrete so the concrete enters the mass of the previously placed concrete from within, displacing water with a minimum disturbance to the surface of the concrete.

f. 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.

g. Self-Supporting Floors and Roofs:

1) Reinforced Concrete Beams and Girders shall be cast monolithically with adjoining arches.

2) Canopies, Cornices and Marquees shall be monolithically cast with floor arches, with profiles true to indicated contours. Top surfaces of canopies and marquees shall be pitched to drain. Exposed soffits and edges shall be rubbed with carborundum stone and left clean and true.

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. 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.

b. 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.

c. Joints receiving an adhesive shall have been prepared and adhesive applied in accordance with the manufacturer's recommendations prior to placing of fresh concrete.

d. 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. Concreting Under Water:

a. Placing concrete in water will be permitted only when approved by the Supervising Engineer for Concrete Construction. Concrete deposited under water shall be carefully placed in a compacted mass in final position by means of a tremie, a closed bottom dump bucket or other approved means, and shall not be disturbed after being deposited. Special care must be exercised to maintain still water at the point of deposit. Concrete shall not be placed in running water. Underwater formwork shall be reasonably watertight. The consistency of the concrete shall be carefully regulated and special care shall be exercised to prevent segregation of materials. The method of depositing concrete shall be regulated to produce approximately horizontal surfaces.

b. When a tremie is used, it shall consist of a tube having a diameter of not less than 10 in. and constructed in sections having flanged couplings fitted with gaskets. The tremie shall be supported to permit free movement of the discharge end over the entire top surface of the work and shall permit rapid lowering when necessary to choke off or retard the flow. The discharge end shall be entirely sealed at all times and the tremie tube kept full to the bottom of the hopper. When a batch is dumped into the hopper, the tremie shall be slightly raised, but not out of the concrete at the bottom, until the batch discharges to the bottom of the hopper. The flow shall then be stopped by lowering the tremie. The flow shall be continuous until the pour has been completed.

c. When a bucket is used to place concrete in water, it shall have a capacity of not less than 1/2 cubic yard.

7. 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.

8. 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. Mass Concrete

1. Concrete sections 4 feet or more in the least dimension are termed mass concrete and shall conform to the special provisions of this article in addition to all applicable provisions of other articles in this Section. Mass concrete proportioning, placement, consolidation and curing shall be in accordance with ACI 304R, 309R, 211.1, and 207.1R.

2. Additional requirements for heating, cooling, curing and protecting concrete sections more than 6 feet in the least dimension shall be as specified in the Contract. Consideration shall be given to temperature rise caused by the hydration of the cement. Large differences in temperature within the concrete shall be avoided.

3. Proportioning and Mix Design:

a. Materials and mix proportioning for mass concrete shall be in accordance with ACI 207.1R - Mass Concrete, latest edition. Type III Portland cement and accelerating type admixtures shall not be used.

b. Selection of concrete aggregates for mass concrete is of paramount importance to the quality of the concrete and to the economy and durability of the structure. Aggregates shall conform to the requirements of ASTM C 88 and C 227. Aggregate size shall be in accordance with ASTM 467.

c. The selection of the mix design should recognize that serious volume change stresses can be avoided by controlling the temperature drop of the concrete from the maximum to ambient. Avoidance of thermal shock is important in preventing surface cracks due to temperature gradients. The maximum internal temperature will depend upon the initial concrete temperature and the type and quantity of cementitious materials used.

d. Mixes shall be designed using types and amounts of cement which will reflect lower internal temperatures. Optimum cement is only obtainable by aggregate proportioning that reduces the volume of the void spaces and depends upon

aggregate gradation. Minimum cement factors with maximum size aggregate, air entrainment and low water cement ratios should be used, to produce workable concrete and the specified strength.

4. Placement:

   a. Concrete with lower than usual slump may be used, provided it can be properly placed and consolidated.

   b. Placing Temperatures - Unless otherwise permitted or specified, the temperature of the concrete when deposited at the point of placement shall not exceed 70 degrees F, nor be less than 35 degrees F. When the temperature of the surrounding air is expected to be below 40 º F during placing, or within 24 hours thereafter, the temperature of the concrete when deposited at the point of placement shall be in accordance with ACI 306R.1.

   c. Concrete shall not be placed until the installation of the temperature monitoring system has been inspected and approved by the Engineer and adequate materials for the curing and thermal protection of the concrete are on the site.

5. Curing and Protection:

   a. The curing period shall be a minimum of 14 days.

   b. Temperature Monitoring:

      1) Thermocouples or thermistors shall be installed in mass concrete placements in sets of two located on a grid at a maximum spacing of 25 feet on center in each direction and no closer than 6 feet from any edge or 4 feet from any opening. One thermocouple shall be placed at mid-depth of the concrete placement and the second thermocouple shall be located directly above the first and 2 inches below the surface. Additional thermocouples shall be placed at exposed edges of concrete placements at 50 feet on center, at mid-depth, and 2 inches beneath the surface. Where cooling pipes are installed, thermocouples shall be located mid-way horizontally between the pipes.

      2) Each wire lead shall extend a minimum of 6 feet out of the concrete and shall be securely labeled with the location of the corresponding sensor and a tracking number.

3) Placement plans showing all temperature sensors and manufacturer's installation instructions and operating manuals for all related equipment shall be submitted to the Engineer for approval prior to concrete placement.

4) Temperature monitoring shall continue during the curing period and until the internal temperature is within 25 degrees F of the ambient air temperature following the end of the curing period.

c. Thermal Control:

1) At mass concrete placements, the curing water added shall not be colder than 30 degrees F below the interior temperature of the concrete. If necessary, curing water shall be heated.

2) For mass concrete, large differentials of temperature between the interior of the concrete and the exterior of the concrete shall be avoided. The maximum allowable temperature differential between the interior of the concrete (core) and the exterior of the concrete (surface) shall not be more than 35 degrees Fahrenheit. When the difference in temperature between the core and the surface (horizontal or vertical) exceeds 30 degrees Fahrenheit, insulation blankets shall be added in 1/2 inch layers as needed to prevent the difference from increasing. Joints in insulation blankets shall be staggered a minimum of 12 inches at adjacent layers. Insulation blankets shall be placed over curing mats and moisture retaining cover. If the addition of layers of insulation are not sufficient to limit the temperature gradient to 35 degrees Fahrenheit, the concrete placement shall be tented and heat shall be applied as needed to control the temperature gradient.

3) Thermal controls and protection shall be maintained until the interior concrete temperature is less than 35 degrees Fahrenheit greater than the average daily ambient air temperature.

4) The rate of cooling within the interior of the concrete shall be regulated to control the temperature drop to not more than 1 degree Fahrenheit in any period of one hour and 10 degrees Fahrenheit in any 24-hour period.

5) Where insulation blankets are provided over mass concrete, at the end of the curing period they shall be

removed one layer at a time at such a rate that the temperature differential between the core and the surface never exceeds 35 degrees Fahrenheit and the cooling rate specified above is not exceeded, but not more than one layer in an 8 hour period.

E. 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.

c. Concealed Form Surfaces: Repair defects on concealed form surfaces that affects durability and structural soundness as directed by the Engineer.

d.

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.

e. Repairs to surfaces exposed to public view shall match the color and texture of surrounding concrete.

f. Provide test areas at inconspicuous locations to verify mixture, texture and color match before proceeding with the patching.

g. Structural cracks shall be pressure grouted using epoxy injection in accordance with the manufacturer’s directions and recommendations.

h. Non-structural cracks shall be pressure grouted using hydrophilic resin in accordance with the manufacturer’s directions and recommendations.

i. 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.

j. 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. Structural cracks shall be pressure grouted using an epoxy injection system. Apply in accordance with the manufacturer's directions and recommendations.

e. 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.

f. 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.

F. Shotcrete

1. Shotcrete is concrete or mortar pneumatically projected at high velocity onto a surface. Shotcrete proportioning, placement, curing and testing shall be in accordance with NYCBC Section 1911, where applicable.

2. For projects where NYCBC is not applicable, ACI 506R and 506.2 guidelines shall be followed.

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.

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.

3)

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.	

4) 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

END OF SECTION

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

Classes of Concrete	Coarse Aggregate Sizes (ASTM C 33)			Minimum Cementitious Materials (lbs/cu yd.)	Cement Type (ASTM C 150)	Mineral Admixtures (%)		W/(C + P) Maximum	Specified Strength (psi)	
	A	B	C			A	B		fc minimum field condition	f_{cr} minimum for mix design See FN3
50	#67 (3/4" to No. 4)	#8	---	550	III	See FN 1	---	0.42	5,000 at 28 days	6,200 at 28 days
45	#57 (1" to No. 4)	#8	---	525	II	---	---	0.42	4,500 at 28 days	5,850 at 28 days
45F	#4 (1.5" to 3/4")	#67	#8	525	II	See FN 2	---	0.41	4,500 at 56 days	5,850 at 56 days
40LW	3/4" to No. 4	---	---	525	I or II	---	---	0.45	4,000 at 28 days	5,200 at 28 days
45PG	3/8" to No. 16	#8	---	660	II	---	---	0.40	4,500 at 28 days	5,850 at 28 days
25	#57 to #67	---	---	376	II	See FN 2	---	0.60	2,500 at 28 days	3,500 at 28 days

Note: Concrete containing coarse aggregate smaller than #67 shall only be used with the approval of the Engineer.

Footnotes (FN) to Table 1:

1. At the Contractor's option, and as approved by the Engineer, up to 15% fly ash and 20% GGBF may be used in Class 50 concrete that will not be in contact with potable water.
2. At the Contractor's option, and as approved by the Engineer, up to 15% fly ash and 20% GGBF may be used in Class 25 and Class 45F concrete that will not be in contact with potable water.
3. Minimum $\mathbf{f_{cr}}$ 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.

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 COAP 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

- 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 OB-144A

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. 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.

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 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 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.

H. Injection Hose Waterstops shall be:

1. Fuko Injection System, as manufactured by BBZ USA Inc., St. Louis, MO.
2. Sika Swell Hose as manufactured 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.

I. Injection Hose Water Stop

1. Injection hose shall consist of a PVC or neoprene central core of sufficient strength to resist the weight of a minimum of 25 feet of fresh concrete placed upon it. Injection openings shall be provided closely spaced along the length of the hose and in a minimum of three (3) locations equally spaced around the perimeter of the hose. The openings shall be sealed by

strips of closed cell foam of a consistency to act as one-way valves preventing entrance of cement paste while allowing free flow of injection material, pumped through the hose, into the concrete joint surface.

2. Injection hose system shall be appropriate for the injection of hydrophilic injection resin. The hose shall allow for vacuuming operations and repeated use. The construction of the hose shall permit free discharge of the specified injected grout into the concrete without backwash, for the entire length of the hose.

3. Injection hose system shall be complete with hold-down clips, connection tubes, fittings and injection connections designed to be mounted flush with the concrete surface and sealed to allow for future injections. All components of the system shall be provided by the same manufacturer.

4. Injection Hose Waterstops 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 00 – 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. When placing concrete is suspended, provisions shall be made for joining future work before the placed concrete has taken its initial set.

4. Maximum distance between horizontal joints in slabs and vertical joints in walls shall be 45'-0" unless otherwise indicated on the Contract Drawings.

5. 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.

6. 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.

7. All reinforcing steel and welded wire fabric shall be continued across joints. Inclined dowels shall be provided as detailed or directed by the Engineer.

8. 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.

9. 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 joints exposed to the weather shall be sealed with a hot poured "para-plastic" rubberized asphalt sealing compound conforming to ASTM D1190. Joints shall be sealed within 14 days of installment.

4. 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.

5. 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.

G. Injection Hose Waterstop

1. The injection hose shall be installed in maximum lengths of 40 feet and shall be located as shown on the Contract Drawings. The hose shall be clamped into position with anchor clips spaced approximately 6 to 10 inches apart.

2. The concrete surface shall be cleaned of stones and debris prior to installation of injection hose. The injection hose shall be installed in direct contact with the face of concrete at the construction joint to prevent floating of the hose in the freshly placed concrete.

3. Where injection hose is used in combination with PVC waterstop, the hose shall overlap the PVC waterstop for a minimum of 6 inches and shall be less than 2 inches away from the PVC.

4. The injection procedure shall be performed in strict conformance with the manufacturer's recommendations. The injection shall be made by an authorized applicator as recommended by the injection system supplier.

5. The injection system supplier or his approved representative shall provide the necessary supervision to satisfy the Engineer that the application conforms strictly to the manufacturer's recommendations.

6. The injector hose and opposite hose vent for each hose length shall be terminated in the injection boxes mounted on the dry side of the wall. At the end of the injection operation, the hose shall be cleaned in accordance with the procedure recommended by the manufacturer. The injection ends and the vents shall be plugged and the box covered leaving the system ready for reinjection in the event that the joint is leaking.

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

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 303R - Guide to Cast-in-Place Architectural Concrete Practice
5. ACI 308.1 - Specification for Curing Concrete
6. ACI 318 - Building Code Requirements for Structural Concrete
7. ACI 303R - Guide to Cast-in-Place Architectural Concrete Practice
8. ACI 347R - Guide to Formwork for Concrete
9. ISO 14025 - Environmental labels and declarations - Type III environmental declarations

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Erect, on the site where directed, a full size mock-up of a cast-in-place wall or panel a minimum of 4 feet high, 4 feet from the corner on two sides, 12 inches thick or as shown in the Contract Drawings conforming to ACI 303R.

1. Reinforce the panel as shown in the Contract Drawings. Use form ties the same as those approved and with the form tie pattern similar to that approved. Use one face for the panel for smooth architectural concrete including “reveal” rustication with form joints, and the opposite face for form liner concrete.
2. Plug the tie holes as specified to determine the correct mortar mixture to match the panel color. If required, remove and replace tie hole plugging mortar until an acceptable color match is obtained. After the sample panels have been approved, intentionally damage and patch portions of the finish surface of the panels for the purpose of determining the correct mixture for patching mortar and patching technique to match the original panel color and surface.
3. Leave the approved mock-up on the job during construction as the standard of workmanship for the project. Remove mock-up form the premises after completion of the work.

B. 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 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.

C. Non-Slip Shake-On Aggregate and abrasion resistant floor hardener:

1. Non-slip abrasion resistant floor hardener shall be:

a. Duraltex 1805 with Duraltex 1807 or broadcast silica sand as manufactured by Euclid Chemical Company, Cleveland, OH;

b. Amorseal 8100 with Armorseal Hi-Wear Additive as manufactured by Sherwin Williams, Cleveland, OH;

c. Or approved equal.

2. Non-slip shake-on aggregate shall be:

a. MasterTop 120 SR (formerly Frictex NS) as manufactured by Master Builders Solutions by BASF, Florham Park, NJ;

b. Sikafloor 2 Syn Top as manufactured by Sika, Lyndhurst, 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.

C. Non-Slip and Abrasion Resistant Floor Hardener:

1. Non-slip abrasion resistant floor hardener for application for new concrete to harden and provide a non-slip walking surface, even when wet. The floor system shall contain flakes or broadcast 20/40 mesh silica sand for traction.

2. Shake-on aggregate floor hardener designed for application to freshly cast concrete to harden and densify the surface for resistance to wear and abrasion.

a. Product shall be a non-slip and non-rusting aggregate.

b. Non-slip aggregate shall NOT be permitted if the base concrete mix design uses air entraining agents (exceeds 3%), fly ash, slag, fibers,

water reducers, accelerators or retarders. These admixtures severely diminish and slow the availability of bleed water.

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.

a. Type I - Rough or Board Form Finish: All fins, burrs and other projections left by the forms shall be removed. All holes left by removal of ties, and all other holes, depressions, or voids shall be filled solid with cement grout after first being thoroughly wetted. Honeycombs shall be chipped back to solid concrete as directed, prior to patching with cement grout. Holes shall be filled with a small tool that will permit packing the hole solidly with cement grout. Cement grout shall consist of one part cement to three parts sand, and the amount of mixing water shall be as little as consistent with the requirements of handling and placing. Color of cement grout shall match the adjacent wall surface. The surface shall be thoroughly cleaned of all stains or discolorations that will interfere with the final finish.

b. 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.

c. Type III - Grout Cleaned: Where this finish is required, it shall be applied after completion of Type II finish. After the concrete has been predampened, a slurry consisting of one part cement (including an appropriate quantity of white cement in order to produce a color matching the surrounding concrete) and 1-1/2 parts sand passing the No. 30 sieve, by damp loose volume, shall be spread over the surface with clean burlap pads or sponge rubber floats and scrubbed into the surface using a rotary motion. Any surplus material shall be removed by scraping and then rubbing with clean burlap. The finish shall be kept damp for at least 36 hours after application.

d. Type IV - Smooth Rubbed: Where this finish is required, it shall be applied after the completion of the Type II finish no later than one day following form removal. Nor rubbing shall be done before the concrete is thoroughly hardened and the mortar used for patching is firmly set. A smooth, uniform surface shall be obtained by wetting the surface and rubbing it with a carborundum stone to eliminate irregularities. Unless the nature of the irregularities requires it, the general surface of the concrete shall not be cut into. Corners and edges shall be slightly rounded by the use of the carborundum stone. Brush finishing or painting with grout or neat cement will not be permitted.

e. Type V - Textured: Use textured forms or textured form liners of plastic, wood, or sheet metal. Secure liner panels in forms by cementing or stapling, not by methods which will permit impressions of nail heads, screw heads, washers, or the like to be imparted to the surface of the concrete. Seal edges of textured panels to each other or to divider strips to prevent bleeding of cement paste. Use a sealant that will not stain the concrete surface.

f. Type VI - Aggregate transfer: Produce aggregate transfer and other special finished that duplicate mock-ups or sample panels prepared in advance and accepted.

g. Type VII - Exposed Aggregate: Expose aggregate using one of the following methods. Provide a concrete surface that will duplicate a mock-up or a sample panel prepared in advance and accepted.

1) For a scrubbed finish, cast concrete against form faces which have been coated with a chemical retarder used in accordance with the manufacturer's recommendations. Wet the partially hardened concrete surface thoroughly and scrub

with fiber or wire brushes, using water freely until the surface mortar is removed and the aggregate is uniformly exposed. Then rinse the surface with clear water. If portions of the surface have become too hard to permit uniform aggregate exposure, use dilute hydrochloric acid (one part commercial muriatic acid diluted with 4 to 10 parts water) to remove the excess surface mortar after the concrete is at least 2 weeks old. Remove the acid from the finished surface with clean water within 15 minutes after application.

2) For a blast finish, sandblast or waterblast the concrete surface to a degree sufficient to expose fine aggregates with occasional exposure of coarse aggregate, and to produce a uniform color with a maximum reveal of 1/16 inch unless specified otherwise in the Contract Documents. All surfaces with the same specified blast finish shall be done at approximately the same time after placing co concrete. Use stainless steel or plastic reinforcement supports and spacers near concrete surfaces to be blasted. Protect adjacent materials and inserts during blasting operations.

3) For a tooled finish, dress the thoroughly cured concrete surface with electric, air, or hand tools to a uniform texture removing surface mortar as specified in the Contract Documents. Then provide the surface with a hand tooled, rough or fine pointed, crandalled, or bush-hammered surface texture, as specified by Contract Documents.

h. Type VIII - Applied: When finishes of stucco, cementitious coatings, or similar troweled materials are required or permitted, prepare the surface of the concrete to ensure permanent adhesion of the finish. If the concrete is less than 24 hours old, roughen it with a heavy wire brush or scoring too. If the concrete is older, roughen the surface mechanically or by acid etching. After roughening, wash the surface free of all dust, acid, chemical retarder, and other foreign material before any final finish is applied.

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 "A" - Screeded: This finish shall be obtained by placing screeds at frequent intervals and striking off to the surface elevation required.

b. Type "B" - Scratched: Following completion of Type "A" finish, roughen the surface with stiff brushes or rakes before final set.

c. Type “C” - Floated: Following completion of Type “A” finish, do not work the concrete further until it is ready for floating. Begin floating with a hand float, a bladed power float equipped with float shoes, or a powered disc float as soon as the water sheen had disappeared and the surface has stiffened sufficiently to permit the operation. During or after the first floating, check flatness of surface with a 10 ft straightedge applied in two or more directions. Eliminate high spots and low spots during this procedure to produce a conventional, straight edge finish, then refloat the slab immediately to a uniform texture.

d. 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.

e. Type “E” - Broom or Belt: This finish shall provide the surface with a transverse scored texture by drawing a broom or burlap belt across the surface immediately after completion of a Type “C” finish.

f. Type “F” - Liquid Hardened Finish: Liquid hardened finish shall be provided by application of a liquid floor hardener. Floors to receive this finish shall have previously received a Type “D” finish. Liquid hardener shall be applied between 30 to 60 days after concrete placement. Surface to be treated shall be dry, clean and free of all loose dust, dirt, oil, wax, sealers and curing compounds. Application procedure shall be in accordance with manufacturer's instructions and shall consist of a three-coat treatment.

g. Type “G” - Dry Shake Hardened Finish: Aggregate hardened finish shall be provided by applying an aggregate floor hardener concurrently with the application of a Type “D” finish. Application procedure shall be in accordance with manufacturer's instructions.

h. Type “H” - Non-Slip Finish: This finish shall be provided by applying a non-slip shake-on aggregate concurrently with the application of a Type “D” finish. Application procedure shall be in accordance with manufacturer's instructions.

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
Architectural finish	V, VI, VII, or VIII as indicated in the contract documents
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
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 60 00 – GROUTING
CONTRACT OB-144A

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 05 05 23.01 – WELDING
CONTRACT OB-144A

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 OB-144A

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 23.01 - Welding
2. 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 B 348 - Titanium and Titanium Alloy Bars and Billets.
6. ASTM D 1785 - Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120.
7. ASTM E 488 - Standard Testing Method for Strength of Anchors in Concrete Elements
8. ASTM E 1109 - Test Method for Strength of Power-Actuated Fasteners Installed in Structural Members
9. ASTM E 1512 - Test Method for Testing Bond Performance of Bonded Anchors
10. ASTM F 436 - Specification for Hardened Steel Washers Inch and Metric Dimensions
11. ASTM F 467 - Nonferrous Nuts for General Use.
12. ASTM F 593 - Stainless Steel Bolts; Hex Cap Screws, and Studs.
13. ASTM F 594 - Stainless Steel Nuts.
14. ASTM F 1554 - Specification for Anchor Bolts, Steel, 36, 55 and 105 ksi Inch and Metric Dimensions
15. 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)

1. AWS D1.1- Structural Welding Code - Steel
2. AWS D1.2- Structural Welding Code - Aluminum
3. AWS D 1.6 - Structural Welding Code – Stainless Steel

E. 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

F. New York City Building Code (NYCBC)

G. NYC Buildings Bulletin 2009-019

H. 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

I. 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
2. AWS D1.2 for Aluminum
3. AWS D1.6 for Stainless Steel.
4. Inadequate welds shall be corrected or redone and retested to the satisfaction of the Engineer, at no additional cost to the City.

C. Fasteners and concrete anchors will be inspected in accordance with the Inspection Article in Part 3.

D. Manufacturer's load tables and certified performance tests for titanium bolts shall be provided.

E. Provide two (2) samples per lot of 100 for material conformance verifications.

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.

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

Table 1 Allowable Tensile Capacity (Kips) for Standard Manufacturer Embedment		
Size	Concrete Anchors Wedge Type	Concrete Anchors with Injection Adhesive System
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.

2. Electrodes for welding aluminum shall comply with the Aluminum Association Specifications and AWS D1.2.

3. Electrodes for welding stainless steel and other metals shall comply with AWS A5.4.

H. Eye Bolts

1. Eyebolts shall be of the size indicated on the Contract Drawings and shall conform to ASTM A489 unless noted otherwise.

I. Titanium Bolts and Anchors

1. Titanium bolts, washers, nuts and anchors shall be provided in, over, and adjacent to containment areas for ferric chloride and sodium hypochlorite, unless indicated otherwise on the Contract Drawings.

2. Bolts and anchors shall be of the size indicated on the Contract Drawings. Bolts, anchors washers and nuts and shall conform to ASTM B 348, Grade 2.

3. Minimum mechanical and physical properties:

a.	Tensile Strength	50,000 psi
b.	Yield Strength	40,000 psi
c.	Elongation in 4" dia.	20%
d.	Modulus of Elasticity	14.9×10^6 psi

J. 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. Titanium Bolts

1. All bolts shall be installed in conformance with the manufacturer’s recommendations.

2. Titanium anchors 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 plate.

E. 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.

F. 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. Inspection of titanium bolted connections shall conform to the requirements of AISC "Code of Standard Practice."
5. 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

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.

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.

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 OB-144A

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 23.01 - Welding
2. 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. A5.1 - Carbon Steel Covered Arc-Welding Electrodes

   b. A5.5 - Low-Alloy Steel Covered Arc-Welding Electrodes

   c. A5.9 - Corrosion-Resisting Chromium and Chromium-Nickel Steel Bare and Composite Metal Cored and Stranded Arc Welding Electrodes and Welding Rods

   d. A5.17 - Carbon Steel Electrodes and Fluxes for Submerged-Arc Welding

   e. A5.18 - Filler Metals for Gas Shielded Arc Welding, Carbon Steel

   f. A5.23 - Low-Alloy Steel Electrodes and Fluxes for Submerged Arc Welding

   g. D1.1 - Structural Welding Code

   h. 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.

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 and 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.

   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 manual shielded metal arc welding shall conform to ANSI/AWS A5.1. Carbon steel electrodes and granular flux for the submerged-arc welding process shall conform to ANSI/AWS A5.17 and low-alloy steel electrodes and fluxes for submerged arc-welding shall conform to ANSI/AWS A5.23 as required for the conditions of actual use.

2. Welding electrodes for ASTM A36 steel shall comply with ANSI/AWS A5.1 (minimum tensile strength of 72,000 psi) and shall be E70XX.

3. 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.

4. Gas-welding electrodes for steel shall comply with ANSI/AWS A5.18 (minimum yield strength of 60,000 psi).

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 and welding 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 bolts and anchor bolts connecting galvanized steel members shall be galvanized.

2. 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 52 13.05 – WELDED PIPE RAILINGS (STAINLESS STEEL)
CONTRACT OB-144A

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the requirements for stainless steel welded pipe railing. Stainless steel welded pipe railing and auxiliary system components shall be provided as specified herein and in the Contract; and 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 stainless steel welded pipe railing.

B. Unless otherwise shown or specified, stainless steel welded pipe railing shall consist of a system of two rails welded 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.

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

B. Section 05 06 00.01 - Schedules for Stainless Steel Work

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.	NYCBC	-	New York City Building Code
2.	ASTM A312	-	Seamless and Welded Austenitic Stainless Steel Pipes, Standard Specification for
3.	ASTM A554	-	Welded Stainless Steel Mechanical Tubing, Standard Specification for
4.	ASTM A666	-	Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar, Standard Specification for
5.	ASTM C1107	-	Packaged Dry, Hydraulic-Cement Grout (Non-shrink), Standard Specification for
6.	ASTM E329	-	Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction, Standard Specification for
7.	ASTM E488	-	Strength of Anchors in Concrete and Masonry Elements, Standard Test Method for
8.	ASTM E894	-	Anchorage of Permanent Metal Railing Systems and Rails for Buildings, Standard Test Method for
9.	ASTM E935	-	Performance of Permanent Metal Railing Systems and Rails for Buildings, Standard Test Methods for
10.	ASTM E985	-	Permanent Metal Railing Systems and Rails for Buildings, Standard Specification for
11.	ASTM F593	-	Stainless Steel Bolts, Hex Cap Screws and Studs, Standard Specification for
12.	ASTM F594	-	Stainless Steel Nuts, Standard Specification for
13.	ANSI/AWS	-	Structural Welding Code D1.1

14. AWS A5.12 - Tungsten and Tungsten Alloy Electrodes for Arc Welding and Cutting
15. AWS - Standard Codes for Arc and Gas Welding in Building Construction
16. ANSI A1264.1 - Safety Requirements for Workplace Walking/ Working Surfaces and Their Access; Workplace, Floor, Wall and Roof Openings, Stairs and Guardrail/Handrail Systems
17. 29 CFR 1910.23 - Guarding Floor and Wall Openings and Holes
18. ISO 14025 - Environmental labels and declarations - Type III environmental declarations

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications

1. Engage a single fabricator, with undivided responsibility for detailing and performance of the stainless steel welded railing systems.
2. Engage a firm which can show minimum of five years previous successful experience in detailing and fabrication of stainless steel welded 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 . 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 successful and documented experience in the installation of stainless steel welded 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 stainless steel welded pipe railing.

c. Amount of area installed.

C. Professional Engineer

1. Engage a licensed professional engineer, registered 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 welded 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 welded 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.

D. Testing Agency Qualifications

1. 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.

E. 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 stainless steel welded 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 welded 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 E 935.

    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 75 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 no computations provide the needed information, testing, in compliance with ASTM E935, shall be performed for verification that stainless steel welded 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 stainless steel welded pipe handrail and railing systems 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.

6. Manufacturer is responsible for structural analysis and detailing of stainless steel welded pipe handrail and railing system. Provide complete structural performance calculations and Shop Drawings for all stainless steel welded pipe handrail and railing members, anchors and all other support system components prepared, signed and stamped with the seal of a licensed professional engineer registered to practice in the State of New York and recognized as an expert in the specialty involved.

F. 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.

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. The Contractor 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. The Contractor shall submit Shop Drawings for approval by 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 stainless steel welded pipe railing system at post and rail intersections with all associated components including typical welded connections, mounted toe-board and sleeve, and handrail complete with mounting brackets all with specified controlled uniform finish.

   b. 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 stainless steel welded 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. Manufacturer's specifications, standard and custom detail drawings and installation instructions and manufacturer’s catalog 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. Show all anchorage items.

   c. Profiles of stainless steel welded pipe railing and handrail system components, and the details of forming, jointing, sections,

connection, internal supports, trim, and accessories. Show details of the stainless steel welded pipe railing and handrail drawn at 1-1/2 inch scale.

d. Calculations for the complete design and engineering analysis of the stainless steel welded 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 licensed professional engineer registered to practice in the State of New York and recognized as an expert in the required Work.

3. Operation and Maintenance Manuals (O&M Manuals): Upon completion of the installation of the stainless steel welded pipe railing and handrail system, 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 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. 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 licensed professional engineer in the design calculations and engineering analyses of the welded pipe railing and auxiliary system components.

c. Licensed 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. Certification of welders and welding procedures.

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. Delivery of Materials

1. Deliver stainless steel welded pipe railing and handrail and all accessories dry and undamaged, with manufacturer's protective coating intact, bearing original intact factory labels.

2. Stainless steel welded 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 stainless steel welded 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 stainless steel welded 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 stainless steel welded pipe railing 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.

3. Keep on-Site handling to a minimum.

4. Maintain protective covering on railings and handrails. System components which are damaged during installation shall be removed from Site and replaced with new, undamaged 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. Stainless Steel Mechanical Tubing: Provide the following:

1. Stainless Steel Mechanical Tubing: ASTM A554, Type 316L, annealed. Provide posts and rails with 1.90-inch outside diameter, 0.109-inch wall thickness.

2. Stainless Steel Fittings: Same material as rails except where otherwise shown on Contract Drawings.

B. Post Reinforcing Insert: ASTM A312, Grade TP316L, welded stainless steel pipe, 1.66-inch outside diameter, 0.140 wall thickness (Schedule 40S).

C. Toe-boards: ASTM A666, Type 316L stainless steel. Provide Toe-boards to the dimensions and details shown on the Contract Drawings and as follows:

1. Provide same finish as rails and handrails, securely fastened in place with not more than 1/4 inch clearance above floor level.

2. 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.

3. Toe-boards shall meet the requirements of 29 CFR, Part 1910.23, Section (e). Minimum thickness of stainless steel plate shall be3/16-inch.

4. Toe-boards shall follow curvature of stainless steel welded pipe railing. Where stainless steel welded pipe railing is shown to have curved contours at corners, or other locations, the toe-board shall likewise be curved to follow line of stainless steel welded pipe railing system.

D. Brackets, Flanges, and Plates: Provide ASTM A666, Type 316L stainless steel brackets, flanges and plates. Components shall be selected by Engineer from manufacturer's standard and custom components. Components shall be in accordance with manufacturer's recommendations and as acceptable to Engineer as shown on approved Shop Drawings.

E. Chain, Snaps and Eyebolts: Provide oblong 0.250-inch welded link, Type 316L stainless steel chain weighing 57 pounds per cubic foot, each link 1-1/8-inch by 7/16-inch. Provide 1/4-inch threaded quick link stainless steel eye bolts with heavy-duty swivel snaps and spring loaded latches.

F. Post Sleeves: Provide the following ASTM A312, Grade TP316Lstainless steel sleeves:

1. Post Sleeves for Fixed Railing: 3.50-inch outside diameter, 0.216-inch wall thickness (Schedule 40S), 6-inch long post sleeves, as required for anchorage to concrete and masonry. Components shall be in accordance with manufacturer's recommendations and as acceptable to Engineer as shown on approved Shop Drawings.

2. Removable Railing Post Sleeves: 6-inch long, Schedule 40S post sleeves for removable railing sections. Size post sleeves for snug fit to avoid removable railing lateral movement. Provide continuous cylindrical Teflon inserts to fill annular space between sleeve and post with top cover flange flush with top of mounting surface.

G. Accessory and Miscellaneous Materials: Provide all accessory items and system components of ASTM A666, Type 316 stainless steel, finished to match posts and rails.

H. Provide all bolts, hex cap screws and studs conforming to ASTM F593 (Alloy Group 2 composition) and all nuts conforming to ASTM F594 (Alloy Group 2 composition).

I. Concealed Connector Sleeves (Rail Splice Inserts): Provide ASTM A312, Grade TP316L stainless steel, 1.66-inch outside diameter, 0.140-inch wall thickness (Schedule 40S), minimum 5-inches long.

J. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrode as recommended by manufacturer of metal to be welded and as required for strength and compatibility of finished items.

K. 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.

L. 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.

M. Bolting Materials: As specified in Section 05 05 23.02 - Miscellaneous Metal Fastenings

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Provide stainless steel welded pipe railing and handrail systems completely factory fabricated using fabrication techniques recommended for stainless steel. Use tools and fabrication equipment dedicated only to the fabrication of Type 300 series stainless steels to completely eliminate ferrous contamination.

B. 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.

1. Railing hall be assembled in sections as long as practicable. Posts shall be connected to flanges and fittings by welding. Surfaces of butt joints shall be ground smooth and square to obtain flush and tight joints undetectable from surrounding finish on all surfaces of the pipe.

2. On-Site welding shall not be permitted.

C. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Fabricate all corners without the use of fittings. Form bent metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work. 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.

D. Cope intersections of rails and posts and weld joints. Butt weld end-to-end joints of railings or use welding connectors. Lower rails shall be coped and welded to the posts.

1. Components shall be coped at perpendicular and skew connections to provide close fit.

E. 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. Cut, reinforce and tap components to receive finish hardware, screws, and similar items.

G. 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.

H. Provide wall returns at ends of wall-mounted handrails. Close end returns, unless clearance between end of handrail and wall is 1/4 inch or less.

1. Close ends of handrail and railing members with prefabricated end fittings.

I. Chains

1. Chains shall be provided across openings in stainless steel welded 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.

J. Weep Holes

1. 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.

2. Provide pressure relief holes at closed ends of handrails and railings.

K. Welding

1. Welding shall comply with the requirements of AWS D1.1 and NYCBC.

2. Provide uniformly ground, smooth and blended weldments so no roughness shows after finishing, and without visible transition to metal surfaces so that welded surface matches contours of adjoining surfaces.

a. Welded joints shall be continuous, and made watertight.

b. Field welding shall not be permitted.

3. All welding shall be performed with Inert Gas Tungsten Arc Welding using Direct Current, Straight Polarity. The non-consumable electrode shall be 1/16-inch diameter, 2 percent threated tungsten electrode and have a point ground on the end similar to a pencil point. The welding current shall be between 70 and 100 amperes. The shielding gas shall be argon,

helium or a combination of both with a minimum flow of 15 cubic feet per hour. Filler metal shall be Type 316L, stainless steel.

L. Finishes

1. All handrail, railing, exposed supports and toe-boards shall be provided with a uniform, bright, mill-polished surface obtained by finishing with a 150 - 220 mesh abrasive, following initial grinding with coarser abrasives. The finish shall be characterized by very fine parallel "grit lines" and be within a uniform range established as either an AISI No. 4 or 5 finish, with final finish established by Sample submission as approved by Engineer in compliance with Section 05 06 00.01 - Schedules for Stainless Steel Work and AISI/NIDI 9012 or AMP/NAAMM AMP 503.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Obtain all stainless steel welded pipe handrail and railing system components and accessories from the same manufacturer.

B. Provide qualified welding processes and welding operators in accordance with ANSI/AWS "Structural Welding Code" D1.1, Section 5, Qualification.

C. Provide certification that all welders employed on, or to be employed for, the fabrication of the stainless steel welded pipe rail system have satisfactorily passed AWS qualification tests within the previous twelve months. Contractor shall ensure that all certification are kept current.

D. Allowable Tolerances:

1. Limit variation of cast-in-place inserts, sleeves and field-drilled holes to the following:

a. Spacing: ± 3/8 inch.

b. Alignment: ± 1/4 inch.

c. Plumb: ± 1/8 inch.

2. Limit variation of completed handrail and railing system alignment to 1/4 inch in 12 feet and 1/16 inch in 3 feet.

E. Set rails horizontal and parallel to rake of steps or ramps to within 1/4 inch in 12 feet.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. The Contractor shall examine the alignment of the substrate and conditions under which the stainless steel welded pipe railing system Work is to be performed and notify Engineer in writing of unsatisfactory conditions. Do not proceed with the stainless steel welded 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 gage of stainless steel welded pipe railing posts and rails brought to the Site by actual measurement of on-site material in the presence of Engineer.

3.02 ERECTION

A. Fastening to In-Place Construction

1. General: 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.

2. Posts and rail sections shall be brought into final alignment by stainless steel welded 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. 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.

6. Field-dowel connections shall be located at posts.

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 by mechanical or other means without further cutting or fitting.

3. 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 anchorage to concrete and solid masonry units, use concrete anchors.

   b. For anchorage to hollow masonry units, use toggle bolts having square heads.

4. Make all splices as near as possible to posts but not exceeding 12 inches from the nearest post. Permanent field splice connections shall be made using manufacturer's recommended minimum 5-inch long Type 316 stainless steel connector sleeves. Tight press-fit all field splice connectors and install in accordance with manufacturer's written instructions as provided on approved Shop Drawings.

5. Space posts 5 feet - 0 inches on center and connect sections as shown on Shop Drawings approved by Engineer.

6. Expansion Joints: Provide slip joints with internal sleeve extending 2 inches minimum beyond joint on each side. Construct expansion joints as for field splices except fasten internal sleeve securely to one side of rail assembly. Locate joints within 6 inches of posts. Submit proposed locations of expansion joints to Engineer.

3.03 FIELD TESTING / QUALITY CONTROL

A. An anchor testing program shall be established based on ASTM E488 and ASTM E894. Perform tension, shear, flexure, and shock loading resistance tests.

1. Test a minimum of one anchor for every three posts and one anchor for every three railing supports.

2. Based on initial results of testing, test additional anchors in order to verify that design safety factors have been provided by anchor installation.

B. Anchors: Suitable equipment shall be used to perform tests required to verify correct installation of anchors and provide proof loads on anchors installed at the Site in accordance with ASTM E488 and ASTM E894.

C. The Contractor shall provide a field report on anchor testing results to Engineer, in compliance with ASTM E488 and ASTM E894, for final approval of welded pipe railing system along with recommendations for remedial work required to bring anchors up to load resistance requirements specified and required by governing authorities having jurisdiction.

D. Final payment and final approval will not be provided to Contractor until report has been approved by Engineer and remedial work is tested and shown to be in compliance with specified performance requirements.

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.

2. Anchor posts in concrete by means of sleeves set and anchored into concrete substrate and by side-mounting, in areas shown on the Contract Drawings. Provide closure secured to the bottom of the sleeves. Unless otherwise shown on the Contract Drawings, after the posts have been inserted into the sleeves, fill the annular space between posts and sleeves solid with non-shrink, non-metallic grout as specified. Crown grout away from posts.

3. Anchor posts to steel with stringer or support flanges, angle-type or floor-type as required by conditions, shop-connected to posts and bolted to the steel supporting members.

4. Side-mount posts by fastening them securely in brackets attached to steel or concrete and in accordance with Shop Drawings approved by Engineer.

5. Provide hinged railing sections where shown on the Contract Drawings. Provide hinges and latch for connection to adjacent railing.

6. At walkways and other locations where railing is provided on each side, locate railing system posts opposite each other.

B. Protection

1. Protect railing system from damage by the work of all contractors.

2. Remove defective railing system components immediately upon discovery of damage, and replace with material that meets specification

requirements, so that all stainless steel welded pipe railing system components will be without damage or surface blemish at the time of Substantial Completion.

C. Cleanup

1. Clean exposed surfaces of stainless steel welded pipe railing work of every substance before leaving the Site after completion of installation. Comply with recommendations of both the stainless steel welded pipe railing and finish manufacturer. Do not use abrasives or non-approved solvent cleaners. Test cleaning techniques on an un-used 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. Leave stainless steel welded pipe railing and handrails, free from dents, burrs, scratches, holes and other blemishes. Refinish minor scratches to be indistinguishable from adjacent un-scarred areas. If, after refinishing, 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.

END OF SECTION

SECTION 05 53 01.02 – STAINLESS STEEL FLOOR GRATINGS
CONTRACT OB-144A

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish and install all stainless steel 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.

1.04 REFERENCES

A. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

B. ASTM A276 - Stainless and Heat-Resisting Steel Bars and Shapes.

C. ASTM A480 - General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plates, Sheet and Strips.

D. ASTM A666 - Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar.

E. ASTM F593 - Stainless Steel Bolts, Hex Cap Screws and Studs.

F. ASTM F594 - Stainless Steel Nuts.

G. ANSI/NAAMM MBG 531 - Metal Bar Grating Manual.

H. ANSI/NAAMM MBG 532 - Heavy Duty Metal Bar Grating Manual.

I. NAAMM MBG 533 - Welding Specifications for Fabrication of Steel, Aluminum and Stainless Steel Bar Grating.

J. ASTM A992 - Steel Plates, Shapes and Bars; Carbon, Structural.

K. National Association of Architectural Metal Manufacturers (NAAMM).

L. New York City Building Code (NYBC).

1.05 DESCRIPTION

A. Design Requirements

1. 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.

2. 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.

3. 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.

4. 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.

5. Gratings shall be designed in accordance with the design criteria specified herein, and the NAAMM specifications, unless otherwise noted on the Contract Drawings or as required by the NYBC.

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 Contractor 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 approval by the Engineer.

B. Gratings shall not be manufactured until the Contractor's Shop Drawings have been approved by the Engineer.

C. 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 or specified, gratings shall be one of the following types and shall be the product of one manufacturer:

a. Type "A" - Parallel bearing bars, with cross members at right angles.

B. Materials

1. Floor gratings and appurtenances shall be Type 316L Stainless Steel and shall conform to the requirements specified herein and to the following standards:

a. Gratings: ASTM A167; ASTM A480; ASTM A666

b. Frames, Curb Angles, Braces, Skirt Angles, Bolts and Fastening Devices: ASTM A276; ASTM A480; ASTM F593, ASTM F594

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Gratings shall be accurately fabricated, free from warps, twists or other defects which affect the appearance and serviceability of the grating,

B. The tops of the grating bearing bars and cross bars shall be in the same plane.

C. Gratings shall have a mill finish unless otherwise noted on the Contract Drawings.

D. All welds shall be ground smooth and conform to the requirements of Section 05 05 23.01 - Welding and NAAMM MBG 533.

E. Openings in and edges of all grating sections shall be banded with bearing bars. Bands shall be welded to all intersecting members.

F. Grating Fabrication

1. Type "A" Grating (Pressure Locked or Welded) shall consist of parallel bearing bars spaced not more than 1-3/16 inches on centers joined by cross members spaced not more than 4 inches on center (unless shown otherwise on the Contract Drawings), to form rectangular openings. Approved welded, electric-forged, slotted, friction fitted or interlocking joints shall be used in joining cross members to the bearing bars to give the grating the required strength, rigidity and durability. The distance between the support and the nearest cross bar shall not exceed 2 inches.

2. Minimum grating depth shall be 1-1/4 inches with bearing bars not less than 3/16 inches thick.

3. Welded cross members shall not be less than 3/16 inch in thickness. Mechanically interlocked cross members shall not be less than 1/8 inch in thickness. The depth of cross members shall not be less than one-half the depth of the bearing bars, but such depth need not exceed 1 inch. Riveted cross members shall be as specified for mechanically interlocked cross members.

4. Each section of grating shall be sized to weigh a maximum of 100 pounds unless noted otherwise on the Contract Drawings.

G. 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.

H. 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. Field 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

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 stainless steel frames to preclude rocking movement; wedges or similar shimming devices shall not be used.

B. Fastening Devices

1. Approved fastening devices 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.

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 OB-144A

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 A47 - Ferritic Malleable Iron Castings

B. ASTM A48 - Gray Iron Castings

C. ASTM A536 - Ductile Iron Castings

D. ASTM B584 - Copper Alloy Sand Castings for General Applications

1.05 DESCRIPTION

A. Miscellaneous metal castings shall include all miscellaneous ferrous and non-ferrous castings to be furnished and installed by the Contractor.

B. 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 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

4. Manganese Bronze: ASTM B584

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

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

D. ISO - International Organization for Standardization

1. ISO 14025 – Requirements and Guidelines for Type III Environmental Labels and Declarations.
2. ISO 14044 - Requirements and Guidelines for life cycle assessment (LCA) studies and life cycle inventory (LCI) studies.

E. EPD - Environmental Product Declaration

1. 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.

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 faying 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.

10. Environmental Product Declarations

a. The Contractor shall provide product-specific type III Environmental Product Declarations (EPDs) conforming to ISO 14025 and ISO 14044.

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 trademark 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.																				

SECTION 26 01 21 – OPERABILITY AND ASSESSMENT
CONTRACT OB-144A

PART 1 GENERAL

1.01 SUMMARY

A. The Operational Assessment Program (OAP) shall be implemented in accordance with the requirements specified under this Section, the Specifications, and the Contract Drawings. Contractor shall provide all labor, materials, and equipment necessary to perform the OAP. Panelboards shall include all power distribution, lighting, and instrument panelboards.

B. Section Includes:

1. The Operational Assessment Program is required to inspect, operate, and document the conditions of equipment at the Oakwood Beach Wastewater Resource Recovery Facility (WRRF) that will be affected by work performed under this Contract. Equipment to be evaluated as part of the OAP will include low voltage power circuit breakers, low voltage insulated case circuit breakers, low voltage molded case circuit breakers, low voltage motor circuit protectors, and low voltage disconnect switches. For each piece of equipment identified, the evaluation will consist of verifying proper operation, capability of being locked out, and suitability for use as an energy isolating device as required for the control of hazardous energy.

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 27 00 - Measurement and Payment

B. Section 01 35 27 - Environmental Health and Safety Requirements

C. Section 01 66 00 - Protection of Materials & Equipment

D. Section 01 78 24 - Spare Parts and Maintenance Materials

1.04 REFERENCES

A. Work performed under this Section shall comply with the latest applicable provisions, at the time the work is performed, and recommendations of the following:

1. NFPA 70 - National Electric Code
2. NYCEC - New York City Electrical Code.
3. NFPA 70E - Standard for Electrical Safety in the Workplace
4. NFPA 70B - Recommended Practice for Electrical Equipment Maintenance
5. ANSI/NETA MTS - Standard for Maintenance Testing Specifications for Electrical Power Equipment and Systems
6. IEEE 3007.2 - IEEE Recommended Practice for the Maintenance of Industrial and Commercial Power systems
7. NESC - National Electrical Safety Code
8. OSHA Part 1910 - Occupational Safety and Health Standards
9. OSHA Part 1926 - Safety and Health Regulations for Construction
10. Manufacturer's Published Instructions
11. Local Utility Requirements
12. Local Codes

1.05 DESCRIPTION

A. The OAP shall consist of the following elements:

1. List of equipment to be evaluated
2. Evaluation of equipment
3. Documentation of satisfactory operation

4. Identification and documentation of deficiencies to be rectified
5. Repair of identified deficiencies
6. Verification of satisfactory operation after repairs
    a. Documentation of satisfactory operation after repairs

B. The Contractor shall arrange with the CM and Plant Chief to execute the OAP.

C. Arrangements shall be made with the CM immediately after notice to commence work in accordance with the Specifications.

1.06 QUALITY ASSURANCE

A. All work under this Section shall be performed by Qualified Persons as defined in NFPA 70E. The Contractor shall determine which of its employees are designated as Qualified Persons based on the requirements of NFPA 70E.

1.07 SUBMITTALS

A. Submit Shop Drawings, Work Plan and Schedule for Implementation under this Specification within 60 days from the work commencement date specified in the Notice to Proceed (NTP).

B. Shop Drawings

1. Manufacturer's catalog cuts for the products proposed for use.
2. Certification from the manufacturer that the products proposed for use are compatible and approved for use with the existing equipment

C. Work Plan and Schedule for implementation of the Operational Assessment Program.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Spare parts, personal protective equipment, instruments, and tools required to execute the OAP shall be delivered, stored, handled, tested, and maintained in accordance with the manufacturer's recommendations, Specification 01 66 00 - Protection of Materials and Equipment, and Specification 01 78 24 - Spare Parts and Maintenance Materials.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. A list of spare parts required for the completion of the OAP is included as Attachment B to this Specification Section. Submit product data for spare parts for approval by the Engineer.

1. For 208V power distribution equipment where spare parts are not readily available due to vintage or obsolescence, the Contractor may utilize spare or out of service electrical parts from available 208V power distribution equipment that the Plant deems out of service and that are being demolished by this Contract. The Contractor shall submit a plan to the CM for removal and reuse of these spare or out of service electrical parts.

2. Personal Protective Equipment and Tools: All Personal Protective Equipment required for the execution of the OAP shall conform to the standards listed in NFPA 70E Table 130.7(C)(14). All Other Protective Equipment and Tools shall conform to the standards listed in NFPA 70E Table 130.7(G).

3. Test Instruments and Equipment: Test Instruments and Equipment shall be applied in accordance with the requirements of NFPA 70E Article 110 Section 110.4.

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. Power Studies Report: The Contractor is responsible for performing the Risk Assessment Procedure as required by NFPA 70E prior to performing work.

B. Personal Protective Equipment: Appropriately rated PPE shall be worn by the Qualified Persons performing each task required by this Section and shall be suitable for the task being performed.

C. Instruments and Tools: Appropriately rated instruments and tools shall be used by the Qualified Persons performing each task required by this Section and shall be suitable for the task being performed.

3.02 APPLICATION

A. Equipment to be evaluated:

1. An evaluation is required for each piece of equipment identified in Attachment A.

3.03 FIELD TESTING / QUALITY CONTROL

A. Equipment Evaluation

1. Equipment Evaluation Checklist: The OAP Equipment Evaluation Checklist is included as Attachment C to this Specification Section. Complete the checklist for each piece of equipment as the work is performed. For each piece of equipment, the checklist shall be signed by the Qualified Person who performed the work, the CM representative, and the Plant representative.

2. Verification of proper operation: Equipment shall be verified for proper operation in accordance with the ANSI/NETA MTS Standard. Cleaning, inspection of bolted electrical connections for high resistance, thermography, and protective device settings adjustments are not required unless necessary for equipment repair.

    a. Low voltage power circuit breakers shall be visually and mechanically inspected in accordance with ANSI/NETA MTS Section 7.6.1.2.

    b. Low voltage insulated case circuit breakers shall be visually and mechanically inspected in accordance with ANSI/NETA MTS Section 7.6.1.1.

    c. Low voltage molded case circuit breakers shall be visually and mechanically inspected in accordance with ANSI/NETA MTS Section 7.6.1.1.

    d. Low voltage motor circuit protectors shall be visually and mechanically inspected in accordance with ANSI/NETA MTS Section 7.6.1.1.

    e. Low voltage disconnect switches shall be visually and mechanically inspected in accordance with ANSI/NETA MTS Section 7.5.1.1.

3. Determination of suitability for use as an energy isolating device:

    a. Verify that each piece of equipment is suitable to be used as an energy isolating device as defined by OSHA 1910.147(b).

4. Assessment of capability of being locked out

    a. Verify that each piece of equipment is capable of being locked out as defined by OSHA 1910.147(b).

B. Equipment Deficiencies

1. For each piece of equipment, note any deficiencies identified on the OAP Equipment Evaluation Checklist as evaluations are performed.

2. If no deficiencies are identified for a piece of equipment, perform sign-off for the equipment in accordance with Paragraph 3.07.

3. If a deficiency is identified, provide a description of the recommended repair to the CM for approval. After receipt of approval from the CM, perform equipment repair using the process described in Paragraph 3.05.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Equipment Repair

1. Equipment requiring repair shall be placed into an electrically safe working condition per the requirements of NPFA 70E, prior to the performance of the repair.

2. If the equipment cannot be placed into an electrically safe work condition, an Energized Electrical Work Permit (EEWP) is required as described in Specification 01 35 27 - Environmental, Health and Safety Requirements. The EEWP form is included as Attachment D to this Specification Section.

3. Prior to performing repairs, document the as-found configuration and settings of all equipment having adjustable ratings or settings, or field-configurable options. Submit as-found settings to Engineer.

4. After completion of repairs, configure and adjust equipment having adjustable ratings or settings, or field-configurable options be to match the as-found settings of the equipment prior to repair. Where use of the as-found settings results in nuisance tripping or other operational concerns, use settings from the preliminary power systems study.

B. Verification Of Proper Operation After Repairs

1. After the equipment repair is complete and before the equipment is placed into operation perform the following tasks:

a. Determination of suitability for use as an energy isolating device

1) Verify that the piece of equipment is suitable to be used as an energy isolating device as defined by OSHA 1910.147(b).

b. Assessment of capability of being locked out

1) Verify that the piece of equipment is capable of being locked out as defined by OSHA 1910.147(b).

c. Perform sign-off for the equipment in accordance with Paragraph 3.07.

C. Sign-Off

1. Equipment not requiring repair: Sign and date the Checklist verifying that the equipment operates as described in Paragraph 3.03.

2. Equipment requiring repair: Sign and date the Checklist verifying that the repair has been completed and that the equipment operates as described in Paragraph 3.06

END OF SECTION

ATTACHMENT A

LIST OF EQUIPMENT TO BE EVALUATED

EQUIPMENT TABULATION

480 VOLTS
3 PHASE
3 WIRE
60 HERTZ

PROJECT OB-144A
MOTOR CONTROL CENTER MCC-11
BUS 600A

ITEM	DESCRIPTION	ID	SECTION	TYPE	REMARKS (AMPS)
1	SLUICE GATE 4301AM	1F-1	SECTION 1	FEEDER BREAKER	15A
2	SLUICE GATE 4301BM	1F-2	SECTION 1	FEEDER BREAKER	15A
3	SLUICE GATE 4302AM	1H-1	SECTION 1	FEEDER BREAKER	15A
4	SLUICE GATE 4302BM	1H-2	SECTION 1	FEEDER BREAKER	15A
5	SLUICE GATE SG-CCT-8	2J-2	SECTION 2	FEEDER BREAKER	15A
6	LANDSIDE INFLUENT GATE	2L-2	SECTION 2	FEEDER BREAKER	15A

EQUIPMENT TABULATION

480 VOLTS
3 PHASE
3 WIRE
60 HERTZ

PROJECT OB-144A
MOTOR CONTROL CENTER MCC-12
BUS 600A

ITEM	DESCRIPTION	ID	SECTION	TYPE	REMARKS (AMPS)
1	EMERGENCY TANK RETURN PUMP 4205AM	1G	SECTION 1	STARTER	7A
2	EMERGENCY TANK RETURN PUMP 4205BM	1I	SECTION 1	STARTER	7A

EQUIPMENT TABULATION

208Y/120 VOLTS
3 PHASE
4 WIRE
60 HERTZ

PROJECT OB-144A
PANELBOARD LP-F
BUS 100A

ITEM	DESCRIPTION	ID	SECTION	TYPE	REMARKS (AMPS)
1	SPARE	CIRCUIT 30	N/A	FEEDER BREAKER	20A

EQUIPMENT TABULATION

208Y/120 VOLTS
3 PHASE
4 WIRE
60 HERTZ

PROJECT OB-144A
PANELBOARD IPP-1
BUS 100A

ITEM	DESCRIPTION	ID	SECTION	TYPE	REMARKS (AMPS)
1	SPARE	CIRCUIT 26	N/A	FEEDER BREAKER	20A

EQUIPMENT TABULATION

208Y/120 VOLTS
3 PHASE
4 WIRE
60 HERTZ

PROJECT OB-144A
PANELBOARD LIGHTING CABINET H
BUS 100A

ITEM	DESCRIPTION	ID	SECTION	TYPE	REMARKS (AMPS)
1	4303AM MOTORIZED VALVE	CIRCUIT 16	N/A	FEEDER BREAKER	15A

EQUIPMENT TABULATION

208Y/120 VOLTS
3 PHASE
4 WIRE
60 HERTZ

PROJECT OB-144A
PANELBOARD PP-12
BUS 100A

ITEM	DESCRIPTION	ID	SECTION	TYPE	REMARKS (AMPS)
1	DUPLEX SUMP PUMP #16	CIRCUIT 7, 9, 11	N/A	FEEDER BREAKER	20A
2	CHLORINE MIXER	CIRCUIT 14, 16, 18	N/A	FEEDER BREAKER	30A

ATTACHMENT B

SPARE PARTS LIST

MCC-11 SPARE PARTS				
MANUFACTURER	**POWER SYSTEM DATA**	**BREAKER / STARTER TYPE**	**AMPERE RATING**	**SPARES**
COMPATIBLE WITH SIEMENS TIASTAR	480V, 3 PHASE, 60HZ	MOLDED CASE BREAKER	15AT/100AF	2

MCC-12 SPARE PARTS				
MANUFACTURER	**POWER SYSTEM DATA**	**BREAKER / STARTER TYPE**	**AMPERE RATING**	**SPARES**
COMPATIBLE WITH SIEMENS TIASTAR	480V, 3 PHASE, 60HZ	SIZE 1 STARTER UNIT COMPARTMENT	7A MCP	1
COMPATIBLE WITH SIEMENS TIASTAR	480V, 3 PHASE, 60HZ	MOLDED CASE BREAKER	15AT/100AF	1
COMPATIBLE WITH SIEMENS TIASTAR	480V, 3 PHASE, 60HZ	MOLDED CASE BREAKER	20AT/100AF	1
COMPATIBLE WITH SIEMENS TIASTAR	480V, 3 PHASE, 60HZ	MOLDED CASE BREAKER	30AT/100AF	1

PANELBOARD LP-F SPARE PARTS				
MANUFACTURER	**POWER SYSTEM DATA**	**BREAKER / STARTER TYPE**	**AMPERE RATING**	**SPARES**
COMPATIBLE WITH GE	208Y/120V, 3 PHASE, 60HZ	MOLDED CASE BREAKER	20AT/100AF	1

PANELBOARD IPP-1 SPARE PARTS				
MANUFACTURER	**POWER SYSTEM DATA**	**BREAKER / STARTER TYPE**	**AMPERE RATING**	**SPARES**
COMPATIBLE WITH EATON	208Y/120V, 3 PHASE, 60HZ	MOLDED CASE BREAKER	20AT/100AF	1

LIGHTING CABINET H SPARE PARTS				
MANUFACTURER	**POWER SYSTEM DATA**	**BREAKER / STARTER TYPE**	**AMPERE RATING**	**SPARES**
-	208Y/120V, 3 PHASE, 60HZ	MOLDED CASE BREAKER	15AT/100AF	1

PANELBOARD PP-12 SPARE PARTS				
MANUFACTURER	**POWER SYSTEM DATA**	**BREAKER / STARTER TYPE**	**AMPERE RATING**	**SPARES**
-	208Y/120V, 3 PHASE, 60HZ	MOLDED CASE BREAKER	20AT/100AF	1
-	208Y/120V, 3 PHASE, 60HZ	MOLDED CASE BREAKER	30AT/100AF	1

ATTACHMENT C

EQUIPMENT EVALUATION CHECKLIST

Operational Assessment Program Equipment Evaluation Checklist

Equipment Designator and Asset ID No.:			
Equipment Type:			
Visual and Mechanical Inspection			
Deficiencies Found:	Yes ( )	No ( )	
Notes:			
Suitable to be Used as an Energy Isolating Device:	Yes ( )	No ( )	
Capable of Being Locked Out:	Yes ( )	No ( )	
Equipment Repair (If Applicable)			
Description of Repair:			
Repair Complete:	Yes ( )	No ( )	
Suitable to be Used as an Energy Isolating Device:	Yes ( )	No ( )	
Capable of Being Locked Out:	Yes ( )	No ( )	
Signatures			
Name of Qualified Person:		Date Completed:	
Signature of Qualified Person:			
Name of CM Representative:		Date Completed:	
Signature of CM Representative:			
Name of Plant Representative:		Date Completed:	
Signature of Plant Representative:			

ATTACHMENT D

ENERGIZED ELECTRICAL WORK PERMIT

Operational Assessment Program Energized Electrical Work Permit

PART I: TO BE COMPLETED BY THE REQUESTER:		EEWP Number:
(1) Description of circuit/equipment/job location:		
(2) Description of work to be done:		
(3) Justification why the equipment cannot be de-energized or the work deferred until the next scheduled outage:		
Name of Qualified Person	Signature of Qualified Person	Date
PART II: TO BE COMPLETED BY THE QUALIFIED PERSONS DOING THE WORK:		**Check When Complete**
(1) Detailed Description of the job procedures to be used in performing the above detailed work:		☐
(2) Description of the safe work procedures to be employed:		☐
(3) Results of the shock risk assessment:		
(a) Voltage to which personnel will be exposed		☐
(b) Limited approach boundary		☐
(c) Restricted approach boundary		☐
(d) Necessary personal and other protective equipment to safely perform the assigned task		☐
(4) Results of the arc flash risk assessment:		
(a) Available incident energy at the working distance of arc flash PPE category		☐
(b) Necessary personal and other protective equipment to safely perform the assigned task		☐
(c) Arc flash boundary		☐
(5) Means employed to restrict the access of unqualified persons from the work area:		☐
(6) Evidence of completion of a job briefing, including discussion of any job-related hazards:		☐
(7) Do you agree the above-described work can be done safely?	Yes ( )	No ( )
Name of Qualified Person	Signature of Qualified Person	Date
Name of Qualified Person	Signature of Qualified Person	Date
PART III: APPROVALS TO PERFORM THE WORK WHILE ELECTRICALLY ENERGIZED:		
Name of Plant Chief	Signature of Plant Chief	Date

NO TEXT ON THIS PAGE

SECTION 26 05 11 – GENERAL ELECTRICAL REQUIREMENTS
CONTRACT OB-144A

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 contractors.

2. Installation procedures and schedules under other contracts shall be reviewed and coordinated with other contractors 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 contractors.

4. Notify other contractors 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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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 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 under each Contract, 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. 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.

E. The modification work shall be coordinated in advance with the plant superintendent 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.

F. 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.

G. 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.
        1) This includes indoor process areas, corrosive areas, and all outdoor areas.
    b. Materials, equipment and incidentals installed in hazardous locations shall meet NYCEC requirements for the Class and Division 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) This includes Electrical Rooms, Control Rooms, finished areas, etc.

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. 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 contractors.

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 of related Contracts 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 plant superintendent 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 the plant engineer, 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 operates 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 contractors.

C. The demonstration of equipment shall include the following:

1. All power circuits shall be operated to verify proper connection to 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 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 OB-144A

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. Not Used.

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

Low-voltage wires and cables shall comply with the latest applicable provisions and recommendations of the following:

1. ANSI/ICEA S-95-658/
   NEMA WC70 - Power Cables Rated 2000 V or Less for the Distribution of Electrical Energy
2. ASTM B5 - Standard Specification for High Conductivity Tough-Pitch Copper Refinery Shapes
3. ASTM B8 - Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
4. ASTM D69 - Standard Test Methods for Friction Tape
5. ASTM D2301 - Standard Specification for Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape
6. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape
7. ICEA S-58-679 - Standard for Control, Instrumentation and Thermocouple Extension Conductor Identification

8.	IEEE 1210	-	Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable
9.	NEMA WC 26/ EEMAC 201	-	Binational Wire and Cable Packing Standard
10.	NETA ATS	-	NETA Acceptance Testing Specifications
11.	NYCEC	-	NYC Electrical Code
12.	NYCCC	-	NYC Construction Code
13.	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. 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.

D. 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.

E. 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.

F. 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.

G. 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.

H. 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 dry locations and 75 degrees C in wet locations and listed by UL as type XHHW-2 or RHW.
c. XHHW-2 shall be used for all indoor circuits and RHW for all underground and outdoor circuits.
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. 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

5. 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

6. 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.

7. 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.

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.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. All low-voltage wires and 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.

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 tested. The field tests shall be performed by the Contractor 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 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 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

NO TEXT ON THIS PAGE

SECTION 26 05 27 – GROUNDING
CONTRACT OB-144A

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.

All grounding associated with the service feeders shall be in accordance with the requirements of the Electric Utility.

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 Shop 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 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 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 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:

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 OB-144A

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. Electric conduit shall include seismic restraints in accordance with the requirements of Section 26 05 33 – Raceways and Boxes for Electrical Systems.
4. 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 or PVC coated. Dissimilar metals shall be avoided when installing stainless steel channels or PVC coated .

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 to the General Contractor. The General Contractor 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 OB-144A

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

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 rigid steel conduit. 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. For conduits located indoors in dry, dusty areas the use of rigid steel conduit without PVC coating shall be permitted.
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. 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 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 or factory applied 40 mil thick PVC coated.

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 steel, brass or bronze.

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 have interior and exterior PVC coatings equivalent and corresponding to that of the conduit on which they are installed and shall be NEMA 4X rated.

3. For outdoor, wet and corrosive areas, conduit fittings and outlet bodies shall be cast gray iron alloy, cast malleable iron 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. Threaded cast ferrous metal, 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 302/304, 306, satin beveled steel cover and device plates for surface mounted boxes shall be used. For corrosive locations, galvanized

ferrous and galvanized cast ferrous metal cover and device plates with neoprene gaskets shall be used.

10. Outlet boxes and fittings installed on PVC coated conduit shall also include interior and exterior coatings equivalent to the conduit. Dissimilar metals shall be avoided.

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 cast iron, malleable iron or hot dipped galvanized. Fittings shall be corrosion-resistant, UL listed and compatible with the conduit system.

c. Expansion /deflection fittings shall 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 cast gray iron alloy or cast malleable iron or copper free aluminum with zinc electroplate and lacquer or enamel finish.

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.

c. For corrosive locations, seal fittings shall include interior and exterior coatings equivalent to the PVC conduit coating specified under this Section. Dissimilar metals shall be avoided.

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 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 steel, malleable iron or zinc. 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 WSCS type thruwall seals shall be used for conduits and cables passing through exterior subsurface walls and exterior concrete walls.

         a) Interior concrete wall

         b) Interior floors

         c) Interior block walls

         d) Exterior block walls

         e) Exterior subsurface walls

         f) Exterior concrete walls

         g) Floor slabs.

      2) CFS type fire stop fittings shall be used for conduits passing through fire rated floors and walls.

3) 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) 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:

a) Interior concrete wall

b) Interior floors

c) Interior block walls

d) Exterior block walls

e) Exterior subsurface walls

f) Exterior concrete walls

g) Floor slabs.

2) CFS type fire stop fittings shall be used for conduits passing through fire rated floors and walls.

3) 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 conduit and cable schedule 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 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.

b. For wet and 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 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 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 the 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 requirements of the NYCEC for Class I, Division 1 Group D hazardous location.

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 OB-144A

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 00 - Cast-In-Place Concrete

B. Section 03 21 00 - Reinforcing Steel

C. Section 05 56 00.01 - 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 23 - 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. 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: See Section 26 05 33 - Raceway and Boxes for Electrical Systems.

B. PVC conduit shall be as manufactured by:

1. Allied Tube & Conduit, Harvey, IL.

2. Heritage Plastics, Harvey, IL.

3. Or approved equal.

C. Fiberglass-reinforced epoxy conduit shall be as manufactured by:

1. FRE Composites Northeast, Boston, MA.
2. Champion Fiberglass, Spring, TX.
3. Or approved equal.

D. Warning tape shall be as manufactured by:

1. Seton, Branford, CT.
2. Ideal Industries, Sycamore, IL.
3. Or approved equal.

E. Duct Seal: See Section 26 05 33 - Raceway and Boxes for Electrical Systems.

F. Reinforced Concrete: See Section 03 30 00 - Cast-in-Place Concrete and Section 03 21 00 – Reinforcing Steel.

G. Expansion and Deflection Fittings: See Section 26 05 33 - Raceway and Boxes for Electrical Systems.

H. 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. Non-Metallic Conduit and Fittings

1. Non-metallic conduit for ducts where shown on the Contract Drawings shall be PVC plastic or fiberglass-reinforced epoxy.
    a. PVC plastic conduit shall be Schedule 40, NEMA type EPC-40 rated 90 degrees C, conforming to UL No. 651.
    b. Reinforced thermosetting resin conduit and fittings shall conform to UL No. 2420. Both conduit and fittings shall consist of 68 percent glass content encapsulated in an epoxy matrix.
2. All non-metallic fittings, elbows, bodies, terminations, expansions and fasteners shall be the same material and manufacturer as the conduit.

C. 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 be permanently imprinted in red 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 00 - Cast-in-Place Concrete. Steel reinforcement shall be in accordance with the requirements of Section 03 21 00 - Reinforcing Steel.

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.

D. 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. Concrete for manholes and handholes shall be in accordance with the requirements of Section 03 30 00 - Cast-in-Place Concrete. Manholes and handholes shall be constructed to withstand ground water pressure when completely submerged by rising water table.

3. Steel reinforcement shall be as shown on the details on the Contract Drawings and shall be in accordance with the requirements of 03 21 00 - Reenforcing Steel.
4. Manholes and handholes shall have dimensions as required for the conduit entries and orientations shown on the Contract Drawings and shall be provided with all duct entrances sized and located to suit duct banks.
5. Concrete floor shall be sloped towards the drain sump at the center of each manhole and handhole.
6. All manhole and handhole hardware shall be hot dipped galvanized steel.
7. Manholes and handholes shall be rated H20 (manholes) or T22 (handholes). Handholes shall be located outside of active roadways.

E. 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 56 00.01 - 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 16 - 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 non-metallic to 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 rigid steel or PVC coated rigid steel conduits as required for the area.

10. Ducts entering manholes and hand holes shall be terminated using suitable end bells. 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 23 - 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. 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 23 16 - Excavation. Backfilling for manholes and handholes shall be in accordance with the requirements of Section 31 23 23 - 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 48 – VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

CONTRACT OB-144A

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish, install, test and place into satisfactory operation Vibration and Seismic Controls (V&SCs) for Electrical Systems complete with all auxiliary equipment as shown on the Contract Drawings and specified in the Specifications and this Section.

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 26 05 11 – General Electrical Requirements.

C. Section 26 05 27 - Grounding

D. Section 26 05 53 – Identification for Electrical Systems

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.
4. 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 99,000 volts.

B. Seismic Restraint as used in this Section and the Specifications shall mean a fixed device (a seismic brace, an anchor bolt or stud, or a fastening assembly) used to prevent vertical and horizontal movement, or both vertical and horizontal movement, of an electrical system component during an earthquake.

C. VISCMA as used in this Section and the Specifications shall mean the Vibration Isolation and Seismic Control Manufacturers Association.

D. Reference Standards

1.	ASCE 7-10	-	Minimum Design Loads for Buildings and Other Structures
2.	FEMA 413	-	Installing Seismic Restraints for Electrical Equipment.
3.	MISR Guide	-	Mason Industries Seismic Restraint Guidelines.
4.	RS 9-6	-	NYCBC 1968 Reference Standard RS 9-6 Earthquake Loads.
5.	NYCBC 1613	-	NYCBC Section 1613 - Earthquake Loads
6.	NYCEAB	-	New York City Electrical Advisory Board
7.	NYCBC	-	New York City Building Code.
8.	NYCEC	-	New York City Electrical Code.

1.05 DESCRIPTION

A. The Contractor shall provide fully functional vibration and seismic controls for equipment installed under Divisions 26, 27, and 28.

B. The devices selected for vibration control or isolation for electrical system shall not transmit the vibrations to the building structure or foundations supporting building structure under normal operation.

C. The devices selected for seismic restraints or control should enable electrical equipment, conduits, components etc to resist seismic forces by the strength of their attachment to the building structure or move with the building structure and remain intact and functioning during and after an earthquake.

D. Equipment subject to requirement for vibration or seismic restraints includes but is not restricted to battery racks, bus ducts, cable trays, conduit, switchgear, generators, transformers, unit substations, motor control centers, variable speed drives and lighting fixtures.

E. Vibrations Control Devices (VCDs)

1. Provide vibration isolators, base frames and inertia bases of sufficient size and design to assure that deflection and stability requirements as specified in this Section are met.

2. Isolators shall be provided to deflect uniformly under operating loads.

3. Steel springs shall be selected to perform their function without undue stress or overloading.

4. All isolators shall have a minimum ¼" thick elastomeric or fiber glass acoustical pad within the vertical load path.

5. Stable steel springs shall be designed to operate in the linear portion of their load versus deflection curve and must be linear over a deflection range of not less than 50 percent above the specified deflection.

   a. The ratio of lateral to vertical stiffness shall be not less than 0.8.

   b. The designed deflection of each spring must be at least 75% of specified deflection of the spring.

6. Where detailed in this Section, the equipment Section or shown on the Contract Drawings all structural steel bases supporting vibration isolated equipment, including concrete filled inertia bases, shall be designed and fabricated by the vibration isolation manufacturer.

   a. Unless otherwise noted in the Contract Documents, all equipment mounted on vibration isolated bases shall have a minimum operating clearance of 2" between the base and floor or support beneath.

F. Seismic Control Devices (SCDs)

1. All seismic restraint devices shall meet the following minimum requirements:

a. The snubber/restrained isolator for isolated equipment shall include a resilient element that will ensure that no un-cushioned shock can occur (excluding cable restraints).

b. It shall be possible to visually inspect the resilient snubbing material for damage and allow for replacement, if necessary.

c. All snubbers to include a maximum air gap of 0.25" (6mm).

d. Seismic restraint devices and systems shall be designed to offer seismic restraint in all directions.

e. Seismic restraint capacities shall to be verified by one of the following methods:

1) A Nationally Recognized Testing Laboratory (NRTL).

2) Certified by a registered Professional Engineer licensed in the State of New York.

3) By a nationally recognized agency, such as VISCMA, that has reviewed and approved the restraint.

2. Seismic restraint manufacturer shall be responsible for the structural design of attachment hardware as required to attach snubbers/restraints to both the equipment and supporting structure on vibration isolated equipment, or to directly attach equipment to the building structure for non-isolated equipment.

3. The Contractor shall furnish to the seismic restraint manufacturer, a complete set of approved shop drawings of all equipment which is to be restrained, from which the selection and design of seismic restraint devices and/or attachment hardware will be completed.

a. The shop drawings furnished shall include, at a minimum, basic equipment layout, length and width dimensions, and installed operating weights of the equipment to be restrained.

4. All conduit, busway and cable trays piping and ductwork shall meet the requirement of NYCEC.

a. At a minimum, the seismic restraint manufacturer shall provide documentation on maximum restraint spacing for various restraint sizes and anchors, as well as 'worst case' reaction loads for each restraint and/or anchor size.

5. The Contractor shall ensure that all housekeeping pads are adequately reinforced and are properly dowelled to the building structure, so as to withstand calculated seismic forces.

a. In addition, the size of the housekeeping pad shall be coordinated with the seismic restraint manufacturer to ensure that adequate edge distances exist in order to obtain desired equipment anchor capacities.

1.06 QUALITY ASSURANCE

A. The V&SC manufacturer shall be the manufacturer of all the major components of V&SC devices and assemblies.

B. The manufacturer of the V&SCs shall have produced V&SCs for a minimum period for the last fifteen (15) years.

1. The Contractor shall provide list of at least five (5) installations with similar equipment, to that which will provided under this contract, and demonstrating compliance with these requirements.

2. 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 equipment at the above listed five installations.

C. V&SCs shall comply with and be installed in accordance with NYCBC 1613.

D. V&SC devices shall have the manufacturers name, part number and material heat code stamped in the devices itself.

E. Independent testing agencies for V&SCs shall have 15 or more years conducting tests on V&SCs.

F. Calculations in relation V&SCs shall be made by a Registered Professional Engineer in New York State and who is has 5 or more years experience in providing vibration and seismic control calculations.

G. V&SC manufacturer shall be responsible for the selection of the attachment hardware as required to attach V&SC devices to both the equipment and supporting structure.

H. The requirements for V&SC in this Section are in addition to other requirements as specified elsewhere in the equipment Sections for the support and attachment of equipment and electrical services, and for the isolation of same equipment.

I. Nothing on the Contract drawings or specifications shall be interpreted as justification to waive the requirements of this Section.

J. The Contractor shall furnish to the V&SC manufacturer a complete set of approved shop drawings of all equipment to which V&SCs are to be provided.

1. From these drawings the selection and design of devices and/or attachment hardware will be completed.

2. The shop drawings furnished shall include, at a minimum, basic equipment layout, length and width dimensions, and installed operating weights of the equipment to which control systems or devices are to be applied.

K. Contractor shall coordinate with the V&SC manufacture the size of all housekeeping pads supporting equipment.

L. Contractor shall coordinate with V&SC manufacturer, equipment manufacturer and structural engineer to locate and size structural supports underneath equipment.

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. Catalog cuts on all V&SC devices detailing compliance with this Section.
2. Detailed schedules of flexible and rigidly mounted equipment.
3. Fabrication details for all equipment bases including dimensions, structural member sizes and support point locations.
4. All details of suspension and support for ceiling hung equipment.
5. Restraint and anchorage calculations for all V&SC devices.
6. Certified copy of the manufacturer's Design Tests made in accordance with and conducted on V&SC devices and type that is being offered for this Contract.
7. 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, and the interrelationship of the various components.
8. Cross sections and details, as required, to satisfy the Engineer, that all components conform to specification requirements, including design and physical arrangement.
9. All information required by the Engineer for the design and location of all connecting structural, mechanical, or electrical items such as piping, ducts, cables, conduit, etc.
10. Weight of the equipment and distribution on the foundation support of the static, impact, seismic, wind, and other loads.
11. Erection drawings.
12. Complete Bill of Material.
13. Details of special features.
14. Nameplate schedules.

15. Recommended spare parts list with pricing.
16. List of Special Tools.
17. Painting Procedures.
18. List of recommended lubricants.
19. Preliminary Operation and Maintenance manuals.
20. Finalized Operation and Maintenance manuals.
21. Certificates of Compliance/Manufacture.
    a. Provide letter signed in the presence of a notary attesting that the manufacturer satisfies qualifications stated in this Section.
22. Reports.
    a. All shop test and field test reports.
    b. All manufacturer's Site visit reports.

1.08 DELIVERY, STORAGE, AND HANDLING

A. V&SC devices and systems shall be delivered, stored, protected and handled in accordance with the manufacturer's instructions, this Section and the Specifications.

B. The Contractor shall inspect and report concealed damage to carrier within the specified time.

C. V&SC devices and systems shall be shipped and delivered in convenient shipping packages.
   1. Each package shall be mounted on shipping skids and wrapped for protection.
   2. Shipping package shall contain accessories to permit handling by cranes.

D. Contractor shall store the V&SC devices and systems and associated equipment in accordance with manufacturer's recommendations.
   1. Store all equipment in clean, dry space.
   2. Maintain factory protective wrappings or cover with heavy canvas or plastic to keep out dirt, water and construction debris.
   3. Within 24 hours of receiving the V&SCs the Contractor shall install temporary heaters to prevent condensation during storage.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. The Contractor shall furnish all spare parts, special tools and supplies in conformance this Section and the Specifications.

B. Deliver all spare parts, tools and supplies with the V&SCs and associated equipment, neatly wrapped or boxed, indexed and tagged with complete information for use and reordering.

C. Furnish all spare parts as recommended by the manufacturer.

D. Furnish the following tools:

1. Two (2) sets of specialized wrenches and tools as required for proper installation, operation and maintenance.

E. Lubricants

1. The Contractor shall furnish as part of the bulk lubricant order the quantity of lubricants required to operate and maintain the equipment furnished under this section for a period of one (1) year after acceptance.

a. Replace all lubricants used during start-up and testing prior to acceptance of equipment.

b. 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. Vibration and Seismic Control Devices shall be as manufactured by:

1. Korfund Dynamics/The VMC Group, Bloomingdale, NJ
2. Mason Industries, Hauppauge, NY.
3. California Dynamics Corporation, Los Angeles, CA.
4. Vibration Eliminator Co. Inc., Copiague, NY.
5. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Vibration Control Devices(VCDs)

1. Type 1 (Elastomeric/ Fiber Glass Pads)

a. Elastomeric isolators shall be pads or molded configuration.

b. Pads shall be used in single and multiple layers.

1) Multiple layer pads shall comprise a bonded, galvanized sheet metal separation plate between each layer.

2) A load distribution plate shall be required to evenly distribute the load over the surface of the pad.

2. Type 2 (Elastomeric Mounts)

a. Elastomeric Isolator Mounts shall be molded from oil, ozone and oxidant resistant compounds, designed to operate within the strain limits of the material.

b. Isolators shall include encapsulated load transfer plate for bolting to equipment and a base plate with anchor holes for bolting to the supporting structure.

3. Type 3 (Steel Spring Isolators)

a. Steel Spring Isolators shall be a freestanding and laterally stable spring assembly without a housing.

b. Isolators shall comprise a leveling device rigidly connected to the equipment or frame above.

4. Type 4 (Restrained Spring Isolators)

a. Spring Isolator shall be equipped with a restrained steel housing to prevent the equipment's operating height from changing should it be necessary to temporarily remove a portion of its weight.

1) The housing shall also function as rigid blocking during rigging so that the installed height and the operating height of the isolated equipment remains the same.

2) The isolator top shall have adequate means for fastening to the equipment, and baseplate shall have adequate means for fastening to the supporting structure, when the equipment is subject to wind loading.

5. Type H1 (Elastomeric Hanger)

a. Elastomeric Hangers shall comprise an elastomeric isolation element contained in a steel hanger housing.

b. The elastomeric element/hanger shall be shaped to prevent the rod from contacting the housing and thereby short-circuiting the isolation.

c. A steel load-distribution plate shall be incorporated/furnished sandwiching the elastomeric element to the hanger housing.

6. Type H2 (Spring Hanger)

a. Spring Hangers shall comprise a stable steel spring contained in a steel hanger housing with an integral elastomeric element to prevent metal to metal contact.

b. The bottom hole must be large enough to allow a +/- 15 degree (30 degree total) rod misalignment.

7. Type H3 (Combination Elastomeric/Spring Hanger)

a. Combination Elastomeric/Spring Hanger shall comprise a stable steel spring contained in a steel hanger housing.

b. An elastomeric element shall be added in series to isolate the upper connection of the hanger box to the structure.

c. The bottom hole must be large enough to allow a +/- 15 degree (30 degree total) rod misalignment.

8. Support Bases with VCDs

a. Type B (Structural Bases)

1) Structural Bases with integral isolators shall be engineered steel frames manufactured from structural steel shapes with welded height-saving brackets as required for side mounting of the isolators.

2) Frames may be square, rectangular or T-shaped.

3) Adjustable motor slide bases shall be included when required for centrifugal fan applications.

b. Type C (Concrete Inertia Bases)

1) Concrete Inertial Bases shall be engineered steel forms with integrated isolator brackets.

2) Bases shall be shipped ready to be filled with concrete on Site by the Contractor.

3) Bases shall include welded or tied reinforcing bars running both ways in a single layer.

4) The bases shall include a template and fastening devices for the equipment for which it will be mated.

5) Weight of concrete and frame shall not be less than the weight of the equipment it supports.

6) Inertia bases shall be at least six inches in depth.

7) Inertia bases shall be sized to accommodate the elbow support(s).

8) Adjustable motor slide bases shall be included when required for centrifugal fan applications.

c. Type D-1 (Curb Isolation Rails)

1) Vibration isolation curb elements shall be inserted between rooftop equipment and existing roof curbs.

2) Elements shall be of aluminum or steel construction and shall be attached to the equipment as specified by the curb isolation manufacturer.

3) Incorporated vibration isolators shall meet the specific characteristics described in this Section.

4) Elements exposed to the weather shall be galvanized or manufactured out of corrosion resistant materials.

5) Contractor shall be responsible for proper attachment of curb isolation elements to curbs.

6) Contractor shall be responsible for verifying the adequacy of the existing curb and its anchorage to the roof structure.

d. Type D-2 (Vibration Isolated Roof Curbs)

1) Curbs used to attach rooftop equipment to the structure shall be of aluminum or steel construction and shall be attached to the equipment as specified by the curb manufacturer.

2) Incorporated vibration isolators shall meet the specific characteristics described in this Section.

3) Elements exposed to the weather shall be galvanized or manufactured out of corrosion resistant materials.

4) Contractor shall be responsible for proper attachment of rooftop curb to building structure.

5) Contractor shall be responsible for coordinating the location of adequate structural support for the rooftop curb with the general contractor.

B. Seismic Control Devices (SCDs)

1. Type A (Coil Spring Isolator Incorporated Within a Cast Iron or Cast Aluminum Housing)

a. Cast iron or aluminum housings shall be made of ductile forms of the material designed for and rated in seismic restraint applications.

2. Type B, C and D (Coil Spring Isolator Incorporated Within a Steel Housing)

a. Spring isolators shall be seismically restrained, incorporating single or multiple coil spring elements, having all of the characteristics of free standing coil spring isolators as specified in the vibration isolation portion of this Section.

b. Springs shall be restrained using a housing, without significantly degrading the vibration isolation capabilities of the spring during normal equipment operating conditions.

c. Vibration isolators shall incorporate a steel housing and resilient snubbing grommet system designed with clearances of no more than 0.25" (6 mm) in any direction and to prevent any direct metal-to-metal contact between the supported member and the fixed restraint housing.

1) In addition to the primary isolation coil spring, the isolator will include a resilient pad in series with the spring(s).

d. Spring elements shall be color coded or otherwise easily identified.

e. Springs shall have a lateral stiffness greater than 0.8 times the rated vertical stiffness and shall be selected to provide a 50% overload capacity.

f. All springs shall be provided with a finish suitable for the application.

3. Type E (All-Directional Elastomeric Isolator)

a. Vibration Isolators shall be elastomeric, molded from oil, ozone and oxidant resistant compounds, designed to operate within the strain limits of the isolator to provide the maximum isolation and longest life expectancy possible.

b. Isolators shall include an encapsulated load transfer plate for bolting to equipment and a base plate with anchor holes for bolting to the supporting structure.

c. Cast iron or aluminum housings shall be made of ductile forms of the material designed for and rated in seismic restraint applications.

d. Isolator shall have minimum operating static deflections as detailed in this Section or as shown on the Contract Drawings and shall not exceed published load capacities.

4. Type F (All-Directional External Seismic Snubber Assembly).

a. Equipment shall be restrained against excessive movement during a seismic event by the use of all-directional resilient snubbers, designed to withstand the project-required seismic forces.

b. A minimum of three (3) snubbers shall be used for each equipment installation, oriented to properly restrain the isolated equipment in all directions.

c. Snubbers shall be of interlocking steel construction and shall be attached to the building structure and equipment in a manner consistent with anticipated design loads.

d. Snubbers shall limit equipment movement at each snubber location to a maximum of 0.25" (6 mm) in any direction.

e. Snubbers shall include a minimum 0.25” (6 mm) thick resilient pad to cushion any impact and to avoid any potential for metal-to-metal contact.

f. Snubbers shall be installed without significantly degrading the vibration isolation capabilities of the isolator during normal equipment operating conditions.

5. Type G (Lateral External Seismic Snubber Assembly)

a. Stable equipment (where uplift forces are zero or are addressed by other restraints) shall be restrained against excessive lateral movement during a seismic event by the use of lateral resilient snubbers, designed to withstand the expected seismic forces.

b. A minimum of three (3) snubbers shall be used at each equipment installation, oriented to effectively restrain the isolated equipment in all lateral directions.

c. Snubbers shall be of steel construction and shall be attached to the building structure and equipment in a manner consistent with anticipated design loads.

d. Snubbers shall limit equipment movement at each snubber location to a maximum of 0.25” (6 mm) in any direction.

e. Snubbers shall include a minimum 0.25” (6 mm) thick resilient pad to cushion any impact and to avoid any potential for metal-to-metal contact.

f. Snubbers shall be installed without significantly degrading the vibration isolation capabilities of the isolator during normal equipment operating conditions.

6. Type H (Omni-Directional External Seismic Snubber Assembly)

a. Equipment shall be restrained by the use of omni-directional resilient snubbers, designed to withstand the expected seismic forces.

b. A minimum of four (4) snubbers shall be used at each equipment installation, oriented to effectively restrain the isolated equipment in all lateral directions.

c. Snubbers shall be of steel construction and shall be attached to the building structure and equipment in a manner consistent with anticipated design loads. Snubber clearances shall be limited to a maximum of 0.25” (6 mm) in any direction.

d. Snubbers shall include resilient pads with a minimum thickness of 0.25” (6 mm) to cushion any impact and to avoid any potential for metal-to-metal contact.

e. Snubber shall be installed without significantly degrading the vibration isolation capabilities of the isolator during normal equipment operating conditions.

7. Type I: Horizontal Single-Axis External Seismic Snubber Assembly

a. Stable equipment (where uplift forces are zero or are addressed by other restraints) shall be restrained against excessive lateral movement during a seismic event by the use of horizontal single-axis resilient snubbers designed to withstand the expected seismic forces.

b. A minimum of four (4) snubbers are to be used at each equipment installation, oriented to effectively restrain the isolated equipment in all lateral directions.

c. Snubbers shall be of steel construction and shall be attached to the building structure and equipment in a manner consistent with anticipated design loads.

d. Snubber clearances shall be limited to a maximum of 0.25” (6 mm) in any direction.

e. Snubbers shall include resilient pads with a minimum thickness of 0.25” (6 mm) to cushion any impact and to avoid any potential for metal-to-metal contact.

f. Snubbers shall be installed without significantly degrading the vibration isolation capabilities of the isolator during normal equipment operating conditions.

8. Type J (Cable Restraints for Suspended Components and Systems)

a. Seismic wire rope cable restraints shall consist of steel wire strand cables, sized to resist expected seismic loads and to restrain suspended components and systems in all lateral directions.

b. Protective thimbles shall be used to eliminate potential for dynamic cable wear and strand breakage, if required.

c. Restraint system shall be sized to the capacity of the cable or to the capacity of the anchorage, whichever is less.

d. Anchor load is to be calculated taking into account the geometry of the bracket.

e. Seismic wire rope connections shall be made using overlapping wire rope “U” clips, cable clamping bolts, swaged sleeves or seismically rated tool-less wedge insert lock connectors.

f. Vertical suspension rods shall be braced as required to avoid potential for buckling due to vertical compression forces.

g. Braces shall be selected to be of sufficient strength to prevent support rod buckling.

1) Braces shall be attached to the vertical suspension rod by a series of attachment clips.

h. Where clevis hanger brackets are used for seismic restraint attachment, the cross bolt shall be fitted with internal bracing to prevent deformation of the clevis hanger.

9. Type K (Rigid Restraints for Suspended Components and Systems.)

a. Rigid restraints shall consist of structural elements, sized to resist expected seismic loads and to restrain suspended components and systems in all lateral directions.

b. Structural element shall be capable of carrying both compressive and tensile loading.

c. Restraint system shall be sized to the capacity of the cable, or to the capacity of the anchorage, whichever is less.

d. Anchor load shall be calculated taking into account the geometry of the bracket.

e. Anchorage of static support system shall be capable of carrying the additional tension loads generated by the compression of the rigid brace.

1) This is the vertical component of the compressive force in the brace.

2) This load is additive to any static load requirements on the system.

f. Vertical suspension rods shall be braced as required to avoid potential for buckling due to vertical compression forces.

g. Braces shall be selected to be of sufficient strength to prevent support rod buckling.

1) Brace shall be attached to the vertical suspension rod by a series of attachment clips.

h.

i. Where clevis hanger brackets are used for seismic restraint attachment, the cross bolt shall be fitted with internal bracing to prevent deformation of the clevis hanger.

10. Type L (Roof Curbs (Non-Isolated))

a. Curbs or fabricated equipment piers used to attach rooftop equipment to the structure shall be of steel construction and shall be attached to the equipment as specified by the manufacturer.

b. Contractor shall be responsible for proper seismic attachment of rooftop curb to building structure.

c. Contractor shall be responsible for coordinating the location of adequate structural support for the rooftop curb.

Components exposed to the weather shall be galvanized or manufactured out of corrosion resistant materials.

11. Type M (Roof Curbs (Isolated))

a. Curbs or fabricated equipment piers used to attach rooftop equipment to the structure shall be of steel construction and shall be attached to the equipment as specified by the manufacturer.

b. Contractor shall be responsible for proper seismic attachment of rooftop curb to building structure.

c. Contractor shall be responsible for coordinating the location of adequate structural support for the rooftop curb.

d. Curbs or piers shall be fitted with snubbers capable of resisting all anticipated design load conditions.

e. Snubber clearances in all planes shall be limited to a maximum of 0.25” (6 mm) in any direction.

f. Snubbers shall include a minimum 0.25” (6 mm) thick resilient pad to cushion any impact and to avoid any potential for metal-to-metal contact.

g. Snubber shall be installed without significantly degrading the vibration isolation capabilities of the isolator during normal equipment operating conditions.

h. Components exposed to the weather shall be galvanized or manufactured out of corrosion resistant materials.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Painting

1. Painting shall be in accordance with Section 09 91 90 – Painting.

2. All internal and external metal surfaces of the V&SC devices shall be thoroughly cleaned, rinsed and phosphatized prior to painting.

3. All steel components shall be cleaned of welding slag and coated with an approved primer.

4. All steel components (excluding springs) on projects exposed to the weather, shall be hot dip galvanized or powder coated.
5. Springs shall be cadmium or zinc plated, powder-coated, epoxy or PVC finished.
6. The V&SC devices shall be painted with a thermosetting electrostatically applied polyester powder with final baked on average thickness between 1.5 to 2.0 mils.
7. The color of all interior finishing coats shall be the manufacturer's standard.
8. The color of the exterior finishing coats shall be the manufacturer's standard.
9. The finish shall have a minimum pencil hardness of 2H as tested per ASTM D3363 and shall pass ASTM B117 5% salt spray test for a minimum of 1000 hours.
10. A supply of touch-up paint shall be provided from paint used for the final coat.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Not Used

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examine areas and equipment to receive V&SC devices and building expansion/seismic joint for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine rough-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected and approved by of the Engineer.

3.02 INSTALLATION

A. Vibration Control Devices

1. VCDs shall be installed in accordance with the manufacturer's instructions and recommendations.
2. VCDs shall not be installed in a manner that will result in equipment stress or misalignment.
3. Isolated equipment or components shall not be installed in manner that makes rigid connections with the building structure unless isolation is not specified

a. Building structure includes, but is not limited to slabs, beams, columns, studs and walls.

b. Coordinate Work with other trades to avoid rigid contact with the building structure.

4. Upon completion of installation of all equipment and VCDs and before adjusting the VCDs, all debris shall be cleaned from beneath the isolated equipment, to avoid the possibility of short-circuiting the isolation system.

5. The contractor shall notify the local representative of the vibration isolation manufacturer prior to installing any vibration isolation devices. The contractor shall seek the representative's guidance in any installation procedures with which he is unfamiliar.

B. Seismic Control Devices

1. SCDs shall be installed as per the manufacturer's written instructions.

2. SCDs shall not be installed in a manner that will result in equipment stress or misalignment.

3. Isolated equipment or components shall not be installed in manner that makes rigid connections with the building structure unless isolation is not specified

a. Building structure includes, but is not limited to slabs, beams, columns, studs and walls.

b. Coordinate Work with other trades to avoid rigid contact with the building structure.

4. Upon completion of installation of all SCDs and before start up of restrained equipment, all debris shall be cleaned from beneath all protected equipment, leaving equipment free to contact snubbers.

5. All external utility connections to restrained equipment shall be designed to allow differential seismic motion without damage to the equipment or utility connections.

6. Adjust isolators and restraints after systems have been filled and equipment is at its operating weight, following manufacturer's written instructions.

7. After equipment installation is completed, adjust limit stops following manufacturer's written instructions so they are out of contact during normal operation.

8. Adjust snubbers according to manufacturer's written instructions.

9. Torque anchor bolts according to anchor manufacturer's written instructions to resist seismic forces.

10. V&SCS equipment shall be installed in accordance with manufacturer's instructions and recommendations.

11. V&SCS equipment shall be installed so that sufficient access and working space is provided for ready and safe operation and maintenance.
12. V&SCS equipment shall be installed on concrete pads at locations shown on the Contract Drawings.
13. Steel channels shall be provided for support of V&SCS equipment.
14. V&SCS equipment shall be securely mounted to mounting surface with anchor bolts.
15. Anchor V&SCS to satisfy the specified seismic requirements in accordance with the anchorage details.
16. Install nameplates for identification of V&SCS equipment.

3.03 FIELD TESTING / QUALITY CONTROL

A. Field Tests

1. After installation, V&SCS shall be field tested for operation and conformance.
2. The Contractor shall perform field tests in accordance with this Section and Specifications.
3. The field tests shall be witnessed by the Engineer and certified by the Contractor.
4. V&SCS testing shall be performed by the manufacturer's representative, prior to energizing equipment.
5. Equipment shall not be energized without the permission of the Engineer.
6. The testing shall be in accordance with the recommendations of the manufacturer's representative and shall consist at a minimum of the following:
    a. Provide evidence of recent calibration of test equipment by a testing agency.
    b. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
    c. Test to 90 percent of rated proof load of device.
    d. Measure isolator restraint clearance.
    e. Measure isolator deflection.
    f. Verify snubber minimum clearances.
7. Remove and replace malfunctioning units and retest as specified above.
8. Prepare test and inspection reports. Testing reports shall include acceptable tolerance levels for each test performed.

B. Upon completion of the installation of all vibration isolation devices herein specified, the local representative of the vibration isolation manufacturer shall, at the contractor's request, inspect the completed system and report in writing any installation errors or other fault in the system which could affect the performance of the system.

C. The installing contractor shall submit a report upon request to the building architect and/or engineer, including the manufacturer's representative's final report, indicating that all vibration isolation material has been properly installed, or steps that are to be taken by the contractor to properly complete the vibration isolation Work as per the Specifications.

D. 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 V&SCS, check the V&SCS 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 V&SCS.

2. The Contractor shall provide V&SCS equipment start-up services and training in accordance with this Section, the Specifications and the Contract Drawings and the following requirements:

3. Minimum number of manufacturer's representative site visits per V&SCS:

Construction Phase	No of Visits	Person-Days	No of Day per Visit
Installation	2	2	1
Field Tests	2	2	1
Acceptance Testing	2	2	1
Training	2	2	1

4. Any additional time required to achieve a successful installation shall be at the expense of the Contractor.

5. The Engineer shall have the right to reallocate any unused person-days.

6. 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.

7. The service representative shall sign in and out with the Engineer on each day they are at the Site.

a. Person-days shall be understood to be the actual time spent at the Site and does not include travel to and from the Site.

3.04 STARTUP / DEMONSTRATION

A. The Contractor shall provide V&SCS start-up services and Training in accordance with this Section and the Specifications.

1. Acceptance Testing
2. The Contractor shall provide acceptance testing of the V&SCS.
3. All acceptance testing shall be performed by the testing firm, after the completion of the field tests specified under this Section.
4. The acceptance testing shall be witnessed by the Engineer and certified by the Contractor.
5. Acceptance testing inspection shall be performed on each V&SCS. Inspection shall include the following:
   a. Physical, electrical and mechanical condition shall be inspected.
   b. Proper anchorage, required area clearances, physical damage and proper alignment shall be checked.
   c. Ventilating air passageways shall be inspected for blockage.
   d. All connections shall be inspected for high resistance.
   e. Electrical and mechanical interlock systems shall be checked for proper operation.
   f. Insulators shall be inspected for evidence of damage or contamination.
   g. Equipment shall be cleaned and lubricated as required.
6. Acceptance electrical testing shall be performed on each V&SCS. Testing shall include the following:
   a. Ground-resistance tests shall be performed.
   b. Insulation-resistance tests shall be performed on each bus section, on each switch, transformer and circuit breaker, phase-to-phase and phase-to-ground.
   c. 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.
   d. Contact-resistance test shall be performed.
   e. Control and metering wiring performance test shall be performed.
   f. Circuit breaker trip characteristics shall be determined by primary current injection.

g. All tests and values shall be in accordance with the manufacturer's recommendations and NETA ATS.

h. The Contractor shall provide an acceptance testing report. The report shall be in accordance with NETA ATS.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Upon completion of the installation of all vibration isolation devices herein specified, the local representative of the vibration isolation manufacturer shall, at the Contractor’s request, inspect the completed system and report in writing any installation errors or other fault in the system which could affect the performance of the system.

B. The installing contractor shall submit a report upon request to the building architect and/or engineer, including the manufacturer’s representative’s final report, indicating that all vibration isolation material has been properly installed, or steps that are to be taken by the Contractor to properly complete the vibration isolation Work as per the Specifications.

END OF SECTION

Appendix

Schedule of Vibration Control Devices

Vibration Isolation Type	Product Description	Product Manufacturer	VISCMA Member Model(s)
1	Elastomeric / Fiberglass Pads	CalDyn/California Dynamics	RP ECPR VT FP EP
		Mason Industries, Inc.	W/SUPER W
		Vibration Eliminator Co., Inc.	100N/200N/400N (NP)
		The VMC Group	MAXIFLEX/NRC/ SHEARFLEX/NR FABRIFLEX/NDB
2	Elastomeric Mounts	CalDyn/California Dynamics	RM-D JQTQN
		Mason Industries, Inc.	BRA/BRB/BRC/BRD RAA, RBA, RCA, RDA
		Vibration Eliminator Co., Inc.	T44/D44/T54/3865 (TD)
		The VMC Group	RSM/RDC/MB R/RD/RVD
3	Steel Spring Isolators	CalDyn/California Dynamics	SSL SSK
		Mason Industries, Inc.	SLF
		Vibration Eliminator Co., Inc.	OST
		The VMC Group	A-SERIES/SW/AW
		Mason Industries, Inc.	SLR/SLRS
		Vibration Eliminator Co., Inc.	KW
		Vibro-Acoustics	CSR/SCSR/SFS
		The VMC Group	MS/MSS/AWRS/M SWSR/AMSR/AEQM/ ASCM
H1	Elastomeric Hangers	CalDyn/California Dynamics	RH RH-D
		Mason Industries, Inc.	HD/CRCH
		Vibration Eliminator Co., Inc.	1C/3C/3CTD
		The VMC Group	HR/RH/BRD/HRD
H2	Spring Hangers	CalDyn/California Dynamics	CH/30
		Mason Industries, Inc.	30/CSCH
		Vibration Eliminator Co., Inc.	SNC
		The VMC Group	HSA SH/BSA
H3	Combined Elastomeric/Spring Hangers	CalDyn/California Dynamics	HH/30
		Mason Industries, Inc.	30N
		Vibration Eliminator Co., Inc.	SNRC
		The VMC Group	HRSA RSH-30A/BSRA

Schedule of Vibration Control Devices (continued)

Equipment Support Base Type	Product Description	Product Manufacturer	VISCMA Member Model(s)
B	Structural Bases	CalDyn/California Dynamics	WW SW XW
		Mason Industries, Inc.	MSL/WFSL
		Vibration Eliminator Co., Inc.	UN-OST/UN-KW
		The VMC Group	SFB/WFB/WX/WSB
C	Concrete Inertia Bases	CalDyn/California Dynamics	CW
		Mason Industries, Inc.	BMK/KSL
		Vibration Eliminator Co., Inc.	OST/KW Frames
		The VMC Group	MPF/CPF/WPF
D-1	Curb Isolation Rails	CalDyn/California Dynamics	JQ
		Mason Industries, Inc.	CMAB
		Vibration Eliminator Co., Inc.	'AR' Bases
		The VMC Group	RTIR
D-2	Roof Curbs (Isolated)	CalDyn/California Dynamics	MW YW
		Mason Industries, Inc.	RSC/ISC
		Vibration Eliminator Co., Inc.	VERC
		The VMC Group	P-6100/P-6200/P-6300 P-7100/P-7200/P-7300

Schedule of Seismic Control Devices

Seismic Snubber Type	Seismic Product Description	Product Manufacturer	VISCMA Member Model(s)
A	Coil Spring Isolator Incorporated Within A Ductile Iron Or Cast Aluminum Housing	CalDyn/California Dynamics	RJ, TJ
		Mason Industries, Inc.	SSLFH
		Vibration Eliminator Co., Inc.	OSTSM
		The VMC Group	AEQM
B	Coil Spring Isolator Incorporated Within a Steel Housing	CalDyn/California Dynamics	JQ, DL
		Mason Industries, Inc.	SLR
		Vibration Eliminator Co., Inc.	KWSR
		The VMC Group	ASCM
C	Coil Spring Isolator Incorporated Within A Steel Housing	CalDyn/California Dynamics	JQ, DL
		Mason Industries, Inc.	SLRS
		Vibration Eliminator Co., Inc.	KWSR
		The VMC Group	CTER, AWRS, AWMR
D	Coil Spring Isolator Incorporated With Integral Seismic Restraint	CalDyn/California Dynamics	JQ, DL
		Mason Industries, Inc.	SLRS
		Vibration Eliminator Co., Inc.	OSTSM
		The VMC Group	SWSR
E	All Direction Elastomeric Isolator	CalDyn/California Dynamics	TYPE JQ-TQN
		Mason Industries, Inc.	RBA, RCA, BRA, BRB,
		Vibration Eliminator Co., Inc.	368SRS, 368SRD, SM
		The VMC Group	RSM, MB, SRVD, RDC
F	All Direction 3-Axis External Seismic Snubber Assembly	CalDyn/California Dynamics	RL-A, RL-C
		Mason Industries, Inc.	Z-1225
		Vibration Eliminator Co., Inc.	ADR
		The VMC Group	ERX, SR
G	Lateral 2-Axis External Seismic Snubber Assembly	CalDyn/California Dynamics	RL-A, RL-C
		Mason Industries, Inc.	
		Vibration Eliminator Co., Inc.	ADR
		The VMC Group.	
H	Omni-Directional 3-Axis External Seismic Snubber Assembly	CalDyn/California Dynamics	RL-A, RL-C
		Mason Industries, Inc.	Z-1011
		Vibration Eliminator Co., Inc.	
		Vibro-Acoustics	
		The VMC Group	ER

Schedule of Seismic Control Devices (continued)

Seismic Snubber Type	Seismic Product Description	Product Manufacturer	VISCMA Member Model(s)
I	Horizontal 1-Axis External Seismic Snubber Assembly	CalDyn/California Dynamics	RL-A, RL-C
		Mason Industries, Inc.	
		Vibration Eliminator Co., Inc.	HCS
		The VMC Group	SR
J	Cable Restraints For Suspended Components and Systems	CalDyn/California Dynamics	
		Mason Industries, Inc.	SCB
		Vibration Eliminator Co., Inc.	SC
		The VMC Group	SCR, SB, LRC
K	Rigid Restraints For Suspended Components and Systems	CalDyn/California Dynamics	
		Mason Industries, Inc.	SSB
		Vibration Eliminator Co., Inc.	
		The VMC Group	SAB
L	Roof Curbs (Non-Isolated)	CalDyn/California Dynamics	N/A
		Mason Industries, Inc.	RRC
		Vibration Eliminator Co., Inc.	VERSC, SQRC
		The VMC Group	P6000
M	Roof Curbs (Isolated)	CalDyn/California Dynamics	MW, YW
		Mason Industries, Inc.	RSC
		Vibration Eliminator Co., Inc.	VERC
		The VMC Group	R6200, R6300, RTIC

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 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. High Voltage Signs

1. High voltage signs shall be provided for equipment operating over 600 volts.
2. High voltage signs shall be fiberglass reinforced polyester, rigid acrylic or aluminum plate 1/16-inch thick. Finish shall be industry standard of red, white and black graphics. Signs shall be 10 inches by 14 inches with the following exceptions:
    a. Use 7-inch by 10-inch signs where this is the largest size that can be applied.
    b. Use 14-inch by 20-inch signs where needed for adequate vision.
3. High voltage signs shall read; "DANGER - HIGH VOLTAGE KEEP OUT".
4. High voltage sign mounting screws shall be 3/16 inch diameter, round head, stainless steel, and self-tapping type.

B. 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.

C. 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.

D. 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.

E. Arc Flash Labels

1. Labels shall be provided in addition to the manufacturers nameplate and equipment nameplate, to identify equipment name, bolted fault and arcing fault current levels, flash protection boundary distances, working distances, personal-protective equipment classes and AFIE (Arc Flash Incident Energy) levels.

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. Personal Protective Equipment category at the working distance
    d. Arc Flash Incident Energy Value (cal/cm²) at the working distance
    e. Limited and Restricted Boundaries
    f. Study Report Number and Issue Date
    g. 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. High Voltage Signs
    1. High voltage signs shall be installed on equipment operating at over 600 volts. High voltage signs shall also be installed on sides of fences or walls which enclose outdoor equipment operating at over 600 volts.

C. 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

SECTION 26 05 91 – LOW-VOLTAGE ELECTRIC MOTORS
CONTRACT OB-144A

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. Portable devices shall have totally enclosed motors and approved cord with provisions for grounding. They shall be suitable for the available power supply.

11. All motors shall be continuous time rated suitable for operation in a 40 degrees C ambient.

12. Motors shall comply with the EPAct 1992 and EISA 2007.

13. Variable-speed motors shall comply with NEMA MG1.

14. 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. Nameplates: engraved or embossed on stainless steel fastened to the motor frame with stainless steel screws or drive pins with information per NEMA MG1.

   d. Motor voltage shall be as shown on the Contract Drawings.

   e. Motors used with adjustable frequency controllers shall be as stated in this Section, the Specifications and the Contract Drawings.

   f. 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.

   g. 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.

h. Motors having considerable core length shall be provided with approved means for taking up shrinkage in length.

i. 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 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.

d. 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.

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 shall be sized per the NYC Electrical Code for number and size of conduit connections as

indicated on the drawings, arranged to accommodate conduit entry from any quadrant.

c) 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.

d) Conduit box sizes shall be in accordance with code requirements. This shall include appropriate terminations for the rated voltages.

e) Protective and auxiliary devices, shall terminate in auxiliary conduit boxes.

f) 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".

g) 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.

h) 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. 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.

5. 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.

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.

B. Electrical Connections

1. Install motor branch circuit conduits and conductors in accordance with NYC Electrical code requirements.
2. Terminate the motor leads per the manufacturers' connection diagrams.
3. Install equipment grounding conductors per NYC electrical code requirements.
4. Tighten electrical connections and terminals according to manufacturers' published torque values.
5. Install conduit and wiring between motor auxiliary devices and associated indicators, controllers and protective devices in accordance with shop drawings.
6. Connect electro-magnetic field sensitive devices such as RTD's, thermistors, thermal protector switches, and vibration sensors with twisted and shielded instrumentation wiring.

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 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 08 11 – GENERAL ELECTRICAL TESTING
CONTRACT OB-144A

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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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 Superintendent 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 Electrical Contractor shall make available the electrical system and personnel when required by other Contractors to test their respective equipment.

2. The Electrical 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 the following:

a. All dielectric tests.

b. All low-voltage protective device testing and setting related to Arc Flash Studies.

c. All low-voltage Protective Device testing and calibration.

d. All potential and current transformer testing and determination of performance curves.

e. All Primary and Secondary injection tests of protective device systems.

f. All ground systems testing.

2. Thermographic Testing and Imaging

a. An independent testing company comprised of Infraspection 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 Contractors 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

SECTION 26 22 13 – LOW-VOLTAGE DISTRIBUTION TRANSFORMERS
CONTRACT OB-144A

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing individually mounted dry type transformers single-phase and three-phase general purpose individually mounted mini-power centers of the two-winding type, self-cooled, as specified herein and as shown on the contract drawings.

B. 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 29 - Hangers and Supports for Electrical Systems

C. Section 26 05 53 - Identification for Electrical Systems

1.04 REFERENCES

A. Dry type transformers shall comply with the latest applicable provisions and recommendations of the following:

1.	ANSI	-	American National Standards Institute
2.	NYCBC	-	New York City Building Code
3.	NYCEC	-	New York City Electrical Code
4.	UL 1561	-	Dry-Type General Purpose and Power Transformers
5.	NEMA ST 20	-	Dry Type Transformers for General Application

1.05 DESCRIPTION

A. Not Used

1.06 QUALITY ASSURANCE

A. General:

1. All transformers shall conform to the applicable NEMA, ANSI and IEEE Standards and shall be built by one approved manufacturer who shall use only best commercial materials and processes of manufacture.
2. Transformer enclosures shall have ample room for primary and secondary wiring connections.
3. All transformers shall be UL listed and certified to ANSI/NEMA sound levels.
4. The transformer 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 of date of testing.
5. 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. Calibration of testing apparatus shall be within one year of date of testing.

B. Seismic Requirements

1. The transformer mounting system shall be designed, constructed and installed suitable for earthquake regulations in accordance with the seismic requirements of the NYCBC.
2. Transverse and longitudinal bracing shall be provided as required to brace the transformer for the seismic requirements specified.

C. Field testing of the transformers 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. Manufacturer's catalog cuts for the transformers proposed for use.
2. Dimensional drawings showing transformer details with diagrammatic nameplate.
3. Transformer anchorage and mounting details prepared and stamped by a licensed Professional Engineer, registered in the State of New York.
4. 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 60 days in advance prior to confirmation of witness testing dates and actual testing.

B. Shop test and field test reports shall be submitted.

C. Operations and Maintenance Manuals shall be submitted in accordance with the Specifications.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Dry type transformers 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. Dry type transformers / Mini-Power Centers shall be as manufactured by:

1. Eaton Corporation;
2. General Electric Company, Stamford, CT.
3. ABB;
4. Schneider/Square D
5. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Mini-Power Centers

1. The Contractor shall furnish and install three-phase general purpose individually mounted mini-power centers of the two-winding type, self-cooled, as specified herein and as shown on the Drawings.
2. The mini-power center and all components shall be designed, manufactured, and tested in accordance with the latest applicable standards of ANSI and NEMA. The assembly and all components shall be UL listed.
3. Unit kVA and voltage ratings shall be as shown on the drawings. Units shall be designed for continuous operation at rated kVA, for 24 hours a day, 365 days a year operation, with normal life expectancy as defined in ANSI C57.96.
4. Transformer sound levels shall not exceed the following ANSI and NEMA levels for self-cooled ratings: 10 to 30 kVA 45 db.
5. Each mini-power center shall include a primary main breaker, an encapsulated dry-type transformer and a panelboard with secondary main breaker.
6. Primary main, secondary main and feeder breakers shall be enclosed with a pad lockable hinged door. Mini-power centers shall be suitable for service entrance application.
7. Transformers shall be insulated with a 180 degrees C insulation system and rated at 115 degrees C temperature rise. Required performance shall be obtained without exceeding the above-indicated temperature rise in a 40 degrees C maximum ambient, with a 30 degrees C average over 24 hours. All insulation materials shall be flame-retardant and shall not support combustion as defined in ASTM Standard Test Method D635.
8. Transformer core shall be constructed with high-grade, nonaging, silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities shall be substantially below the saturation point. The transformer core volume shall allow efficient transformer operation at 10% above the nominal tap voltage. The core laminations shall be tightly clamped and compressed. Coils shall be wound of electrical grade copper with continuous wound construction. The core and coil assembly shall be completely encapsulated in a proportioned mixture of resin and aggregate to provide a moisture proof, shock-resistant seal. The core and coil encapsulation system shall minimize the sound level. The core of the transformer shall be grounded to the enclosure Provide two (2) 5% FCBN taps.
9. Secondary bus shall be copper.
10. All interconnecting wiring between the primary breaker and transformer, secondary main breaker and transformer and distribution section shall be factory installed. All transformers shall be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring.

11. Each mini-power center shall include a primary main breaker with an interrupting rating of (14kA) at 277/480 volts; and a secondary main breaker with an interrupting rating of 10kA at 120/208 volts, and a panelboard with a minimum of 12 1-pole branch circuits.
    a. Branch circuit breakers shall be rated 20A.
12. The secondary distribution section shall accommodate bolt-on circuit breakers with 10 kA interrupting capacity.
13. The enclosure shall be made of heavy-gauge steel and the maximum temperature of the enclosure shall not exceed 90 degrees C. The enclosure shall be totally enclosed, non-ventilated, NEMA 3R, with lifting eyes.
14. Factory tests shall be performed and be in accordance with the accordance with the latest version of ANSI and NEMA. Tests shall include the following:
    a. Ratio tests at the rated voltage connection and at all tap connections.
    b. Polarity and phase-relation tests on the rated voltage connection.
    c. Applied potential tests.
    d. Induced potential test.
    e. No-load and excitation current at rated voltage on the rated voltage connection.

B. General Purpose Transformers

1. General purpose transformers shall be of the dry, commercially quiet, low temperature rise type consisting of two windings per phase.
2. Transformers shall have kVA rating, primary voltage and connection, secondary voltage and connection and number of phases as shown on the Contract Drawings.
3. Conductors for transformer windings shall be copper only.
4. Transformers shall be suitable for indoor or outdoor installation in accordance with the locations shown on the Contract Drawings.
5. Transformer insulation shall be rated 220 degrees C, 80 degrees C rise.
6. Transformers shall be equipped with six 2-1/2 percent fully rated taps, two above and four below the rated voltage tap on the primary winding.
7. The arrangement, assembly, and laminations of the core shall be such as to facilitate repair to the windings.
8. The design, shape, and arrangement of windings shall allow free flow of air for insulation and cooling.

C. Shielded Isolation Transformers

1. Shielded isolation transformers shall conform to the requirements specified under this Section for General Purpose Transformers and the following:
    a. Shielded isolation transformers shall also include an electrostatic shield, grounded to the transformer case, to attenuate electrical noise.

D. Non-Linear Load Transformers

1. Non-linear load transformers shall conform to the requirements specified under this Section for General Purpose Transformers and the following:
    a. Non-linear load transformers shall be specifically designed for non-sinusoidal loads.
    b. Transformers shall be K-factor rated as shown on the Contract Drawings.
    c. Transformers shall be provided with oversize neutral suitable to handle at least 200 percent of normal phase current.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Not Used

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Shop Tests

1. Shop tests shall be performed at the transformer's manufacturer's plant prior to shipment.
2. Shop tests shall demonstrate that the equipment tested conforms to the requirements specified.
3. Each transformer shall be given a routine test in accordance with the latest requirements of UL, ANSI and NEMA standards.
4. The Contractor shall provide a shop test report. The report shall identify the tests performed and the results obtained.
5. Transformer shop tests shall be performed consisting of the following:
    a. Applied potential shall be performed.
    b. Induced potential shall be performed.
    c. No load losses shall be performed.
    d. Voltage ratio shall be performed.
    e. Polarity shall be performed.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Transformers shall be installed on walls or floors. Floor mounted transformers shall be installed on one inch of Korfund sound absorber material on raised concrete base at locations shown on the Contract Drawings.

B. Sufficient access and working space shall be provided for ready and safe operation and maintenance.

C. Transformers mounting, supports and restraints shall confirm to the requirements of this Section and Section 26 05 29 – Hangers and Supports for Electrical Equipment.

D. Transformers shall be grounded in accordance with the requirements of Section 26 05 27 – Grounding and as shown on the Contract Drawings.

E. The transformer leads shall be provided with solderless, clamp type cable connectors.

F. Conduit runs shall be arranged for easy removal of the transformers.

G. Transformer nameplates shall be installed for identification of equipment. Nameplates shall be provided in accordance with the requirements of Section 26 05 53 – Identification for Electrical Systems.

3.03 FIELD TESTING / QUALITY CONTROL

A. Insulation resistance tests shall be performed on the transformers after installation.

B. The tests shall be witnessed by the Engineer and certified by the Contractor. The tests shall be performed by the Contractor who shall furnish all testing equipment.

C. The Contractor shall provide a field test report. The report shall identify the tests performed and the results obtained.

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 24 21 – EXISTING 480V MOTOR CONTROL CENTERS
CONTRACT OB-144A

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for modifying, altering, replacing, retrofitting existing 480V Motor Control Centers (MCCs) and associated components. All work shall be in accordance with the requirements specified under this Section and the Contract Drawings.

B. Section Includes:

1. The Contractor shall modify and test existing motor control centers (MCC-11 and 12) as shown on the Contract Drawings and specified herein. Modifications shall include required disassembly of existing MCC-11 and 12 components as well as furnishing, installing and testing of new combination starter and breaker compartments as shown on the Contract Drawings and as specified herein.

   a. Motor Control Center MCC-11 is manufactured by Siemens – model tiastar.

   b. Motor Control Center MCC-12 is manufactured by Siemens – model tiastar.

C. 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. Section 26 05 53 - Identification for Electrical Systems

B. Section 26 08 11 - General Electric 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 at less than 1000 volts and within the 600 V Class.

B. Reference Standards

1.	NEMA ICS 1	-	Industrial Control Systems: General Requirements
2.	NEMA ICS 2	-	Industrial Control and Systems: Contactors and Overload Relays Rated 600V
3.	NEMA ICS 2.3	-	Instruction for Handling, Installation, Operation and Maintenance of Motor Control Centers Rated Not More Than 600V
4.	NEMA ICS 18	-	Motor Control Centers
5.	NEMA 250	-	Enclosures for Electrical Equipment (1000V maximum).
6.	NYCBC	-	New York City Building Code
7.	NYCEC	-	New York City Electrical Code
8.	NETA ATS	-	NETA Acceptance Testing Specifications.
9.	NFPA 70E	-	Standard for Electrical Safety in the Workplace.
10.	NFPA 79	-	Electrical Standard for Industrial Machinery
11.	UL 489	-	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.

1.05 DESCRIPTION

A. Ratings and Performance Requirements

1. MCC components shall be low-voltage Class suitable for operation on a three phase, 60 hertz system.

2. The nominal operating voltage, number of wires, bus ampacity and short circuit withstand capability shall be as shown on the Contract Drawings.

3. The incoming disconnect device of each unit compartment incoming circuit shall have a minimum short circuit interrupting rating of 65 kA symmetrical.

4. All motor starters shall be NEMA size 1 minimum.

5. In general, the MCC included under this Section shall include, but not be limited to the following:

   a. Main disconnecting devices.

   b. Motor starters and controls.

   c. Feeder disconnecting devices.

   d. Control wiring and interlocking.

6. The Contractor shall review installation procedures under other sections and contracts and coordinate them with the work specified herein.

7. The Contractor shall notify other disciplines in advance of the installation of the work included to provide them with sufficient time for 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.

8. In all cases where a device or part of the equipment is referred to in this Section in the singular (such as motor starter), it is intended that such references shall apply to as many such devices as are required to complete the installation.

1.06 QUALITY ASSURANCE

A. General:

1. Motor control center modifications shall be constructed and tested in accordance with the latest applicable editions of NEMA, UL, NFPA, and the NYCEC.

2. The MCC manufacturer shall have been engaged in production, installation and providing field service on MCC for a minimum of 10 years.

3. All structures shall be fabricated of code gauge steel.

4. The Contractor shall obtain motor nameplate data on the actual equipment that will be power by the MCC to properly size circuit breakers, starters and overloads.

5. The settings of all devices shall be based upon the actual motors or loads furnished.

6. When shown on the drawings MCC modifications shall be in accordance with the requirements of the NYCEC.

7. The costs of the drawing submission and any resubmissions shall be included for payment in the lump sum price bid for the Work under this Contract.

8. All shop and field test equipment and instrument calibration shall be in accordance with the latest edition of the accuracy standard of the NIST.

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

a. Equipment specifications and data sheets identifying all materials used and methods of fabrication.

b. Complete assembly, layout, and installation drawings with clearly marked dimensions.

c. Equipment cross section drawings.

d. Weights of all component parts, assembled weight of units and approximate total shipping weight.

e. Provide Interconnection Wiring Diagrams. Wiring diagrams shall include complete control schematics for each motor starter including all control, indicating and alarm devices required for motor control as shown in the contractor documents.

f. Circuit breaker and fuse time-current curves.

g. Complete motor data and performance characteristics including nameplate data sheet.

h. List of Spare Parts.

i. List of Special Tools.

j. List of recommended lubricants.

k. Painting procedures.

l. Installation instructions.

m. Preliminary operation and maintenance manuals.

n. Internal wiring diagrams for each unit compartment.

2. Certificate of Compliance

a. Letter certifying qualifications of manufacturer as listed in Article 1.06.

3. Reports

a. Shop test and field test reports shall be submitted.

b. Manufacturer's site visit and acceptance testing reports shall be submitted.

4. Operation and Maintenance (O&M) Manuals

a. O&M Manuals shall be submitted.

1.08 DELIVERY, STORAGE, AND HANDLING

A. MCC equipment shall be delivered, stored and handled in accordance with this Section, the Specifications and 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 location in which a uniform temperature is maintained. Equipment shall be protected with coverings and maintain air circulation.

3. Protect MCC and associated components in accordance with manufacturer’s recommendations.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Spare Parts

1. The Contractor shall furnish all spare parts in conformance with Division 1. Deliver all spare parts, tools and supplies with the equipment, neatly wrapped or boxed, indexed and tagged with complete information for use and reordering.

2. Furnish the following spare parts:

a. One (1) of each circuit breaker size for each one (10) provided, minimum of one (1) if less than ten (10).

b. Ten (10) complete sets of control fuses of each type and size.

c. One (1) of each starter size for each ten (10) provided, minimum of one (1) if less than ten (10).

3. Furnish the following tools.

a. 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. MCC manufacturers and their particular products shall be fully compatible in all respects with existing MCC-11 and MCC-12 shown to be modified under the scope of the Contract Documents as well as specified herein. Products shall match existing MCC components in all respects including, but not limited to; short circuit withstand ratings, bus ratings, voltage class, paint color, vertical bus connection means and shall be compatible with existing MCC replacement and consumable parts.

B. MCC cubicles and associated components shall be as manufactured by:

1. Siemens, VA
2. Square D/Schneider Electric, MA
3. Eaton/Cutler-Hammer, OH
4. General Electric, CT
5. Or approved equal

2.02 MATERIALS / EQUIPMENT

A. The MCC replacement components shall be 600 volt class suitable for operation on a three phase, 60 hertz system. The system operating voltage is be 480V. Number of wires, bus ampacity, and short circuit withstand capability for existing MCCs is as shown on the Contract Drawings.

B. Refer to Contract Drawings for actual layout and location of equipment and components, current ratings of devices, components and assemblies, and other details.

C. Replacement or modified MCC components shall match the existing wiring methods (NEMA Class and Type) of the existing MCCs shown to be modified on the Contract Drawings.

D. The circuit breakers, motor circuit protectors, disconnect switches and motor starters shall have a short circuit withstand rating equal to the existing MCC short circuit withstand rating. Replacement cubicles/buckets for existing MCC shall be rated to match existing in all aspects, including, but not limited to; width, depth, steel gauge, NEMA enclosure rating, seismic rating, paint color, etc.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Unit Compartments

1. Each unit compartment shall be provided with an individual front door. Each front door shall have a drawing holder mounted on the inside of the door for holding wiring diagrams. Each plug-in unit shall be supported and guided by a removable unit support pan, so that the unit rearrangement is easily accomplished. The rearrangement of the unit support pan from one location to the other shall be accomplished without use of tools. After

insertion, each plug-in unit shall be held in place by at least two multi-turn latches, located on the front of the unit. At least one latch shall be located at the top of the unit and one at the bottom, for front accessibility and inspection convenience.

2. Unit compartments shall contain circuit breakers, combination motor starters, fused disconnects, etc., and related equipment such as overload relays, control power transformers, terminal blocks, etc. as shown and as specified and required.

3. All unit compartment interiors shall be painted white.

4. All units shall be isolated from one another, above and below, by unit support pans or steel barriers which can remain in place when the units are withdrawn.

5. Incoming line compartments shall be isolated from horizontal and vertical wireways by steel barriers.

B. Operating Mechanisms

1. An operating mechanism shall be mounted on the primary disconnect of each feeder or starter unit. It shall be mechanically interlocked with the unit door to prevent access unless the disconnect is in the OFF position. A defeater shall be provided to bypass this interlock. With the door open, an interlock shall be provided to prevent inadvertent closing of the disconnect. A second interlock shall be provided to prevent removal or re-insertion of the unit while in the ON position. Padlocking facilities shall be provided to positively lock the disconnect in the OFF position with from one (1) to three (3) padlocks with the door open or closed. In addition, means shall be provided to padlock the unit in a partially withdrawn position with the stabs free of the vertical bus.

2. Feeder Breakers

a. Feeder circuit breakers shall be the molded case type (as described above). Breakers shall be manually operated and shall provide thermal magnetic, inverse-time overload and instantaneous short-circuit protection. Provide electric trip units where shown.

b. Breakers shall have 100A frames as a minimum. Overload protection shall be provided on all poles, with trip settings as indicated on the Contract Drawings. Breakers with 225A or larger frames shall have interchangeable trip units and adjustable magnetic trip elements. Breakers 50A and larger shall be provided with ground fault protection. Feeder ground fault protection shall be coordinated with main and tie circuit breaker ground fault protection.

c. Feeder breakers shall have operating mechanisms as described above.

3. Combination Motor Control Units:

   a. Combination motor control units shall consist of a main disconnect device, a motor starter, a control power transformer, an overload relay, relays, pilot devices, terminal blocks, and modules for communications and motor protection as described below. Additional relays or other devices shall be included as required and as shown on the Contract Drawings.

      1) Disconnecting Service:

         a) The disconnect device shall be either a circuit breaker (as described above), motor circuit protector, or fused disconnect as shown on the Contract Drawings.

         b) Motor circuit protectors (MCP) shall be molded case devices similar to circuit breaker (as described above) with a current sensing coil in each of the 3-poles and shall have an adjustable magnetic trip setting by means of a single dial, mounted on the front of the MCP. The MCP shall be designed to meet the NEC requirements concerning motor full load and locked-rotor current.

         c) The settings of the MCP's shall be based on actual motor nameplate data.

         d) The MCP's shall have operating mechanisms as described above.

         e) Disconnect switches shall be heavy duty, single-throw fused type.

         f) Switches shall be rated 600V and shall have amperage and number of poles as shown on the Contract Drawings.

         g) Switches shall be quick-make/quick-break and shall accept Class R dimension fuses.

         h) Disconnect switches shall have operating mechanisms as described above.

   b. Motor Starters and Overload Relays

      1) Motor starters shall be for across-the-line starting, unless otherwise indicated. The size of the starter shall be as required for the particular load. In no case shall starters smaller than NEMA Size 1 be used. Size 1 and 2 starters shall be completely drawout type so that units may be withdrawn without disconnecting any wiring. Size 3 and 4 full-voltage, non-reversing starters shall be drawout type

after disconnecting power leads only. Starters over three space-units high may be bolt-on type. A positive guidance system shall be provided to assure proper alignment of wedge-shaped power stabs in deadfront openings in vertical power bus.

2) Magnetic starters and contactors shall double break design with cadmium oxide silver contacts. Design shall meet or exceed the requirements of UL and NEMA Standards. Coils shall be hot molded construction to protect the coils from mechanical and environmental damage. Starter unit shall be supplied with overload relays, as described below.

3) The magnetic starter should be able to withstand 20 million operations.

4) Each starter coil shall be equipped with a surge-suppression device.

5) Each starter shall be able to accommodate a minimum of eight (8) normally opened or normally closed auxiliary contacts.

6) Overload relays shall be solid-state type, 3-pole with remote reset capability and Class 20 operation.

7) Overload relays shall be manually resettable through the front of the unit compartment door.

8) Overload heater elements shall be provided for all overload relays and shall be sized based on actual motor nameplate data

9) Overload relays shall contain a normally open auxiliary contact, as a minimum. Additional contacts shall be provided as shown on the Contract Drawings.

c. Control Power Transformers

1) Control power transformers (CPT) shall be provided with each combination motor control unit. CPT's shall be 480V-120V, 60 Hz unless shown otherwise, and shall have the following minimum volt-amp ratings:

a)	NEMA Size Starter	VA
b)	1 & 2	200

2) Additional transformer capacity shall be provided when required.

3) CPT's shall be epoxy encapsulated, core and coil units designed for machine tool applications. Insulation classes

shall be 185°C (NEMA) and 180°C (UL), 115°C rise. Maximum surface temperature shall be 65°C.

a) CPT's shall be provided with one secondary lead furnished with a Class H control fuse and clip, and the other secondary lead grounded. Both primary leads shall be provided with Class CC control fuses and clips. The above fusing shall apply to all CPT's unless shown otherwise on the Contract Drawings.

d. Control Relays

1) Control relays shall be machine tool type and shall be furnished and installed as required in the unit compartments, or in individual relay panels as shown on the Contract Drawings.

2) Control relays shall be rated 600V with contacts rated 10A continuous, and shall be capable of making 7200VA and breaking 720VA. Coil voltage shall be 120V, 60 Hz unless shown otherwise.

3) Contacts shall be bifurcated and convertible.

a) Relays shall be standard, latching type or time delay type, and shall be furnished with the number of contacts required. Each relay shall contain a minimum of two (2) normally open and two (2) closed contacts.

e. Pilot Devices

1) Pilot devices shall be provided as required and as shown on the Contract Drawings.

2) Pilot devices shall be heavy duty, machine-tool service type.

3) Pilot devices shall be rated 600 volt with contacts rated 10 ampere continuous, and shall be capable of making 7200VA and breaking 720VA.

4) Pilot lights shall be LED push-to-test, transformer type.

5) Pushbuttons, selector switches, indicating lights and other pilot devices shall be provided on unit door mounted control station.

6) The control station shall be removable for the purpose of mounting and wiring the pilot devices, and shall be held in place with mounting screws.

7) Contact blocks of the pilot devices shall be mounted in a recessed control station housing to minimize the hazard of accidental contact when the unit door is opened.

f. Terminal Blocks

1) Terminal blocks shall be mounted on the right side or bottom of the unit compartment for easy accessibility. Control terminal blocks shall be pull-apart type on plug-in units for easy removal of the unit from the structure. Terminal blocks on non plug-in units shall be the fixed type.

2) Control terminal blocks shall be rated 20A, 600V minimum.

C. Labelling

1. The structure and each compartment within shall have identifying nameplates in accordance with the requirements of Section 26 05 53 – Identification for Electrical Systems.

2. Each spare and space compartments shall be labeled as such.

D. Painting

1. All metal surfaces of the MCCs 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 nitro-cellulose lacquer enamel.

3. All exterior surfaces shall be given three coats of the same lacquer. The color of the finishing coats shall be light gray ANSI No. 61.

4. All unit compartment interiors shall be painted white.

E. Wiring

1. Control and power wiring shall be flame-retardant (VW-1) moisture, heat and oil resistant thermoplastic insulation rated 600V, 90°C, with stranded copper conductors, types MTW and THW.

2. Control wires shall be red. Power wires shall be black. Neutral wires shall be white. Ground wires shall be green.

3. Control wire size shall be #12 AWG minimum. Power wire size shall be #10 AWG minimum.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Certified Shop Tests:

1. Bench test replacement equipment to demonstrate that it has been properly assembled, properly lubricated, is not overheating, is not overloading, and has no electrical or mechanical defects.

2. Test all disconnecting devices, starters and controls. Simulate controls for each starter and verify all contacts, relays, etc. operate properly. Verify all meters, monitors and communication devices operate properly. Verify all

miscellaneous devices, such as power supplies, transfer devices, etc., operate properly.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. General

1. Contractor shall provide new conduit openings in existing MCC enclosure as required by Cable and Conduit Schedule. Any drilling/cutting required to provide new opening in existing MCC enclosure shall be perform in a neat and workmanlike manner and be in accordance with the manufacturer's recommendations. Where drilling/cutting is performed in place, equipment shall be protected internally to prevent introduction of foreign debris/materials into the existing enclosure. Contractor is responsible for the complete operability of the MCC and all of its component parts where any modification(s) is(are) shown to be made at said MCC.

2. All existing MCC components shown to be removed shall be re-packaged and conditioned for long term storage and turned over to the plant for use as spare.

3. Install nameplates for identification of equipment.

B. Wiring:

1. The Contractor shall wire all equipment per Contract Drawings and as required.

C. Adjustments

1. The Contractor shall test and adjust all equipment within the MCC as modified by the Contract. This includes short circuit device settings, electronic trip settings of breakers, MCP settings, timing relay settings, etc. All devices shall be properly adjusted such that the MCC protection and control circuits operate correctly and safely

3.03 FIELD TESTING / QUALITY CONTROL

A. After installation of the equipment, controls and all appurtenances, field test the equipment for system operation and conformance to the specified performance parameters. The Contractor shall perform field tests in accordance with Division 1 - General Requirements. Test the equipment to demonstrate the following:

1. Equipment has not been damaged in transportation and installation.

2. Equipment has been properly installed.

3. Equipment has been properly lubricated.

4. Equipment has been properly connected.
5. Equipment is not overheating.
6. Equipment is not overloading any part.
7. The equipment has no electrical or mechanical defects.
8. Prove compliance with performance and design parameters.
9. Prove system operability under all control schemes.

B. Manufacturer's Field Services

1. The Contractor shall furnish the services of a qualified manufacturer's service representative to assist in the installation of 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. The Contractor shall provide equipment start-up services and training in accordance with Division 1, General Requirements and as described in this section.
3. The Contractor shall provide the services of the representative for the following minimum durations:
   a. Field Tests: 3 Visits of 1 Day Each
   b. Training: 3 Visits of 1 Day Each
4. Reports: The Contractor shall submit a report from the manufacturer of each visit to the site. The Contractor shall provide complete information on time, schedule, tasks performed, persons contacted, problems corrected, test results, training, instruction, and all other pertinent information.
5. All service representatives shall sign in with the Engineer on each day they are at the construction site.

3.04 STARTUP / DEMONSTRATION

A. The Contractor shall provide equipment start-up services and training in accordance with this Section and the Specifications.

B. Acceptance Testing

1. The Contractor shall provide acceptance testing of the modified MCC.
2. All acceptance testing shall be performed by the testing firm, after the completion of the field tests specified under this Section.
3. The acceptance testing shall be witnessed by the Engineer and certified by the Contractor.
4. Acceptance testing inspection shall be performed on the modified MCC. Inspection shall include:

a. Physical, electrical and mechanical condition shall be inspected.

b. The settings of all protective and monitoring devices shall be confirmed with the full load current rating of the motors.

c. All connections shall be inspected for high resistance.

d. Electrical and mechanical interlock systems and control circuits shall be checked for proper operation.

5. Acceptance electrical testing shall be performed on the modified MCC. Testing shall include the following:

a. Insulation resistance tests shall be performed on each bus section, on each starter and circuit breaker, phase-to-phase and phase-to-ground.

b. Measure insulation resistance of each control circuit with respect to ground.

c. Protective devise inclusive of motor overload units shall be tested by current injection.

6. All tests and values shall be in accordance with the manufacturer's recommendations and NETA ATS.

7. The Contractor shall provide an acceptance testing report. The report shall be in accordance with NETA ATS.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Adjusting, protection and cleanup shall be performed as specified in this Section and as specified in Division 1.

END OF SECTION

SECTION 26 29 13 – ENCLOSED CONTROLLERS
CONTRACT OB-144A

PART 1 GENERAL

1.01 SUMMARY

A. Requirements for providing enclosed controllers. Enclosed controllers 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 48 - Vibration and Seismic Controls for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems

D. 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.

3. For wound rotor motors of all horsepower ratings, the primary and secondary shall be controlled by a magnetic motor starter or as shown on the Contract Drawings.

4. Multiple speed squirrel cage motors, shall be controlled by a magnetic motor starter. The magnetic motor starter shall provide adequate protection of the motor at each speed. A line establishing contactor shall be provided for each motor speed.

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 enclosed controllers.

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. Enclosed controllers 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

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) Circuit breakers shall be the molded case type with number of poles, voltage and current ratings as shown on the Contract Drawings.

2) Breakers shall be manually or remotely operated thermal magnetic or solid state type, including inverse-time overload and instantaneous short-circuit protection. Contacts shall be nonwelding silver alloy and arc extinction shall be accomplished by means of arc chutes.

3) 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.

4) Breakers with frame sizes 225 amp or larger shall have interchangeable trip units and adjustable magnetic trip elements.

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.

7) Where shown on the Contract Drawings breakers shall be provided with electronic trip units. Electronic trip units shall include long time, short time, instantaneous and ground fault 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.

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.

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 and 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.

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. Enclosed controllers shall be installed in conformance with the NYCEC.

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 Work of this Section includes furnishing and installing a fiber optic communications infrastructure including, but not limited to, fiber optic cable (FOC), conduit, pull boxes, patch panels, terminations, testing, and implementation.

B. The Work includes terminating and testing individual fiber cables installed under this Contract, and testing a completed fiber optic communications network. It also includes the demolition of the fiber optic cables when the interim system is demolished.

C. 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. Section 26 05 33 – Raceways and Boxes for Electrical Systems

B. Section 40 62 16.01 - PMCS Network Equipment

C. Section 40 67 16 - PMCS Panels and Enclosure.

D. Refer to the Instrumentation and Electrical Contract Drawings for fiber optic cable conduit and connections.

1.04 REFERENCES

A. Abbreviations and Acronyms

1.	ANSI	American National Standards Institute
2.	BICSI	Building Industry Consulting Services International
3.	EIA	Electronic Industries Alliance
4.	ETA	Electronics Technicians Association
5.	FOA	Fiber Optic Association
6.	IEEE	Institute of Electrical and Electronic Engineers
7.	ICEA	Insulated Cable Engineers Association
8.	NECA	National Electrical Contractors Association
9.	NEMA	National Electrical Manufacturers Association
10.	NFPA	National Fire Protection Association
11.	TIA	Telecommunications Industry Association
12.	UL	Underwriters Laboratories

B. Reference Standards

1. NECA/FOA 301 – Standard for Installing and Testing Fiber Optic Cables.
2. ANSI/TIA/EIA 568 – Cabling Standards.
3. ICEA S-83-596 – Indoor Optical Fiber Cables.
4. ICEA S-87-640 – Optical Fiber Outside Plant Communications Cable.
5. ICEA S-104-696 – Indoor-Outdoor Optical Fiber Cable.
6. NFPA 262 – Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
7. NFPA 70 – National Electrical Code, Article 770.
8. TIA 598 – Fiber Optic Cabling Coding.
9. UL 1651 – Standard for Optical Fiber Cable.
10. UL 1666 – Standard for Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts.

11. UL 1685 – Standard for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables.

12. UL 2024 – Standard for Signaling, Optical Fiber and Communications Raceways and Cable Routing Assemblies.

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 DESCRIPTION

A. One 12-strand, OM4 multimode fiber optic cable shall be installed from the New Chlorine Building Control Panel (LCP-4200) in the Chlorine Building to the Existing Emergency Tanks Return Panel in the Meter Building to provide communications.

B. One 24-Strand OM4 multimode fiber optic cable shall be installed from the New Chlorine Building Control Panel (LCP-4200) in the Chlorine Building to the CE-9100 Network Panel in the Main Building Control Room.

1.06 QUALITY ASSURANCE

A. The cable manufacturer shall be ISO 9001 certified and registered.

B. The fiber optic cabling system materials furnished under this Section shall be provided by fiber optic manufacturer who have been providing these types of materials for the past five years.

C. The installation of fiber optic cabling system materials furnished under this Section shall be performed by an installer who has been installing these types of materials and systems for the past three years.

1.07 SUBMITTALS

A. Contractor shall submit the following shop drawings in accordance with the requirements of Section 01 33 00 – Submittal Procedures.

1. Catalog Data: Detailed bill of material and catalog data on fiber-optic cable, termination devices, patch panels, breakout enclosures, pigtails, and fan-outs kits where applicable. Product data sheets shall include the manufacturer's name and catalog number for each item, the manufacturer's descriptive literature including electrical and physical characteristics, catalog cuts, and any power supply requirements.

2. Fiber optic link power budget for each cable run in excess of 1000 feet. The budget shall include transmitter power, receiver sensitivity, connector losses, cable losses, and a 3dB-aging margin. Fiber optic transmission line shall maintain a minimum of 10dB safety margin.

3. Catalog sheets, engineering drawings and specifications for patch cords.

4. Detailed fiber optic cable installation diagrams. The following drawings shall be included as a minimum:
    a. Drawings showing the proposed point-to-point routing of all fiber optic cable. Locations of pull boxes, manholes, and wall penetrations shall be indicated. Show the proposed routing of cable by overlaying it on the plant site plan. One overview drawing shall be included as well as a minimum of four individual drawings that show a magnified view of the fiber routing at each plant area so that details of pull boxes, conduit sizes, etc. can be clearly shown.
    b. Drawings for each communication enclosure (CE) detailing the proposed fiber optic cable terminations (including patch cables) at each patch panel and network switch. The drawings shall depict the color of each strand, the port number to which it is terminated, and the function (i.e. SCADA, Remote I/O, Telephone, etc.)
5. A cable pulling plan shall be submitted a minimum of 45 days prior to the planned initiation of cable pulling. The pulling plan and pull tension calculations may be prepared by using a software program such as Pull-Planner 3000 by American Polywater Corporation. The cable pulling plan must be approved a minimum of 15 days prior to pulling cable. Work plan shall include the following:
    a. Pull tension calculations.
    b. Detailed description of pull operation methods for all conduit runs.
    c. Tools and equipment to be used for cable installation and testing.
    d. Safety and manual assist cable pulling operations.
    e. Detailed schedule for pulling and testing cables.
    f. Copies of ETA Certified Fiber Optics Installer certificates, BICSI Registered Cabling Installers Technician Level certificates, or resumes demonstrating a minimum of 5 years of experience with fiber optic network installations of similar size and scope for all field technicians.
6. Shop test reports.
7. Field Test reports, including Pre-installation and Post-installation testing as specified herein.
8. O&M manual that includes the following:
    a. Approved fiber optic submittals, including catalog data, power budgets (if applicable), and pulling plan.

b. As-built fiber optic installation drawings

c. Post-installation test reports

d. Warranty information

e. Instructions on how to test and terminate fiber.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The cable shall be packaged in cartons and/or wound on spools or reels. Each package shall contain only one continuous length of cable. The packaging shall be constructed so as to prevent damage to the cable during shipping and handling.

B. Test tails shall be at least two meters long. The inner end shall be fastened so as to prevent the cable from becoming loose during shipping and installation. Reels shall be permanently marked with an identification number that can be used by the manufacturer to trace the manufacturing history of the cable and fiber.

C. All fiber optic cables shall be attenuated tested. The attenuation of each fiber shall be provided with each cable reel by the manufacturer.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Provide 20 spare connectors of each type of connector supplied.

B. Provide a minimum of 2 spare patch cables with terminated connectors (both ends) for each length of patch cable from patch panels to termination point. Provide protective covers to each end of patch cable.

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. Fiber optic cable, terminators, connectors, assemblies, patch cords, and patch panels

1. Cisco Systems, San Jose, CA.

2. Or approved equal.

B. Pulling lubricant

1. American Polywater Corporation, Stillwater, MN

2. Or approved equal.

C. Warning tape

1. Brady Corporation, Milwaukee, WI
2. Or approved equal.

D. Duct Plugs

1. Condux International, Mankato, MN
2. TE (Tyco Electronics) Connectivity Ltd., Berwyn, PA
3. Cal Am Manufacturing, El Cajon, CA
4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Laser-Optimized 50/125 µm Multimode Fiber (OM4)

1. General

a. The multimode fiber utilized in the optical fiber cable shall meet ANSI/TIA/EIA-568-C.3, "Optical Fiber Cabling Components Standard" and corresponds to designation OM4 (TIA 492AAAD) per ISO/IEC 11801 or ISO/IEC 24702.

b. The fiber shall operate at wavelengths 850/1300 nm, with maximum attenuation of 3.0/1.0 dB/km at these respective wavelengths. For 1 Gb Ethernet link, performance assured to 1000/600 m at these respective wavelengths.

2. Cable Identification

a. The individual fibers shall be color coded for identification. The optical fiber color coding shall be in accordance with EIA/TIA-598, "Color Coding of Fiber Optic Cables." The coloring material shall be stable over the temperature range of the cable, shall not be susceptible to migration, and shall not affect the transmission characteristics of the optical fibers. Color coded buffered fibers shall not adhere to one another. When fibers are grouped into individual units, each unit shall be numbered in the unit jacket for identification. The number shall be repeated at regular intervals.

b. The outer cable jacket shall be marked with the manufacturer's name or UL file number, date of manufacture, fiber type, flame rating, UL symbol, and sequential length markings every two feet. The markings shall be in contrasting color to the cable jacket.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Loose Tube Fiber Optic Cable (Indoor/Outdoor)

1. Cable shall be flame-retardant, UV stabilized, fully water blocked with dielectric central member for use in indoor/outdoor applications. The buffer tubes shall be gel-free. Each buffer tube

shall contain a water-swellable yarn for water-blocking protection. Cable shall be suitable for installation in duct, aerial, and riser environments. Cable shall meet UL OFNR specifications and not require transition splicing upon building entry in order to meet fire codes.

2. Optical fibers shall be placed inside a buffer tube.

3. Each buffer tube shall contain 6 fibers.

4. In buffer tubes containing multiple fibers, the colors shall be stable across the specified storage and operating temperature range and not subject to fading or smearing onto each other or into the gel filling material. Colors shall not cause fibers to stick together.

5. Buffer tubes shall be kink-resistant within the specified minimum bend radius.

6. Fillers may be included in the cable core to lend symmetry to the cable cross-section where needed.

7. The central anti-buckling member shall consist of a glass-reinforced plastic rod. The purpose of the central member is to prevent buckling of the cable.

8. The cable core shall contain a water-blocking material. The water-blocking material shall be non-nutritive to fungus, electrically non-conductive, and homogenous. It shall also be free from dirt and foreign matter and shall be readily removable with conventional non-toxic solvents. Cable shall contain water-blocking threads between tubes.

9. The cable shall contain at least one ripcord under the sheath for easy sheath removal.

10. Tensile strength shall be provided by a combination of high tensile strength dielectric yarns.

11. The high tensile strength dielectric yarns shall be helically stranded evenly around the cable core.

12. All dielectric cables (with no armoring) shall be sheathed with medium density polyethylene (MDPE). The minimum normal jacket thickness shall be 1.4 mm. Jacketing material shall be applied directly over the tensile strength members and water-blocking material. The polyethylene shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.

B. Cable Construction

1. Plenum Cables

a. Plenum cables up to 24 fibers: The fibers shall be stranded around a dielectric member.

b. Cable shall be all dielectric and requiring no grounding or bonding.

c. Fibers shall have a 250-um buffer coating

2. Cable Jacket

a. The jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. The jacket shall have a consistent, uniform thickness; jackets extruded under high pressure are not acceptable. The jacket shall be smooth, as is consistent with the best commercial practice. The jacket shall provide the cable with a tough, flexible, protective coating, able to withstand the stresses expected in normal installation and service.

b. The cable and subunit jacket color shall be orange for cables containing multimode fibers.

c. The cable and subunit jacket color shall be yellow for cables containing single-mode fibers.

d. For cables with more than two fibers, the cable jacket shall be designed for easy removal without damage to the optical fibers by incorporating a ripcord under each cable jacket. Non-toxic, non-irritant talc shall be applied to the aramid yarns to allow the yarns to be easily separated from the fibers and the jacket.

e. The nominal thickness of the cable outer jacket shall be sufficient to provide adequate cable protection while meeting the mechanical, flammability, low smoke, and environmental test requirements of this document over the life of the cable.

C. Fiber Cable Terminations, Connectors, And Cable Assemblies

D. Buffer Tube Fan-Out Kits

1. Individual fibers within a loose tube cable with 250 µm coated fibers shall use a fan-out kit to maintain flexibility and ease of handling fibers within a termination cabinet. Fan-out kits shall be installed in the patch panel enclosures to transition the loose tube fibers to ruggedized tight-buffered fiber pigtail cables. Optical fusion splices shall connect the loose tube fibers to the tight-buffered pigtail cables. The optical splice loss shall comply with the specifications for optical splices. Splice protection sleeves shall be employed on all splices to protect the splices.

2. The tight-buffered pigtails shall be factory preconnectorized with connectors as specified.

E. Connectors

1. The fiber optic communications system shall utilize stainless steel LC style connectors for all fiber optic connections. ST or SC style connectors will be acceptable only if LC style connectors are not compatible with the equipment being provided. The connectors shall be designed for use with 50/125 micron cable. Each connector shall cause a maximum signal attenuation of 1.6 dB

2. Field-Installed Connectors: Connector type to match furnished type, with ceramic or polymer ferrule and strain relief boot. The connector installation shall not require the use of epoxies, adhesives or ovens. The connector shall contain a mechanical splice and have a tool kit available to aid in assembly. The installation tools used to terminate the connector shall be able to terminate other small-form-factor and single-fiber connector designs. The connector shall not require end-face polishing in the field. The connector shall have a factory polished optical fiber stub in the connector ferrule that is bonded in the ferrule micro hole. Ferrule material shall be available in ceramic or polymer. Connector specifications shall be as follows:

   a. Insertion loss (typical): 0.3 dB.

   b. Durability (mating cycles): 500 (minimum).

   c. Repeatability: Less than 0.2 dB.

   d. Operating Temperature: 0 to plus 60 degrees C.

3. After termination with connectors, the fiber ends must be visually inspected at a magnification of not less than 100 power for multimode and 200x for single mode to check for cracks or pits in the endface of the fiber.

4. Connectors shall have a maximum allowable connection loss of 0.3 dB per mated pair, as measured per EIA-455-34. No index-matching gel is to be used; dry interfaces only.

5. Each connector shall be of the industry standard LC type compatible; designed for single-mode and multimode tolerances; shall meet or exceed the applicable provisions of EIA-455-5, 455-2A, 455-34, and 568-B.3; and shall be capable of 100 repeated ratings with a maximum loss increase of 0.1 dB. Connectors shall incorporate a key-way design and shall have a Zirconia ceramic ferrule. Connector bodies and couplings shall be made of corrosion-resistant and oxidation-resistant materials such as nickel-plated zinc, designed to operate in humid environments without degradation of surface finishes. Connectors shall be capable of operating in a range of -40 to 75 degrees C.

F. Fiber Optic Patch Cables

1. Fiber optic patch cable shall be two-fiber zipcord 50/125 core/clad micron multimode riser rated cable.

2. Installation of patch cables shall include all spares and observe the minimum fiber bend radius and strain relief.

G. Patch Cords

1. All fiber patch cords will meet NFPA 70 - National Electric Code jacketing requirements for this project's application and will have outer jacket coloration of yellow for single mode patch cords. All duplex patch cords will be of a zip cord design and will have connector boots of two (2) colors, namely white or off-white for one leg of the duplex cord (non-printed zip leg) and red for the opposite leg (printed zip leg) or the duplex cord.

2. Connector losses will not exceed the limits established herein for connectors.

3. No splices of any type are allowed within an assembly. Each assembly is to be fully tested and those test results placed on a test tag for each mated pair of connectors. Connectors will then be attached to one end of each pair within the assembly. Each assembly will be individually packaged within a plastic bag with the manufacturer's part number marked clearly on the outside of said bag. Label each installed patch cord as directed by the Engineer.

H. Fiber Optic Patch Panels

1. Refer to Specification 40 62 16.01 – PMCS Network Equipment.

I. Pulling Lubricant

1. Pulling lubricant shall be nontoxic, nonflammable, noncombustible and noncorrosive. The lubricant shall be water based and contain no waxes, greases, or silicones. The material shall be UL listed and compatible with the cable insulation and jacket.

2. The pulling lubricant shall be specifically intended for fiber optic cable installations.

J. Warning Tape

1. A metal detectable warning tape shall be installed 4 to 6-inches below grade and above any buried fiber optic cable. Tape shall be constructed of 5 mil orange polyester material, 2-inch minimum width. Tape shall be capable of being detected or located by either conductive or inductive location techniques.

2. Black lettering shall read CAUTION: BURIED FIBER OPTIC LINE BELOW.

K. Duct Plugs

1. Reusable plugs to seal around cables in conduits and ducts to make a watertight seal shall be corrosion proof and compatible with cable jacket type.
2. Plugs shall be either blank or sized as required based on cable and duct sizes.
3.

2.04 SOURCE QUALITY CONTROL / SHOP TESTING

A. Perform manufacturers standard production testing and inspection in accordance with applicable ICEA standards listed in 1.04 References.

B. Submit all test data provided by the manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Fiber Optic Cable Preparation

1. Verify that fiber optic cable reels have been off-loaded from truck carefully and not damaged.
2. Submit to the Engineer all test data provided by the fiber manufacturer.
3. Verify that the optical fibers of the cable assembly are the type and quantity as specified and as recommended by the Instrumentation System Supplier.
4. Verify that cable construction is the type specified.
5. Test cable on reel per field testing paragraph.

3.02 INSTALLATION

A. Raceways

1. The raceway system installation including conduits, ducts, manholes, handholes, and pull boxes shall comply with Section 26 05 33 – Raceways and Boxes for Electrical Systems.
2. All conduits designated "fiber optic" shall be installed with inner ducts as shown on the Contract Drawings.
3. All conduits or ducts, whether used or spare, shall be sealed with duct plugs at all outdoor box locations and at the first entry box location indoors.
4. All spare conduits or ducts shall be provided with a pull string.

5. Use of manufactured bends shall be limited to an absolute minimum and shall be coordinated with the maximum bending radius of the fiber cable. Provide a minimum sweep radius of three feet.

B. Pulling Points

1. At no point shall the cable pulling tension exceed the TIA standards for the cable type. If calculated cable pulling tension exceeds TIA standards, provide additional pulling points, i.e. manholes, handholes, or pull boxes at no additional cost to the DEP.

2. Pull points shall be provided at no greater than 1,200-feet in a straight line direction. Within the 1,200-feet distance, the Contractor shall install pulling points at locations wherever the cumulative change of direction of the raceway exceeds 270 degrees.

3. Pulling points shall be provided on at least one side of any tunneled, i.e. directional drilled, crossing. For crossings wherever the cumulative change of directions accounts exceeds 270 degrees, provide a pulling point on both sides of the crossing.

C. Fiber Optic Cable Installation

1. General

a. The Contractor shall determine a suitable cable installation method to ensure that all cable installation requirements shall be met in all conduit/inner duct sections. All work shall be carried out in accordance and consistent with the highest standards of quality and craftsmanship in the communication industry with regard to the electrical and mechanical integrity of the connections, the finished appearance of the installation, and the accuracy and completeness of the documentation.

b. The Contractor shall make a physical survey of the project site for the purpose of establishing the exact cable routing and cutting lengths prior to the commencement of any work or committing any materials.

c. Cable installation personnel shall be familiar with the manufacturer's recommended procedures including, but not limited to, the following:

1) Proper attachment to the cable strength elements for pulling during installation. Depending on cable design, this will involve direct attachment to internal strength members or attaching an external "Kellums" or split mesh grip using a 600 lb breakaway swivel.

2) Cable tensile limitations and tension monitoring procedures.

3) Cable bending radius limitations.

4) Cable twisting limitations.

d. All cable shall be installed in conduit.

e. Installation tools and materials shall be approved by the cable manufacturer.

f. Provide breakout kits, signal transceivers, power supplies, patch panels, pigtails and jumpers as required and as indicated to install a complete network. Patch panels shall be mounted inside panels as shown on the drawings.

2. Cable Protection

a. Precautions shall be taken during installation to prevent the cable from being kinked, crushed, or twisted. A pulling eye shall be attached to the cable end and be used to pull the cable through the duct and conduit system. As the cable is pulled off the reel and into the cable feeder guide, it shall be lubricated with a lubricant as specified in this Section.

b. Crushed or kinked cable shall be replaced with new cable.

c. Dynamometers or break-away pulling swings shall be used to ensure the pulling line tension does not exceed the installation tension values specified by the cable manufacturer. The mechanical stress placed upon the cable during installation shall not be such that the cable is twisted and stretched. Maximum allowable cable strain during installation shall be less than 0.75 percent.

d. As the cable is pulled into the conduit system, add pulling lubricant to completely coat the cable in accordance with the lubricant manufacturer's recommendation.

e. Repair of cable jacket will not be permitted. Jacket damage will require removal and re-installation of a new cable run at the Contractor's expense.

f. Installation at Pull boxes

1) The pulling of the cable shall be hand-assisted at each handhole or pull box. The cable shall not be crushed, kinked, or forced around a sharp corner. Sufficient slack shall be left at each end of the cable to allow proper cable termination.

2) The cable shall be looped in all pull boxes, as noted on the plans, to provide approximately 15 feet of extra cable in the pull box. At termination points such

as at cabinets or computers, a 15 foot loop shall also be provided wherever space permits.

3) The fiber optic cable shall be coiled and secured with cable ties in the pull box.

4) The Contractor shall ensure that the minimum bending radius of the fiber optic cable is not compromised when preparing this stored cable slack.

3. Splicing

a. Splicing of fiber optic cable shall not be permitted except in emergency conditions. Fiber optic cable runs and required looping of the cable shall be provided in one continuous length. A splice is only permitted when authorized by the Engineer, splicing shall be by trained, authorized persons only. Any allowed splicing of fiber optic cable shall be by fusion splice only; no mechanical splices are permitted.

b. All fusion splicing equipment shall be in good working order, properly calibrated, and meeting all industry standards and safety regulations. Cable preparation, closure installation, and splicing shall be accomplished in accordance with accepted and approved industry standards.

c. Splices shall be made in manholes, handholes, pull boxes or other enclosures and shall use re-enterable splice closures. Make splices watertight and provide mechanical protection equal to the cable jacket, or better.

d. The average splice loss shall be 0.1 dB or less per splice. The average splice loss is defined as the summation of the loss as measured in both directions using an optical time domain reflectometer (OTDR) through the fusion splice, divided by two. No individual splice loss measured in a single direction shall exceed 0.15 dB.

e. Upon completion of the splicing operation, all waste material shall be deposited in suitable containers, removed from the job site, and disposed of in an environmentally acceptable manner.

D. Identification

1. All cable identifiers shall be in accordance with the approved fiber optic network submittal.

2. Tag each cable in junction boxes, manholes, and handholes. Provide permanent nylon/plastic tie wrap type tags with waterproof markings.

3. Label each cable, buffer tube, and fiber with permanent waterproof typewritten tags.

3.03 FIELD TESTING / QUALITY CONTROL

A. Physical Checkout

1. Conduct physical checkout of the fiber optic network. Physical checkout shall be performed prior to all testing listed under Section 40 80 82 – PMCS Startup and Field Testing.
2. Verify identification is completed.
3. Verify that fiber optic patch panels have been installed plumb and level at locations indicated.
4. Verify that optical fiber connections or terminations within patch panels and splice closures are in accordance with cable manufacturer's recommendations.

B. General: The Contractor shall perform pre-installation and post-installation FOC tests. The Engineer shall be notified in advance so that these tests are witnessed as required by Section 01 75 10 – Preliminary and Final Field Tests.

C. Test equipment:

1. All test equipment shall be traceable to NIST standards.
2. The Contractor shall use the following to perform pre-installation and post-installation FOC tests:
    a. Optical Loss Test Set (OLTS): The OLTS shall consist of an optical fiber light source that produces wavelengths that match the type of fiber optic cable provided and a power meter to measure within +/- .25dB. OLTS shall also be able to measure the optical length of the fiber optic cable.
    b. Optical Time Domain Reflectometer (OTDR). The OTDR shall be laser precision, and able to test single mode or multimode systems with a visual fault locator.
    c. Fiber Microscope: Capable of at least 200X magnification.
    d. Test equipment that combines all of these devices into one instrument is acceptable.
3. Manufacturers of test equipment
    a. Fluke Networks
    b. Corning, AFL (Noyes)
    c. Exfo

d. Or approved equal.

D. Pre-installation Reel Test

1. The purpose of these tests prior to installation is to verify that the cable conforms to the manufacturer's specifications; is free of defects, breaks, and damages by transportation and manufacturing processes; and to provide baseline readings in dB.

2. Prior to removal of each cable from the delivery reel, all optical fibers within the cables shall be tested by the Contractor using an OTDR. The OTDR tests shall consist of end-to-end length and fiber attenuation (dB/km) measurements to ensure proper performance of the fiber optic cable. The tests shall be performed from both ends of each fiber to ensure complete fiber continuity within the cable structure.

3. Pre-installation, "on-reel" test results shall be compared with the manufacturer's test report delivered with the cable. Gross dissimilarities shall be noted and remedied between the Contractor and manufacturer. In all cases, all fibers must meet the optical attenuation specifications prior to cable installation.

4. For multimode fiber: The maximum allowable attenuation is 3.5dB/km at 850nm and 1.5 dB/km at 1300nm. The Contractor shall replace any cable in which any fiber strand within that cable does not meet this requirement

5. The Contractor shall perform tests on all reels of cable. The Engineer shall be notified a minimum of 15 days prior to any test.

6. The Contractor shall document this test and submit the report for review and approval. Documentation shall consist of a PDF of the test results along with the manufacturers test report.

7. Cable shall not be installed until the Engineer has reviewed and approved the test report.

E. Post-installation tests: After FOC has been installed and connectors have been added, the following tests shall be performed:

1. Visually inspect terminal connectors for out of round condition and surface defects such as micro chips, cracks, and scratches using the fiber microscope. Record results on spreadsheet and replace any defective connections.

2. ANSI Tier 1 Fiber Testing: The end-to-end link and length attenuation shall be calculated and recorded in a spreadsheet using the formulas specified by ANSI/TIA-568-C. On the same spreadsheet, the actual OLTS results shall be recorded and then compared to the acceptable power loss budget of the equipment that the fiber optic cable is connected to.

3. ANSI Tier 2 Fiber Testing: A recording OTDR shall be used to test for end-to-end continuity and attenuation of each optical fiber in accordance with ANSI/TIA-568-C. The OTDR shall have an X-Y plotter to provide a hard copy record of each trace of each fiber. The OTDR shall be equipped with sufficient internal masking to allow the entire cable section to be tested. This may be achieved by using an optical fiber pigtail of 30 feet or more to display the required cable section.

    a. The OTDR shall be calibrated for the correct index of refraction to provide proper length measurement for the known length of reference fiber.

    b. A transmission test shall be performed with the use of 850 and 1300 nm stabilized light sources and 850 nm/1300 nm power meters for multimode fiber This test shall be conducted in both directions on each fiber of each cable.

    c. All traces shall display the entire length of cable under test, highlighting any localized loss discontinuities (installation-induced losses and/or connector losses). The trace shall display fiber length (in kilofeet), fiber loss (dB), and average fiber attenuation (in dB/km), as measured between two markers placed as near to the opposite ends of the fiber under test as is possible while still allowing an accurate reading. Care shall be taken to ensure that the markers are placed in the linear region of the trace, away from the front-end response and far-end Fresnel reflection spike. Time averaging shall be used to improve the display signal to noise ratio. The pulse width of the OTDR shall be set to a sufficient width to provide adequate injected power to measure the entire length the fiber under test.

    d. If connectors exist in the cable under test, then two traces shall be recorded. One trace shall record the fiber loss (dB) and average attenuation (dB/km) of the entire cable segment under test, including connectors. The second trace shall display a magnified view of the connector regions, revealing the connector losses (dB). All connector losses shall be measured using the five-point splice loss measurement technique.

    e. Hard and electronic copies of test documentation shall be submitted. The OTDR trace shall also include the following information:

        1) The test site, including name and location.\

        2) The name of the person conducting the test.

3) The date and time the test results were saved in memory

4) The manufacturer and model number of the device used for testing.

5) Fiber cable identification name, number, and type.

6) Fiber sub-cables(strands) identification name, number, and colors

7) Length of each fiber

8) Trace plot including event tables at appropriate wavelengths.

9) Index of refraction setting for OTDR.

10) dB/km loss.

11) Optical wavelengths used for testing.

12) Pulse width setting for OTDR.

13) Launch point connector number.

14) The averaging interval of the test.

F. The Contractor shall compare the pre-installation test results to the post-installation results. If a deviation of greater than one dB occurs, the Engineer shall be notified in writing by the Contractor, and the cable shall be removed and replaced at no additional cost to the DEP.

G. Upon completion of the previous tests, all FOC coils shall be secured with ends capped to prevent intrusion of dirt and water.

H. Certification of completion of pre- and post-fiber installation testing including test results shall be provided to the Engineer. Test results shall be submitted on paper in a binder, including results indicated in tables or a spreadsheet. Test results that exceed specification limits shall be noted. The electronic copy shall be included in the binder.

3.04 STARTUP / DEMONSTRATION

A. Fiber Optic Cable Training

1. Provide one half-day training and instruction on the maintenance of the fiber optic system and how to use the tools and testing equipment provided in this Section for up to four DEP instrumentation technicians and electricians. This training shall be conducted immediately following installation and testing of fiber optic cable and at a time suitable to the DEP. Provide a hands-on course using actual network as well additional fiber pieces as required. This training shall take place at the DEP's Owls Head Wastewater Resource Recovery facility. As a minimum the following shall be included:

a. Fiber cable layout and basic of cable construction.

b. "Jumper" installation

c. Testing procedures.

d. Troubleshooting and diagnosis.

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 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. 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 45 - Hazardous Materials Control

B. Section 02 24 20 - Soil Sampling and Analysis

C. Section 05 12 00 - Structural Steel Framing

D. Section 31 23 19 - Dewatering

E. Section 31 23 23 - Fill

F. Section 31 25 10 - Dust, Soil Erosion and Sediment Control

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.

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.

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. The Contractor's operations shall conform to the requirements of Section 31 25 10 - Dust, Soil Erosion and Sediment Control.

2. Site Conditions:

a. 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:

1) Geotechnical Investigation Report for the Construction of Dechlorination Facilities at the Owls Head and Oakwood Beach WWTPs, Contract OB-144, May 2018. Prepared by Matrix New World Engineering.

2) Design of Dechlorination Facility at Oakwood Beach Wastewater Treatment Plant, Task 2.5e – Soil and Groundwater Sampling and Analysis Data Interpretive Report, June 15, 2018.

3) Oakwood Beach Hazards Mitigation Report, Contract EE-RRC-DES-2, May 17, 2019. Prepared by Matrix New World Engineering.

4) Oakwood Beach Hazardous Materials Investigation, Contract OB-144A, September 2025. Prepared by Entech.

b. 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.

c. 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). All subsurface utility information shown on the Contract Drawings was obtained from various plans and maps and is not guaranteed to be complete or accurate. It shall be the Contractor's responsibility to locate all such necessary utilities that may affect his work by the digging of

test pits, at locations designated by the Engineer, prior to the start of construction or the ordering of any material that might be affected.

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.

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. Disposal details:
            a) 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.

   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.

D. Annual Reporting Requirements: NYSDEC requires annual reports for specific uses of Beneficial Use Determination (BUD) materials. The reports will capture information from each calendar year and are due by March 1st.

1. All projects granted a Case-Specific BUD shall complete the Case-Specific Beneficial Use Determination Annual Report form specific to the reporting year to submit the annual report to NYSDEC. The form provides instructions for submittal.

2. Projects with materials distributed pursuant to pre-determined beneficial uses as described in 6 NYCRR Part 360.12(c) (i.e. excavated material used as fill or cover) that equal or exceed 10,000 tons shall complete the Pre-Determined BUD Large Quantity Annual Report form specific to the reporting year to submit the annual report to NYSDEC. The form provides instructions for submittal.

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 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.

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 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.

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.

H. Unforeseen Material:

1. The contractor shall stop the Work upon the discovery of any unforeseen materials until otherwise directed by the Engineer.
2. The QEP will provide a written determination for what testing or controls are required in accordance with Section 02 24 20 - Soil Sampling and Analysis and Section 01 35 45 - Hazardous Materials Control.
3. Obtain written approval from the Engineer before continuing the excavation.

3.02 IMPLEMENTATION

A. 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 over-excavate 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 over-depths 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.

B. 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.

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. 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 may be indefinite at the site of waste generation or at a location under the same ownership or control as the site of waste generation. All locations under the ownership or control of municipal agencies and departments are considered under the ownership or control of the parent municipality (6 NYCRR Part 360.14(b)(1).

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.

END OF SECTION

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. The Contractor shall provide standby equipment and power supply for maintaining uninterrupted construction dewatering.

C. The Contractor shall install groundwater monitoring wells/piezometers and measure, record and report the levels/hydraulic head of groundwater as required during the project.

D. 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.

E. 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.

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. 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 621, Uniform Procedures

4. NYSDEC CP-43: Groundwater Monitoring Well Decommissioning Policy, November 3, 2009 or latest version

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

C. Reference Reports:

1. Geotechnical Investigation Report for the Construction of Dechlorination Facilities at the Owls Head and Oakwood Beach WWTPs, Contract OB-144, May 2018. Prepared by Matrix New World Engineering.

2. Design of Dechlorination Facility at Oakwood Beach Wastewater Treatment Plant, Task 2.5e – Soil and Groundwater Sampling and Analysis Data Interpretive Report, June 15, 2018.

3. Oakwood Beach Hazards Mitigation Report, Contract EE-RRC-DES-2, May 17, 2019. Prepared by Matrix New World Engineering.

4. Oakwood Beach Hazardous Materials Investigation, Contract OB-144A, September 2025. Prepared by Entech.

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 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.

5. Post-construction Submittals: A Well Decommissioning Plan shall be submitted to the Engineer for review and approval. The Plan serves to reduce the potential for contamination to be introduced to the subsurface, prevent well from contributing to the unwanted mixing of groundwater, and removes construction materials to prevent interference with potential future construction and/or excavation activities. The Plan shall include:

   a. Well Construction Logs for all wells/piezometers to be decommissioned.

   b. Map showing all well/piezometer locations.

   c. Selection of appropriate decommissioning method as per the NYSDEC CP-43 Well Decommissioning Policy, noting that criteria for method selection includes geologic and hydrologic conditions, presence or absence of contamination in the groundwater, and well construction details.

   d. Details on grout mixture and placement.

   e. Removal of well materials, where possible, e.g., upper 5 ft of casing, riser, well pad, etc.

   f. Backfilling and site restoration.

   g. Waste handling and removal, and associated documentation.

   h. Field documentation as per NYSDEC CP-43 Policy.

   i. Required permits, if necessary, e.g., NYCDOT sidewalk permits, hydrant permit, One Call tickets (per location).

6. Well Decommissioning Report: The report shall include the following:

   a. List of decommissioned wells.

   b. Field measurements and field screening results.

   c. Documentation of backfilling and restoration activities.

   d. Completed well field inspection logs and decommissioning records as per NYSDEC CP-43 Policy.

   e. Waste material inventory and characterization results.

   f. Details regarding waste material handling and disposal.

g. Waste shipping documents, e.g., Waste profiles, facility permits and letters of acceptance, and waste manifests.

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 decommissioned at the completion of the work, except as directed by the Engineer, in accordance with NYSDEC CP-43 Policy.

C. All wells shall be decommissioned 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 OB-144A

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

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
#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.

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 25 10 – DUST, SOIL EROSION AND SEDIMENT CONTROL
CONTRACT OB-144A

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 01 14 00 - Work Restrictions

B. Section 01 74 17 - Cleaning and Site Maintenance

C. Section 02 24 20 - Soil Sampling and Analysis

D. Section 31 23 19 - Dewatering

E. 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-0-25-001, 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, November 2016, or latest version)

4. New York State Stormwater Management Design Manual (latest version)

5. New York State Department of Environmental Conservation (NYSDEC)
   a. 6NYCRR Part 361-4 – Mulch Processing Facilities.

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.
   a. Vegetative cover stabilization shall employ a Meadow Mix as per Section 32 90 00 – Planting.
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. Seeding and planting shall be in accordance with Section 32 90 00-Planting. Temporary seeding shall utilize methods and materials

as specified in Section 32 90 00 – Planting and the Contract Drawings. 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 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. Non-Winter month 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.

c. Winter months Temporary Inactivity Less than 3 days: In winter months, where construction activity will resume on a portion of the site within 3 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.

5. Concrete Washout Debris: In accordance with NYC Local Law 70 of 2011 concrete washout shall not be allowed to enter the sewer. Concrete washout muck and debris shall be removed and adequately disposed by the Contractor at no additional cost to the City.

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. 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 submit modified practices as part of the Contractor's Erosion and Sediment Control Plan, demonstrate equivalence to the technical standard, obtain the Engineer's approval and update the project SWPPP accordingly.

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-0-20-001 (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-0-20-001, 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.

a. Maintenance Inspections: A trained contractor shall inspect the erosion and sediment control practices and pollution measures being implemented within the active work area daily to ensure that they are always being maintained in effective operating conditions. If deficiencies are identified, the Contractor shall begin implementing corrective actions within one business day and shall complete the corrective actions in a reasonable time frame.

b. Qualified Inspector Site Inspections: The Contractor shall coordinate inspections with the Construction Manager's Qualified

Inspector. Qualified Inspector Site inspections are conducted a minimum of twice every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days. The Contractor shall begin implementing any corrective actions identified by the Qualified Inspector within one business day and shall complete the corrective actions in a reasonable time frame.

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. The SWPPP 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. Culvert inlet, culvert outlet and channel protection in accordance with Section 31 35 10 – Embankment and Channel Protection.
8. 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).

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.

D. 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. Site inspections are conducted a minimum of once every seven (7) calendar days and twice every seven (7) calendar days for construction activity located in the New York City Watershed of any size. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.
4. 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-0-20-001) 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. Where erosion and sediment control practices are not designed in conformance with these technical standards, the Contractor must submit modified practices as part of the Contractor's Erosion and Sediment Control Plan, demonstrate equivalence to the technical standard, obtain the Engineer's approval and update the project SWPPP accordingly.

2. 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.

3. Erosion Control Blanket shall meet the following requirements:

   a. Be a type of rolled erosion control product that is fully biodegradable with a functional longevity of a minimum of twelve (12) months.

   b. It shall be comprised of weed-and pest free wood fiber, straw, jute mesh or combination thereof, at a minimum unit weight of 10 ounces per square yard and a triple netted layer of biodegradable material.

   c. Staples shall be used to anchor the blanket to the bare soil surface.

   d. Erosion Control Blanket shall meet the following requirements:

      1) Be of a uniform open plain weave of undyed and unbleached single jute yarn averaging 190 pounds per spindle of 14,400 yards. This yarn shall be of a loosely twisted construction having an average twist of not less than 1.6 turns per inch and shall not vary in thickness by more than one-half its normal diameter.

      2) The width of the jute mesh shall be approximately forty five inches (45") or as specified or approved. Jute mesh shall be woven as follows:

         a) Approximately 60 warp ends per yard of width;

         b) Approximately 40 weft ends per lineal yard.

      3) Weight of Jute Mesh shall average 1.44 pounds per square yard (plus or minus 5%).

   e. Wire staples: Shall consist of 12-inch lengths of No. 11 gauge wire bent to form a "U", or other wire staples as approved.

   f. Wood Pegs: Shall be wedge shaped, approximately one inch by two inches by six inches (1" x 2" x 6”).

4. Compost shall meet the following requirements:

   a. Be well decomposed, aerobically composted at least 3 months, with no objectionable odors;

   b. Be weed-free, organic matter, containing less than 1%, by dry weight, of man-made foreign materials; and

   c. Be in accordance with the Blue Book Table 5.2 - Compost Standards Table, except that the 100% of the material shall pass through the 1/2% sieve.

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, RFP 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.A above.

3) Delaware Aerator Topsoil Pile: Delaware Aerator Topsoil pile, as shown in contract drawings, shall be stabilized in accordance with the NYSDEC Blue Book; a bottom liner is not required.

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.A 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.A 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.

B. The Contractor shall provide winter stabilization in accordance with Section 2.38 of the NYS Standards and Specifications for Erosion and Sediment Control (Blue Book). The winter stabilization standards apply to all construction activities involved with ongoing land disturbances and exposure between November 15th to the following April 1st. The Contractor shall provide the following:

1. Snow Management Plan
2. 25 ft. perimeter buffers
3. Tall marker stakes for silt fence
4. 2 rows of silt fence if within 100ft. of a waterbody
5. Clear flow paths to drainage structures
6. Soil stockpiles shall be stabilized

7. Soil stabilization performed daily

8. Provide 2x normal mulching rate

C. The Contractor shall provide soil restoration in accordance with Table 4.6 Soil Restoration Requirements of the Blue Book to the subgrade soil, prior to placement of topsoil or planting materials. The soil restoration standard shall be applied to areas where heavy construction traffic has occurred, or as specified by the Contract Drawings prior to final stabilization. The Contractor shall:

1. Apply 3 inches compost, as specified in Section 2.02.A.4 above, over the subgrade soil.

2. Till compost into the subgrade to a depth of at least 12 inches using a cat-mounted ripper, tractor mounted disc, or tiller, to mix and circulate air and compost into the subsoil.

a. No light-duty chisel plows shall be used.

3. All stone or rock material greater than four inches shall be removed from the subgrade.

3.03 FIELD TESTING / QUALITY CONTROL

A. 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, Section 01 74 17 – Cleaning and Site Maintenance and Section 31 10 10 – Site Clearing. Where appropriate, truck wash/decontamination stations shall be installed to minimize the migration of sediment off-site as specified herein.

END OF SECTION

SECTION 32 12 16 – ASPHALT PAVING
CONTRACT OB-144A

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, or approved equal, 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, or approved equal, 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°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 33 01 10.60 – DISINFECTION OF PIPING, TANKS, STRUCTURES, AND EQUIPMENT
CONTRACT OB-144A

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 OB-144A

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.	AWWA C105	Polyethylene Encasement for Ductile-Iron Pipe Systems
8.	AWWA C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
9.	AWWA C600	Installation of Ductile-Iron Mains and Their Appurtenances.

10.	AWWA C606	Standard for Grooved and Shouldered Joints.
11.	AWWA M11	Steel Pipe: A Guide for Design and Installation,
12.	AWWA M41	Ductile-Iron Pipe and Fittings.
13.	DIPRA	Installation Guide for Ductile Iron Pipe.
14.	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) Include a north arrow.

6) 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.)

7) Location of pipe couplings, specials, and adapters.

8) 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.

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.

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.

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. 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.

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 OB-144A

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. 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.

2. 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 other pipelines not listed in Section 33 06 01, including outfall sewers, via a hydrostatic test with clean water.

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. 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.

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 33 06 01 – SCHEDULE FOR BURIED PIPING
CONTRACT OB-144A

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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2.04	Source Quality Control / Shop Tests	2
PART 3	EXECUTION	2
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3.02	Installation	3
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3.04	Startup / Demonstration	3
3.05	Adjusting / Protection / Cleanup	3

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. 33 05 05 – Buried Piping Installation

B. 33 05 05.30 – Leakage Testing for Buried Piping
C. 40 05 06 – Couplings, Adapters, and Specials for Process Piping
D. 40 05 19 – Ductile Iron 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 Coatings, Treatments	Remarks
FWL	DI	56	RMJ/POJ	60	Hyd	150	CL	AC	Encased in polyethylene wrap
TD	DI	56	Flg	10	Hyd	10	CL & CEL	-	Encased in concrete as shown on Drawings.

SECTION 33 06 01 – SCHEDULE FOR BURIED PIPING
CONTRACT OB-144A

A. The following service abbreviations are used in Schedule 33 06 01-1:

Service:	Abbrev:	Service:	Abbrev:
--Fire water loop	FWL	--	--
--Landside CCC tank drain	TD	--	--
--	--	--	--
--	--	--	--

B. The following pipe material abbreviations are used in Schedule 33 06 01-1:

Pipe Material:	Abbrev:	Pipe Material:	Abbrev:
		Ductile Iron	DI

C. The following joint type abbreviations are used in Schedule 33 06 01-1:

Joint Type:	Abbrev:	Joint Type:	Abbrev:
		Restrained Mechanical Joint	RMJ
Flanged	Flg		

D. The following interior coating abbreviations are used in Schedule 33 06 01-1:

Interior Coating	Abbrev:	Interior Coating:	Abbrev:
		Cement Lined	CL
Ceramic Epoxy Lined	CEL		

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		

F. The following testing abbreviations are used in Schedule 33 06 01-1:

Test Type:	Abbrev:	Test Type:	Abbrev:
Hydrostatic	Hyd	--	--

SECTION 40 05 05 – EXPOSED PIPING INSTALLATION
CONTRACT OB-144A

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 00 – Cast-in-Place Concrete.

B. Section 05 12 00 – Structural Steel Framing.

C. Section 40 05 06 – Couplings, Adapters, and Specials for Process Piping.

D. Section 40 05 07 – Hangers and Supports for Process Piping.

E. Section 40 05 53 – Process Valves Four-inch Diameter and Larger.

F. Section 40 05 56 – Process Valves, Smaller than Four-inch Diameter.

G. Section 40 05 97 – Identification for Process Equipment.

H. Section 40 06 01 – Schedule for Exposed Piping.

I. Section 40 42 13 – Process Piping Insulation.

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. This 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. 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. 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 40 42 13 - Process 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 and heat tracing.

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 expansion and swing joints, submit EMA calculations. Submit separate calculations for each pipe system and/or service.

f. 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) 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.

3) Materials Certificates of Conformance: Submit certificates of conformance with Referenced Standards specified in the corresponding piping specification section.

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.

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 ductile iron pipe:

1) AWWA C600.

2) AWWA M41.

b. 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.

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.

2) Drainage from gas lines shall be provided through an approved, double-valved, manually operated condensate trap.

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. Drip Pans:

a. The Contractor shall provide drip pans under all pipelines installed over electrical equipment and motors and conduct drainage to the nearest floor drain, gutter, or other drainage system with ¾-in. red brass pipe conforming to the requirements of Section 40 05 15 - Copper and Brass Process Pipe, and installed as specified herein.

b. Make the connection between the drip pan and the brass drain pipe leak-tight.

c. Pitch the drip pan uniformly toward the drain pipe at a slope not less than ⅛-in. per lineal ft.

15. 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.

16. 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.

17. Restraints, Supports, and Thrust Blocks:

a. Provide concrete and metal cradles, collars, kickers, and blocks as shown on the Contract Drawings.

18. 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.

19. 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.

20. 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.

21. 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.

22. 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. 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 40 06 01 - Schedule for Exposed 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. Provide supports for exposed ductile iron piping, fittings, appurtenances, and specials in accordance with the requirements of Section 40 05 07 - Hangers and Supports for Process Piping. In addition:

1) Where shown on the Contract Drawings, ductile iron pipe beneath the ground floors of buildings or structures shall be encased in concrete to form an integral part of the floor slab.

a) This piping shall be included in the definition of exposed piping.

b) The reinforcement in the floor slab shall be placed and bent so that the pipe encasement is an integral part of the concrete structure.

c) Concrete for encasement:

(1) Shall be class 40.

(2) Shall conform to the requirements of Section 03 30 00 - Cast-in-Place Concrete.

(3) Provide a 3-in. minimum depth of concrete between reinforcement and pipe or hanger components, and a 3-in. minimum depth covering on reinforcement.

C. 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

SECTION 40 05 06 – COUPLINGS, ADAPTERS, AND SPECIALS FOR PROCESS PIPING
CONTRACT OB-144A

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. Section 09 91 00 – Painting.

B. Section 40 05 05 – Exposed Piping Installation.

C. Section 40 05 19 – Ductile Iron Process Pipe.

D. Section 40 05 31 – Thermoplastic Process Pipe.

E. Section 40 06 01 – Schedule for Exposed Piping.

F. Section 40 42 13 – Process Piping Insulation.

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 Contractor 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 ductile iron pipelines:

a. Groove Type Coupling:

1) Flexible Type:

a) Style 31, with flexible radius grooves, as manufactured by Victaulic Co., Easton, PA.

b) Or approved equal.

2) Rigid Type:

a) Style 31, with rigid radius grooves, as manufactured by Victaulic Co., Easton, PA.

b) Or approved equal.

b. Shoulder Type:

1) Style 31, as manufactured by Victaulic Co., Easton, PA.

2) Or approved equal.

2. For PVC/CPVC pipelines:

a. Grooved Type Coupling:

1) Flexible type:

a) Style 177V, as manufactured by Victaulic Co., Easton, PA .

b) ---

c) Or approved equal.

2) Rigid Type

a) Style 357 Coupling, as manufactured by Victaulic Co., Easton, PA

b) ---

c) 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. Thread Lubricant:

1. G-N paste (Molycote), as manufactured by Dow-Corning Industries, Auburn MI.
2. ---
3. 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 insure 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.

C. Sleeve Type Couplings:

1. General:

a. The maximum working pressure of the sleeve-type couplings shall be not be 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 Couplings:

1. General:

a. Couplings shall be of the following types:

1) For steel pipe ≤ 24-in.: grooved type

2) For steel pipe > than 24-in.: suitable welded steel collars shall be welded to the pipe ends, furnished by the same manufacturer as the groove and shoulder type coupling.

b. Unless otherwise specified, groove-type couplings shall conform to the requirements of AWWA C606.

2. Materials and Construction:

a. Housing:

1) Housing shall be in two or more parts, closely fitting the pipe and gasket.

2) Housing material shall be ductile iron, ASTM A536 (Grade 654512), except for stainless steel and aluminum pipelines, which shall have housings of Type 316 stainless steel, ASTM A744 Grade CF-8M, and aluminum, ASTM B26, Alloy 356-T6, respectively.

b. Gaskets:

1) Gaskets shall be of materials compatible with the type and temperature of the fluid in the pipeline, and shall be of the material as recommended by the coupling manufacturer for the service specified in Section 40 06 01, Schedule for Exposed Piping.

2) Gaskets shall be molded so that internal pressure tightens the seal. All gaskets shall be continuous, uniform in texture, and free from surface blemishes and defects.

E. Groove and Shoulder Type Fittings:

1. For steel and ductile iron pipe ≤ 24-in.:

a. Grooved end fittings shall be cast of ductile iron with working pressure ratings not less than shown in Table 40 05 06-2.

2. For steel and ductile iron pipe > 24-in.:

a. Fittings shall be provided with shoulders.

b. Working pressure ratings shall not be less than 150 psig.

c. Fabricated steel fittings shall be provided with extra-long end pieces to suit the coupling.

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 OB-144A

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 pipes, fittings, valves, and other in-line equipment, 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 00 – Cast-in-Place Concrete.

B. Section 03 60 00 – Grouting.

C. Section 05 05 23.02 - Miscellaneous Metal Fastenings

D. 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 Contractor 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. When equipment or appurtenance manufacturers have indicated that piping loads shall not be transmitted to their equipment or appurtenance, certification that from said manufacturer(s) that the Contractor's hanger and support design complies with said manufacturer(s) requirements. Submit a separate certification for each equipment or appurtenance bearing piping loads supported, in whole or in part, by Contractor's hanger and support design.

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 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. Not Used

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Not Used

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 Process Air Piping:

a. Air piping shall be supported on stainless steel saddle type supports in the locations shown on the Contract Drawings and as specified.

1) Fixed supports, as located on the Contract Drawings, shall hold the pipe firmly in place, preventing any movement.

2) Sliding supports, as located on the Contract Drawings, shall allow longitudinal movement of the pipe to account for thermal expansion.

3) Guides, as located on the Contract Drawings, shall allow for longitudinal pipe movement while preventing lateral movement and maintaining alignment.

b. Supports shall be fabricated Type 316L stainless steel.

1) Saddles shall support 120° of the pipe circumference and at least 12-in. along the length of the pipe.

2) Saddles shall be bolted to the structural steel or concrete slab supports.

3) Straps shall be of Type 316 stainless steel.

4) All sliding supports shall be provided with 8-in. wide hold-down straps.

5) Straps shall not clamp down on the pipe, but shall allow the pipe to slide on the saddle to permit thermal expansion.

c. All sliding supports shall have a resilient bearing pad of Teflon attached to the saddle to allow the pipe to slide on the saddle to permit thermal expansion.

d. All hangers from overhead supports shall be saddle or cradle-type hangers which shall support the lower 120° of pipe circumference and a minimum length equal to one quarter the pipe diameter, but not have less than 6-in. or more than 12 in..

1) Where pipe is supported from existing slabs, new through-slab hanger rods shall be used instead of expansion bolts, except where otherwise authorized by the Engineer.

8. 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.

9. Supports for Pipelines Subject to Temperatures Greater than 300°F:

a. Spring hangers of heavy stainless steel construction.

10. 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..

11. 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.

12. Hangers for Radiators:

a. Support wall hung radiators on approved wall brackets or overhead hangers.

b. Support wall hung radiators by all-metal brackets and plates that are screw adjustable after erection.

1) Wall plates shall be made of stainless steel of size and shape to insure rigidity and strength and with a minimum resistance to expansion.

2) Plates shall be fastened directly to walls, columns or pilasters with at least one ½-in. bolt, and with spacing of brackets not in excess of 42-in..

c. Where rod hangers are specified or shown supporting wall radiators, supporting rods shall be not less than ⅝-in. in diameter.

13. 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.

14. 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.
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

Pipe Size (in.)	Single Rod (in.)	Double Rod (in.)	Max. Load per Hanger (lbs.)
10	*⅞	⅝	1,750
12	*⅞	¾	2,200
14	*1	⅞	2,500
16	*1	⅞	3,075
18	*1	⅞	3,700
20	*1¼	1	4,425
24	*1¼	1	6,050

* 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. Painting:

1. Conform to the requirements of Section 09 91 00, Painting.

B. 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 ductile iron, steel, and stainless steel pipe:

        1) Maximum spacing in accordance with Table 3 of MSS-SP-69. The designer should check the capacity of the steel or building structure to which the hanger or support is attached, and adjust the maximum spacing accordingly.

        2) In addition, ductile iron pipe shall have a minimum of two supports per length and shall have a hanger or support adjacent to each end.

    b. 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.

    c. 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. Cast iron anchors shall be provided with stainless steel straps on piping, except where anchors form an integral part of pipe fittings and couplings or where an anchor of special design is required or shown on the Contract Drawings.

4. 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 OB-144A

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 33 01 10.60 – Disinfection of Piping, Tanks, Structures, and Equipment.

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 06 – Couplings, Adapters, and Specials for Process piping.

G. Section 40 05 07 – Hangers and Supports for Process Piping.

H. Section 40 06 01 – Schedule for Exposed Piping.

I. Section 40 42 13 – Process Piping Insulation.

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. 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.

C. 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.

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 Contractor 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.

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.

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. Flanges shall be tapped where tap or stud bolts are required.

4. 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.

5. 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.

6. 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. 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.

4. 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.

5. Painting:

a. Pipe and fittings shall be painted in accordance with the requirements of Section 09 91 00 - Painting.

6. 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.

7. Epoxy and Urethane Coatings:

a. Epoxy and urethane coatings shall be applied in accordance with Section 09 91 00 - Painting.

8. 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.

9. 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.

10. 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

SECTION 40 05 31 – THERMOPLASTIC PROCESS PIPE
CONTRACT OB-144A

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 33 01 10.60 – Disinfection of Piping, Tanks, Structures, and Equipment.

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 06 – Couplings, Adapters, and Specials for Process Piping.

G. Section 40 05 07 – Hangers and Supports for Process Piping.

H. Section 40 06 01 – Schedule for Exposed Piping.

I. Section 40 42 13 – Process Piping Insulation.

1.04 REFERENCES

A. Reference Standards:

1.	ASME B1.1	Unified Inch Screw Threads (UN and UNR Thread Form).
2.	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).
3.	ASTM A307	Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength.
4.	ASTM D1784	Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
5.	ASTM D1785	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40,80 and 120.
6.	ASTM D2241	Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
7.	ASTM D2464	Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
8.	ASTM D2467	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
9.	ASTM F437	Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.

10.	ASTM F439	Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
11.	ASTM F441	Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
12.	ASTM F442	Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR).
13.	AWWA C207	Steel Pipe Flanges for Waterworks Service, Sizes 4 in. Through 144 in. (100 mm Through 3,600 mm).

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. Couplings for thermoplastic process pipe shall be provided as specified in Section 40 05 06, Couplings, Adapters, and Specials for Process piping.

b. 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 in 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. CPVC process pipe and fittings shall be as manufactured by:

1. B. F. Goodrich (now Lubrizol Advanced Materials, Inc.), Cleveland, OH;
2. Lewis Pipe Company, Ardmore, AL;
3. Or approved equal.

B. PVC and CPVC Solvent cement shall be as manufactured by:

1. Weld-On®, as manufactured by IPS Corp., Compton, CA;
2. Or approved equal.

C. 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 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. Socket type fittings shall conform to ASTM D2467.

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.

D. Wall Sleeve Annular Seals:

1. For penetrations through walls, partitions, or floors where fire-rated construction is not required:

a. Provide an elastomeric element that is of the size, quantity, type and material that the manufacturer recommends for the intended service and that will 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. 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. 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 53 – PROCESS VALVES FOUR-INCH DIAMETER AND LARGER
CONTRACT OB-144A

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.	ASME B16.1	Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125 and 250.
2.	ASME B16.34	Valves-Flanged, Threaded, and Welding End.
3.	API 594	Check Valves: Flanged, Lug, Wafer and Butt-welding.
4.	API 598	Valve Inspection and Testing.
5.	API 609	Butterfly Valves: Double-flanged, Lug- and Wafer-type.
6.	ASTM A126	Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
7.	ASTM A536	Standard Specification for Ductile Iron Castings.
8.	AWWA C504	Rubber-Seated Butterfly Valves.
9.	AWWA C542	Electric Motor Actuators for Valves and Slide Gates.
10.	AWWA C550	Protective Interior Coatings for Valves and Hydrants.
11.	ASTM D1418	Standard Practice for Rubber and Rubber Latices—Nomenclature.

12. FS TT-C-494B Coating Compound-Bituminous Solvent Type, Acid Resistant.

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.

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 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. Gate Valves: Each spare part set shall consist of the following:

1) One (1) set of gaskets.

2) One (1) set of glands.

3) One (1) set of bushings.

b. Butterfly Valves: Each spare part set shall consist of the following:

1) One (1) set of bearings.

2) One (1) set of bearing seals or O-rings.

3) One (1) set of packing.

4) One (1) disc seat (if replaceable).

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
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. 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. Gate Valves (Resilient-Seated):

1. Kennedy Valve, Division of McWane, Inc., Elmira NY;

2. Or approved equal.

B. Butterfly Valves:

1. DeZurik, as manufactured by DeZurik APCO Hilton, Inc., Sartell, MN;

2. Henry Pratt Co., Aurora, IL;
3. Or approved equal.

C. Mud Valves:
1. Troy Valve, as manufactured by Penn-Troy, Inc., Troy, PA;
2. Or approved equal.

D. 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.

E. Position Indicators:
1. Trumbull Industries, Inc., Youngstown, OH.
2. Or approved equal.

F. 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 B 61 (Alloy UNS No. C92200) or B 62 (Alloy UNS No. C83600).

b) Composition "B" conforming to ASTM B 61 (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 B 584, 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 B 584, 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. Gate Valves (Resilient-Seated):

1. General:

a. Resilient seated gate valves shall conform to AWWA C509.

b. Design Working Pressures:

1) For valves ≤ 12-in.: 200 psig.

2) For valves > 12-in.: 150 psig.

c. Maximum Fluid Temperature: 150°F, unless a higher temperature is specified in Schedule 40 05 53-1, located after the "End of Section" designation.

2. Materials:

a. All materials of construction shall conform to the requirements of AWWA C509.

b. The materials of construction for the various components of each valve shall be as follows:

1) Body, Bonnet, and Stuffing Box: Cast iron

a) Shall conform to the requirements of ASTM A126, Class B.

2) Wedge:

a) Cast iron, symmetrically and fully encapsulated with molded rubber.

(1) Rubber thickness: ≥ ⅛-in.

3) Stem: Manganese Bronze.

a) Alloy: UNS C86500

b) Shall conform to the requirements of ASTM B 584.

4) All Rubber Items: Acrylonitrile butadiene synthetic rubber.

5) All internal and external bolting and other hardware including pins, set screws, studs, bolts, nuts and washers: Type 316 stainless steel.

3. Construction:

a. The valves shall be provided with fully encapsulated resilient wedges.

4. Appurtenances:

a. Gear Actuators for Manual Valves:

1) Each valve shall be provided with gear actuators conforming to the requirements of AWWA C500.

a) The gear actuators shall be sized for maximum differential pressures as specified herein.

C. Butterfly Valves:

1. General:

a. Butterfly valves shall conform to AWWA C504 Class 150B.

b. Design Working Pressure: 150 psig.

c. Maximum Fluid Temperature: 180°F.

d. Sizes:

1) For flanged butterfly valves: ≤ 72-in.

2. Materials:

a. All materials of construction shall conform to the requirements of AWWA C504.

b. The materials of construction for the various components of each valve shall be as follows:

1) Body: Cast iron, ductile iron, or alloy cast iron.

c. Shaft: Type 316 stainless steel.

1) Discs:

a) For valves < 30-in.: Cast iron.

d. Seats: Acrylonitrile butadiene synthetic rubber, or other synthetic rubber suitable for the application.

1) Seating Surfaces: Type 316 stainless steel.

2) Bearings:

a) For valves ≥ 24-in.: Fiberglass with polytetrafluoroethylene lining.

3) Shaft Seals: Same as of seats.

4) Tapered Pins for Attachment of Shaft to Disc: Type 316 stainless steel.

5) All internal and external bolting and other hardware including pins, set screws, studs, bolts, nuts and washers: Type 316 stainless steel.

3. Construction:

a. The butterfly valves shall be capable of being held in open, or partially open position for manual operation or for automatic operation.

1) When the disc is so held, there shall be no chatter or vibration of the disc or operating mechanism.

b. The butterfly valves shall provide drip-tight bidirectional shut-off at the design working pressure as well as operating pressures as specified herein.

c. Seals:

1) Shall be self-adjusting V-type chevron; and

2) Shall be mounted in the body.

d. Valve packing shall be replaceable without dismantling the valve.

e. Valve seats:

1) For valves ≥ 24-in.: rubber seats shall be field replaceable.

4. Appurtenances:

a. Gear Actuators for Manual Valves:

1) Gear actuators shall conform to the requirements of C504.

2) Size gear actuators as follows:

a) For butterfly valves ≤ 20-in.: 150 psi differential pressure and 16 ft/s velocity.

b) For butterfly valves > 20-in.: Shall be sized based on maximum differential pressures and velocities as specified in Schedule 40 05 53-1, located after the "End of Section" designation.

D. Mud Valves

1. General:

a. The mud valves shall be:

1) Rising stem type; and

2) Flanged end type.

2. Materials:

a. Body: Stainless Steel ASTM A276, T316.

b. Yoke: Stainless Steel ASTM A276, T316.

c. Gate: Stainless Steel ASTM A276, T316.

d. Plates: Stainless Steel ASTM A276, T316.

e. Gate and Body Rings: Stainless Steel ASTM A276, T316.

f. Stem: Stainless Steel ASTM A276, T316.

g. Thrust Bearing: Delrin/Acetal ASTM D6778/D6100

h. All Bolting including Bolts, Nuts and Washers: Stainless Steel ASTM A276, T316.

3. Construction:

a. Body style shall be ANSI CL 125-lb flange and match existing flange.

E. 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.

F. 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: 12 in/min or recommended by actuator manufacturer.

5) Power Supply: 480 volts, 3 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) Provide a remote mounted control panel for each electric actuator where:
   a) Required by the valve location, as specified herein; or
   b) Shown on the Contract Drawings.
2) Enclosure: NEMA 4X, Type 316 stainless steel.
3) Provide LOCAL/OFF/REMOTE Selector Switch. "LOCAL" position provides operation from open/stop/close push buttons.
   a) "REMOTE" position enables open/close/stop control from remote source.
   b) "OFF" position disables local and remote operation. Provide contact when switch is in remote position for remote indication.
4) Provide OPEN/CLOSE/STOP push buttons with a hold-to-run or momentary contact selection.
5) Provide OPEN/CLOSE/STOP indicating lights and 0% to 100% position indication on liquid crystal display window.

G. 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.
3. Extension stems and floorstands:
   a. Provide where indicated, necessary, or required.
   b. Sizing of the complete lifting mechanism shall conform to the applicable requirements of AWWA C501.
   c. Bench and Pedestal Floorstands:
      1) The valves requiring extension stems shall be provided with bench or pedestal floorstands as indicated.
      2) Type: Heavy-duty with tapered roller bearings enclosed in a weatherproof housing, provided with positive mechanical seals around lift nut and pinion shaft to prevent loss of

lubrication and to prevent moisture from entering the housing. A lubrication fitting shall be provided for grease. The base shall be machined.

d. Extension Stems:

1) Maximum Slenderness Ratio (L/R): 100.

2) Minimum Diameter: 1.5 in.

3) Threads: ACME.

4) A top nut and a bottom coupling shall be provided on the stem with required pins and set screws.

e. Stem Guides:

1) Maximum Stem Length between Guides: 7 feet.

2) Stem guides shall be adjustable in two directions.

f. Materials of Construction:

1) Floorstand Housing: Cast-iron, ASTM A126, Class B.

2) Lift Nut: Cast bronze, ASTM B 98.

3) Wall Brackets for Floorstands: Type 316L stainless steel.

4) Stem and Stem Couplings: Type 316 stainless steel.

5) Top Nut, Bottom Coupling and Hardware: Type 316 stainless steel.

6) Stem Guides: Type 316 cast stainless steel.

7) Grease Fitting: Stainless steel.

8) All Bolting: Type 316 stainless steel.

H. 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. Extension Stems for Non-Rising Stem Gate Valves and Quarter Turn Buried Valves:

a. Extension stems shall be provided to bring the operating nut to 6-in. below the box cover.

b. Minimum Size and Material: Same as valve stem.

c. Maximum Unsupported Length: 3 ft.

4. 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.

I. 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.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Gate Valves (Resilient-Seated):

1. Test all resilient-seated gate valves in accordance with the requirement of AWWA C509.
2. The performance test reports shall be certified, signed, and sealed by the professional engineer.

B. Butterfly Valves:

1. Test all valves in accordance with the requirement of AWWA C504.
2. The performance test reports shall be certified, signed, and sealed by the professional engineer.

C. 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.

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. Installation of plug valves in sludge lines:

1. Plug valves in horizontal lines shall be installed with the stem horizontal. The plugs shall be on top when open and on pressure side when closed.
2. Plug valves in vertical lines shall be installed with the plug at the top when closed.

G. 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 53-1
VALVE SCHEDULE, VALVES 4 INCH AND LARGER(1)

Valve Tag (No.):	Service:	Size: (in.)	Type:	Material:	Actuator:	End Type:	Remarks:
76-06-101	FWL	6	GV-RS	CI	Manual	RMJ	With valve box
77-12-101 TO 77-12-107	TD	12	Mud	SS316	Manual	Flg	Rising stem with floor stand and extended stem
4302C0/4302CM	EWS	24	BFV	CI	Elec(O/C)	Flg	With floor stand and extended stem

Notes:
(1) Only valves to be permanently provided as part of the Work are included in Schedule 40 05 53-1.

A. The following service abbreviations are used in Schedule 40 05 53-1:

Service:	**Abbrev:**	**Service:**	**Abbrev:**
Fire water loop	FWL	--	--
Effluent water system supply	EWS	--	--
CCT tank drain	TD	--	--
--	--	--	--

B. The following valve type abbreviations are used in Schedule 40 05 53-1:

Valve Type:	**Abbrev:**
Gate Valve, Resilient-Seated	GV-RS
Butterfly Valve	BFV
Mud Valve	Mud

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:**
		Cast Iron	CI
316L Stainless Steel	316L SS		

E. The following valve end type abbreviations are used in Schedule 40 05 53-1:

Joint Type:	**Abbrev:**	**Joint Type:**	**Abbrev:**
Flanged	Flg		
		Restrained Mechanical Joint	RMJ

NO TEXT ON THIS PAGE

SECTION 40 05 56 – PROCESS VALVES, SMALLER THAN FOUR-INCH DIAMETER
CONTRACT OB-144A

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.

Article	Title	Page
PART 1	GENERAL	1
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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 78 90 – PMCS Panel Mounted Instruments and Devices

F. Section 40 06 01 – Schedule for Exposed Piping.

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. Electric actuator motors shall conform to the requirements of Section 26 05 91, Low Voltage Electric Motors.

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. Thermoplastic Ball Valves:

1. Asahi/America, Lawrence, MA;
2. Hayward Industries, Inc., Elizabeth, NJ;
3. Or approved equal.

B. Thermoplastic Check Valves:

1. Asahi/America, Lawrence, MA;
2. Hayward Industries, Inc., Elizabeth, NJ;
3. Or approved equal.

C. Thermoplastic Air Valves:

1. Asahi/America, Lawrence, MA;
2. Hayward Industries, Inc., Elizabeth, NJ;
3. Or approved equal.

D. Thermoplastic Butterfly Valve:

1. Thermoplastic Valves Incorporated, Emmaus, PA;

2. Chemtrol, Division of Nibco, Inc., Elkhart, IN;

3. Or approved equal.

E. Quick Connect Couplings - Chemical and TRC Analyzer Sampling Service:

1. Banjo Corporation, Crawfordsville, IN;

2. Bee Valve, Inc., Elyria, OH;

3. 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.

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. Valves for Thermoplastic Piping

1. Ball Valves:

a. Type: True union, full port.

b. Body and Ball: Poly (Vinyl Chloride) (PVC) Compounds, ASTM D 1784.

c. Stem: Type 316 stainless steel.

d. Seats: Polytetrafluoroethylene.

e. Seals: Fluoropolymer elastomer synthetic rubber.

f. O-Rings: Ethylene propylene diene monomer rubber.

g. End Connections: Socket solvent welded unions or flanges as required.

h. Rating: 150 psig at 73°F.

2. Check Valves:

a. Type: True union, ball.

b. Body and Ball: CPVC Compounds, ASTM D 1784.

c. Seats: Polytetrafluoroethylene.

d. Seals: Fluoropolymer elastomer synthetic rubber.

e. O-rings: Ethylene propylene diene monomer rubber.

f. End Connections: Socket solvent welded unions or flanges as required.

g. Rating: 150 psig at 73°F.

3. Air Valves:

a. Type: Hollow and floating ball.

b. Body and Ball: CPVC Compounds, ASTM D 1784.

c. Seals: Fluoropolymer elastomer synthetic rubber.

d. O-rings: Ethylene propylene diene monomer rubber.

e. End Connections: Socket solvent welded unions and threaded outlet as required.

f. Rating: 150 psig at 73°F.

4. Butterfly Valves:

a. Type: Short body.

b. Body: Solid PVC Compounds.

c. Disc: PVDF.

d. Seats and Shaft: Fluoropolymer elastomer synthetic rubber.

e. Seat and Shaft Seals: Elastomer.

f. Bearings: Glass-filled Polytetrafluoroethylene.

g. Operators: Locking handle constructed of reinforced plastic.

h. End Connections:

1) For valves ≥ 2½-in.: Flanged ends conforming to ANSI B16.1, Class 125.

2) For valves < 2-in.: Socket solvent welded unions.

C. Appurtenances and Miscellaneous Items

1. Quick Connect Couplings - Chemical and TRC Analyzer Sampling 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.

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. In addition:

1. Shop test the following valves in conformance with the following, additional requirements:

a. Test the following sizes of metal-seated gate valves in accordance with the requirements of AWWA C500.

1) Metal-seated gate valve sizes: ≥ 3-in.

b. Test the following sizes of resilient-seated gate valves in accordance with the requirements of AWWA C509.

1) Resilient-seated gate valve sizes: ≥ 3-in.

c. Test the following sizes of swing check valves in accordance with the requirements of AWWA C508.

1) Swing check valve sizes: ≥ 2-in.

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)

Valve Tag (No.):	Service:	Size: (in.)	Type:	Material:	Actuator:	End Type:	Remarks:
See Drawing	SAMP	1-1/2	BVP	CPVC	Manual	SW	
See Drawing	SAMP	1-1/2	CVP	CPVC	N/A	SW	
See Drawing	SAMP	1-1/2	BFVP	CPVC	Manual	SW	
See Drawing	SAMP	1/2	BVP	CPVC	Manual	SW	
See Drawing	HYPO	1	AVP	CPVC	Manual	SW	
See Drawing	HYPO	1	BVP	CPVC	Manual	SW	

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:**
Sampling water for TRC analyzer	SAMP	--	--
Sodium Hydrochloride	HYPO	--	--
--	--	--	--
--	--	--	--

B. The following valve type abbreviations are used in Schedule 40 05 56-1:

Valve Type:	**Abbrev:**
Thermoplastic Ball Valve	BVP
Thermoplastic Check Valve	CVP
Thermoplastic Butterfly Valve	BFVP
Thermoplastic Air Valve	AVP

C. The following actuator type abbreviations are used in Schedule 40 05 56-1:

Actuator Type:	**Abbrev:**
Manual	Manual

D. The following valve material abbreviations are used in Schedule 40 05 56-1:

Pipe Material:	**Abbrev:**	**Pipe Material:**	**Abbrev:**
		Chlorinated PVC	CPVC

E. The following valve end type abbreviations are used in Schedule 40 05 56-1:

Joint Type:	**Abbrev:**	**Joint Type:**	**Abbrev:**
		Solvent Weld	SW
		--	--

NO TEXT ON THIS PAGE

SECTION 40 05 59.05 – STAINLESS STEEL SLIDE GATES
CONTRACT OB-144A

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances to furnish, install, and test all stainless steel hydraulic slide gates, complete and operational.

B. The following index of this Section is included 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 59.05-1, Stainless Steel Slide Gates 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 05 05 23.01 – Welding

B. Section 05 05 23.02 – Miscellaneous Metal Fastenings

C. Section 09 91 00 – Painting

D. Section 26 05 91 – Low Voltage Electric Motors

E. Section 40 05 97 – Identification for Process Equipment

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 A29 - Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought
2. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings
3. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
4. ASTM A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
5. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes
6. ASTM A320 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service
7. ASTM A395 - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures
8. ASTM A536 - Standard Specification for Ductile Iron Castings
9. ASTM A572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
10. ASTM A582 - Standard Specification for Free-Machining Stainless Steel Bars
11. ASTM B98 - Standard Specification for Copper-Silicon Alloy Rod, Bar, and Shapes
12. ASTM B148 - Standard Specification for Aluminum-Bronze Sand Castings

13. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications
14. ASTM D707 - Standard Classification System and Basis for Specification for Cellulose Acetate Butyrate Molding and Extrusion Compounds (CAB)
15. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications
16. ASTM D3935 - Standard Classification System and Basis for Specification for Polycarbonate (PC) Unfilled and Reinforced Material
17. ASTM D5436 - Standard Specification for Cast Poly (Methyl Methacrylate) Plastic Rods, Tubes, and Shapes
18. AWWA C561 - Fabricated Stainless-Steel Slide Gates
19. AWWA C542 - Electric Motor Actuators for Valves and Slide Gates
20. ISO 14025 - Environmental labels and declarations - Type III environmental declarations

1.05 DESCRIPTION

A. This Section includes requirements for providing stainless steel hydraulic slide gates, including, but not limited to, gate operators, appurtenances, related controls, and accessories, in accordance with applicable standards and regulations. In addition:

1. Slide gate identification number, location, service, type, size, design pressure, type of operator and type of stem are listed in Schedule 40 05 59.05-1, located after the "End of Section" designation, and as shown on the Contract Drawings.
2. Stainless steel hydraulic slide gates and gate operators shall be constructed of materials suitable for use in the water and wastewater environment to which they will be exposed.
3. Stainless steel hydraulic slide gates and gate operators shall meet the general design requirements set forth herein and the specific design and operating requirements listed in Schedule 40 05 59.05-1, located after the "End of Section" designation, and as shown on the Contract Drawings.
4. Design slide gates for specified seating or unseating pressures.
    a. Seating pressure shall be measured to the center of the slide gate.
    b. Unseating pressure shall be measured to the center of the slide gate.
    c. Structural design must consider the pressure difference from the invert.
5. Design the operating mechanisms based on the following loading:

a. The minimum vertical load is fifty percent (50%) of the force, in pounds of force, on the gate resulting from the operating head acting on the horizontal centerline of the gate multiplied by the effective area of the gate, plus the weight of the slide and stem.

b. The operating head is the distance from the centerline of the slide gate to the maximum water level of the channel within which the gate is located.

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 Contractor 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 no be limited to) the following activities:

a. Obtain representative material samples.

b. Verify traceability.

c. Obtain copies of Certified Materials Test Reports (both chemical and physical) and Manufacturer's Certificates of Conformance.

d. Perform visual inspection of welding, as per applicable welding code.

e. Perform visual and dimensional inspection of completed work.

f. Witness passivation of stainless steel parts and tests for free iron contamination, as applicable.

B. Qualifications of Manufacturer:

1. The manufacturer shall have a minimum of five (5) years of experience in the design and fabrication of stainless steel hydraulic slide gates of similar size, capacity, and type to those specified in Schedule 40 05 59.05-1, located after the "End of Section" designation, and shall show evidence of at least five (5) substantially similar installations in satisfactory operation.

C. Supply and Compatibility:

1. All components shall be traceable to the original heat and/or lot numbers unless otherwise approved.

2. All stainless steel hydraulic slide gates included in this section shall be provided by the Contractor through a single, qualified stainless steel hydraulic slide gate manufacturer. The manufacturer shall also supply the following as part of the Work:

   a. Mounting plates.

   b. Self-containing frames.

D. Regulatory Requirements:

1. If the stainless steel hydraulic slide gate requirements of this Section and referenced standards or manufacturer requirements are in conflict, the more stringent provision shall apply.

E. Welding Work:

1. All welding work, qualifications, and inspections shall conform to the requirements of Section 05 05 23.01 - Welding, and shall be 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) The Contractor shall submit all information necessary and required to substantiate approval of a stainless steel hydraulic slide gate manufacturer in accordance with the quality assurance requirements of this Section.

   b. Schedule of deviations.

   c. Shop Drawings:

      1) Arrangement and erection drawings of the gates, operators and control equipment.

         a) Clearly identify all materials for all components on all shop drawings.

      2) Schematic control diagrams, electrical connection diagrams, and complete description of the control system;

      3) Operating characteristics, including the conditions specified in Schedule 40 05 59.05-1, located after the “End of Section” designation.

   d. Calculations:

      1) All calculations shall be based on the hydraulic conditions specified in Schedule 40 05 59.05-1, located after the “End of Section” designation.

2) Submit the manufacturer's structural computations for approval, showing that stresses and deflections are within specified limits.

3) Submit calculations of anchor bolts, including concrete penetration. Indicate all forces on structures resulting from gate operation.

4) Submit computations for sizing of operator and stem and of bearing pressures on power screw threads.

5) Complete calculations for each size of motor operator indicating the force required to operate the gate, the operator force provided, full load and locked rotor current, and horsepower.

6) Submit leakage calculations or documentation based on the hydraulic conditions.

7) All required calculations listed above, shall be signed and sealed by a Professional Engineer licensed in the State of New York.

e. Operation and Maintenance Manuals.

2. Information Submittals:

a. The material supplier shall certify to the City the yield strength of the material from which the stem is to be fabricated.

b. Manufacturer's certified performance and material specifications, as specified.

c. Submit material test reports representing all major components of slide gates and operators. An affidavit of compliance of stainless steel hydraulic slide gate manufacture with all applicable provisions of AWWA C561 and additions as specified.

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 63.01 – Sustainability 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 63.01 – Sustainability 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. The Contractor shall deliver all materials provided under this Section in accordance with the requirements of the Contract Document.

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 stainless steel hydraulic slide gates, and as per the requirements of the Contract Documents. In addition, the Contractor shall furnish the following:

1. For slide gates:
    a. Two (2) threaded lift nuts of each size and type.
    b. Two (2) stem couplings of each size and type, where couplings are provided for the installed gate.
2. For electric motor operators:
    a. One (1) motor of each size.
    b. One (1) torque switch of each size.
    c. One (1) limit switch assembly of each size.
    d. Six (6) pushbuttons.
    e. Six (6) color caps of each color.
    f. Twenty (20) indicating lamps.
    g. One (1) reversing starter of each size.
    h. One (1) overload relay of each size.
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 (1) year of operation.

c. For explosion-proof enclosures with desiccant-type dehumidification, provide a 2-year supply of desiccant. Include instructions for renewal of the desiccant supply.

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. Stainless Steel Hydraulic Slide Gates:

1. Hydrogate, Denver, CO;
2. Waterman, Exeter, CA;
3. Whipps, Inc. Athol, MA;
4. Or approved equal.

B. Electric Motor Operators:

1. Limitorque Corp., Lynchburg, VA;
2. Rotork Control, Inc., Mullica Hill, NJ;
3. EIM as manufactured by Emerson Electric Co., St. Louis, MO;
4. AUMA Actuators, Inc., Canonsburg, PA;
5. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. General:

1. Fabricated stainless steel slide gates shall meet or exceed the requirements of AWWA C561.
2. Finish: Mill finish on stainless steel. Welds shall be sandblasted to remove weld burn and scale. The working design stresses on the disc and frame, under maximum load conditions, shall not exceed the lesser of the following:
   a. 40% of the yield strength of the materials; or
   b. 25% of the ultimate strength of the materials.

B. Slide:

1. General:

a. Design slide gate slides to limit deflection under maximum loading as specified in Schedule 40 05 59.05-1, located after the "End of Section" designation, to the lesser of the following two (2) values:

1) $^{1}/_{720}$ of the span of the gate; or

2) 0.25-in.

2. Materials and Construction:

a. Shall be constructed of flat stainless steel plate with a thickness as shown, specified, necessary, and/or required. In addition:

1) Thickness of the slide plate: ≥ ¼ in.

b. The gate slide shall be reinforced with structural formed members of stainless steel of thickness necessary and/or required to limit gate deflection to the values specified herein. In addition:

1) Thickness of reinforcing members: ≥ ¼ in.

c. Slide:

1) Type 316L stainless steel meeting the requirements of ASTM A240.

d. Slide reinforcing members:

1) Type 316L stainless steel meeting the requirements of ASTM A276.

C. Frame:

a. Frame shall be constructed of welded structural members that are formed from plate, and then welded together to form rigid, one-piece construction. Guide member designs where water loads are transferred through the assembly bolts are specifically not acceptable.

b. Gate frame shall be flange back, embedded, or channel mount as shown in Schedule 40 05 59.05-1. The frame shall be an integral unit of brake form and structural shapes, rigidly assembled to form the waterway openings. Holes shall be provided for mounting on anchor bolts. The head channels shall be welded or bolted to the gate frame. The channels are to be sufficiently spaced to allow removal of the gate slide. The primary frame shall contain polymer guide, to prevent metal-to-metal contact between slide and frame.

c. The gate frame shall be designed to allow wall mounting without a box-out into the concrete opening.

2. Materials:

a. Frame and gate frame guides: Type 316L stainless steel meeting the requirements of ASTM A276.

D. Invert:

1. Shall be a stainless-steel angle welded to the bottom of the guides to form the seating surface for the flush-bottom seals attached to the frame invert.

E. Yoke:

1. General:

a. Provide a yoke for self-contained slide gates as indicated in Schedule 40 05 59.05-1.

b. Design shall allow removal of the slide without removal of the yoke.

c. The yoke shall be designed so that the deflection under full operating load shall not exceed whichever is less of the following two values:

1) $^{1}/_{720}$ the width of the gate; or

2) 0.25-in.

a. Materials and Construction: Yoke shall consist of two (2) structural formed channel members welded to the top of the guides.

b. Type 316L stainless steel meeting the requirements of ASTM A276.

F. Seals:

1. General:

a. All gates shall be provided with a self-adjusting seal system to restrict leakage in accordance with the requirements listed in this specification.

b. All gates shall be equipped with Ultra-High Molecular Weight (UHMW) Polyethylene seat and seals to restrict leakage and to prevent metal to metal contact between the frame and slide. Seat contact pressure shall not exceed 600 psig at the design head.

c. The seat/seals shall extend to accommodate 1.5 times the height of the slide when the slide is in the fully closed or fully opened position.

d. All upward opening gates shall be provided with a resilient seal to seal the bottom portion of the gate. The seal shall be attached to the invert member or the bottom of the slide and it shall be held in place with Type 316 stainless steel attachment hardware.

e. All downward opening weir gates shall be provided with UHMW polyethylene seat/seals across the invert member.

f. The seal system shall be durable and shall be designed to accommodate high velocities and frequent cycling without loosening or suffering damage.

g. All seals must be bolted or otherwise mechanically fastened to the frame or slide.

1) Arrangements with seals that are force fit or held in place with adhesives are not acceptable.

h. The seals shall be mounted so as not to obstruct the water way opening.

i. Gates that utilize rubber ”J” seals or ”P” seals are not acceptable.

j. The seal system shall have been factory tested to confirm negligible wear (less than 0.01-in.) and proper sealing. The factory testing shall consist of an accelerated wear test comprised of a minimum of 25,000 open-close cycles using a well-agitated sand/water mixture to simulate fluidized grit.

2. Materials and Construction of Seals:

a. Ultra-High Molecular Weight Polyethylene ASTM D4020 and Neoprene ASTM D2000 Grade AA625.

3. Seals shall be self-adjusting.

G. Slide Gate Operators and Lifting Stems:

1. General:

a. Provide slide gate operators and lifting stems.

b. Provide all slide gates with rising stems, except as otherwise specified in Schedule 40 05 59.01, located after the "End of Section" designation, or as shown on Contract Drawings.

c. The stem diameter shall be based on the following modified Euler's equation (Using the AWWA equation to calculate the stem diameter will not be approved.):

$$\frac{P}{a} = \frac{571{,}000{,}000}{\left({}^{L}/_{R}\right)^{2}}$$

where:
P = The maximum force applied to stem, resulting from manual or power operation (lbf)
a = Cross sectional area of stem, at root of thread, if any (in^2).
L = Unrestrained length (in.)
R = Radius of gyration.

1) The value of P/a shall not exceed two thirds of the yield stress of the stem material.

2) To determine stem diameters, force P shall be set to the following values:

a) For electrical operators: Force P shall be based on twice the stalled (locked) rotor force.

b) For hydraulic cylinder operators: Force P shall be twice the maximum hydraulic pressure on the full piston area.

c) For manual operation: Force P shall be based on a manual force of 250 lbf applied to the operating crank or handwheel.

2. Materials and Construction:

a. Design stems for the maximum operating torque of the operator and the weight and service of the gate.

b. Limit the length over radius of gyration ratio of the stem to 200.

c. The minimum stem diameter shall be 2.00-in.

d. Bronze components shall conform to the requirements of ASTM B98.

e. Stainless steel components shall be ASTM A276 Type 316.

f. Slide Gate Operators:

1) Operator housings and pedestal handwheels:

a) Ductile iron:

(1) ASTM A395

(2) A536, Grade 65-45-12

2) Operator worms, steel: ASTM A29/A 29M Grade Designation 8620

3) Operator gears, steel: ASTM A572/A572M

4) Worm gears, bronze:

a) ASTM B148, Alloy UNS No. C95400/C95500

b) ASTM B584, Alloy UNS No. C86300

5) Lift Nut: Manganese bronze, ASTM B584, Alloy UNS No. C86500

6) Pinion Shaft: Stainless steel, ASTM A276, Type 304

7) Floorstand Support Brackets:

a) Cast Iron, ASTM A126, Class B; or

b) Fabricated Stainless Steel, ASTM A167, Type 304.

8) Stem:

a) Stainless Steel, ASTM 276 Type 316.

9) Stem Protection, Bottom:

a) Stainless steel, ASTM A240/A 240M, Type 304, Schedule 20 pipe (minimum).

10) Stem Cover, Top:

a) Clear polycarbonate, ASTM D3935, ASTM D707; or

b) Cast methacrylate plastic, ASTM D5436, Clear plastic butyrate pipe.

3. Appurtenances:

a. Support:

1) Provide an operator supporting structure capable of supporting the operator and all appurtenances. The maximum deflection of the operator supporting structure shall not to exceed the lesser of the following under full operating load, when a 40-lbf. effort is placed on the handwheel or hand crank:

a) $^{1}/_{720}$ of the span of the gate; or

b) 0.25-in.

2) Design the structure with a factor of safety of 5 based on the ultimate tensile, compressive, and shear strength of the material.

b. Handwheel and Cranks:

1) Mount manually operated handwheels or cranks directly on the lifting mechanism to maximum height of 3.5 above the operating floor level.

2) Where the lifting mechanism is above this elevation, mount the handwheel or crank on the side of the head frame.

3) Connect side-mounted wheel and crank operators to the lifting mechanism with bronze or cadmium-plated gearing and stainless steel shafting supported on roller bearing mounts. Limit operator to a maximum pull of 40 lbf. on the handwheel or crank at design load.

c. Bench Stand Hoist:

1) Provide a bench stand hoist equipped with roller bearings above and below the operating nut and with mechanical seals around the operating nut.

d. Rising Stems:

1) Provide rising stem operators, unless otherwise specified.

2) Securely fasten stems to the gate by means of a casting, mounting block or angles secured to the gate.

3) Acme-threaded stem to have 63 micro-inch finish or better.

4) Gate stem attachment to be provided with provisions for keying or pinning the stem to the gate attachment.

e. Stem Guides:

1) Provide stem guides where required to limit the unsupported stem length

2) Stem guides shall be polymer or bronze bushed.

f. Stem Covers:

1) The stem cover shall have a rain cap, vent holes to prevent condensation and clear biaxially-oriented polyethylene terephthalate travel indicating tape.

a) Travel indicating tape shall have markings in increments of every one inch.

2) The tape shall be field applied to the stem cover after the gate has been installed and positioned.

3) Stem covers shall be as shown in contract drawing.

H. Electric Operators (Open/Close)

1. General:

a. Electric operators for open/close service shall conform to the requirements of AWWA C542.

b. Provide operators that hold the gate in any position from fully open to fully closed, without vibration.

c. Application Criteria:

1) Temperature Range: -20°F to +140°F.

2) Ambient Humidity: 100%.

3) Maximum design seating and unseating heads:

a) Refer to Schedule 40 05 59.05-1, located after the "End of Section" designation.

4) Opening and closing speeds: 12-in./min

a) Shall be for both open and close directions.

b) Speed hall be when the differential pressure is the maximum specified and the voltage at the terminals is 15% below the nominal voltage.

5) Power Supply: 480 V, 3-phase, 60-Hz.

6) Control voltage: 120 V, single phase, 60-Hz.

7) Integral Transformer:

a) Provide an integral 480V/120V control transformer with fused secondary.

8) Torque:

a) Design the operator to exert an unseating torque of ≥ 50% in excess of the required slide seating torque at the specified voltage, neglecting hammer-blow effect.

9) Duty Cycle:

a) Provide a motor rated for 15 min. cycle or three (3) complete cycles opening and closing gate, whichever is longer, during a 60-minute period.

b) Duty cycle shall be measured under maximum operating head, as specified in Schedule 40 05 59.05-1, located after the "End of Section" designation, and at 40° C ambient temperature.

10) Each gate operator shall be equipped with a hand wheel for manual operation:

a) Rim pull: ≤ 40 lbf.

b) The handwheel shall be connected such that operation by the motor will not cause the handwheel to operate.

c) Provide an operator that is arranged so that motor or motor gearing failure does not prevent manual operation.

d) Arrange the operator to automatically change from manual operation to electrical operation when its motor is energized and to continue electric operation until the operator is reset to manual operation.

e) Provide a means for locking the drive in either manual or motor operation.

f) Handwheel shall be removable.

11) The operator shall be operable with handwheel even after the electric motor has been disengaged and removed for repairs.

d. All electrical shall conform to the area classification shown on the Contract Drawings and conform to the area classification specified in Schedule 40 05 59.05-1, located after the "End of Section" designation.

2. Materials and Construction:

a. Electric Motor:

1) General:

a) Motor shall be in accordance with the requirements of Section 26 05 91 - Low Voltage Electric Motors.

b) Motor shall be specifically designed for gate operator service.

c) Motor shall have high torque characteristics.

d) Motor shall have a maximum continuous total temperature rating of 70° C.

e) The motor shall be sized for at least 1.5 times the operator torque requirement.

b. Operator Mounting:

1) Design the operator to be mounted on the floor stand, unless otherwise shown or specified.

c. Power Gearing:

1) Provide power gearing consisting of:

a) Worm gear; and

b) One (1) of the following two (2) gear types:

(1) Helical gear; or

(2) Spur gears.

2) Worm Gear:

a) Shall be of either:

(1) hardened alloy steel with threads ground and polished after heat treating; or

(2) Nickel or manganese bronze.

3) Helical and spur gears:

a) Shall be of accurately machined hardened alloy steel.

4) Use antifriction bearings throughout.

5) Provide grease pack or oil bath lubrication.

d. Lost-Motion Device:

1) Provide a lost-motion device that will permit the motor to attain full speed, and then impart a hammer blow to the stem nut to start movement of the slide in both the opening and closing directions.

e. Declutching Mechanism:

1) Provide a declutching mechanism to disengage the motor mechanically but not electrically from motor to handwheel operation.

2) If the clutch is of the external lever type, arrange it such that the lever does not move when the motor is energized.

f. Position Indication:

1) Provide an operator-mounted gate position indicator of either:

a) The mechanical; or

b) The indicating light type.

2) Indicate the following:

a) Fully open position; and

b) Fully closed position; and

c) Intermediate gate position.

3) Provide electrical contacts as required for remote indication of gate position.

g. Housing:

1) Provide housings for controls, gears, and motors with integrally cast flanges.

2) Fully machine and template drill the flanges and their mating surfaces.

3) Provide joints which are metal-to-metal or gasket or O-ring sealed as required.

h. Control and Motor Enclosures:

1) Provide the controller with mechanical interlocks and mount as an integral part of the operator.

2) For explosion-proof enclosures which are dependent upon metal-to-metal faces for weatherproofing, either:

a) Provide explosion-proof breathers and drains with desiccant type dehumidification.

(1) Desiccant shall be silica gel and enclosure shall have sufficient desiccant capacity for 6 mo. service without requiring renewal.

b) Provide actuators that are hermitically sealed which do not require breathers and drains or desiccant.

i. Electrical Compartment Heater:

1) Provide electrical compartment heaters.

j. Reversing Controller, Overload Protection and Internal Wiring:

1) Provide a reversing controller, complete with mechanical interlocks and controls as an integral part of the operator.

2) Provide adequate overload protection in the controller or embedded in the motor windings.

3) Install an overload device in each phase.

4) If overload devices are installed in the motor windings, provide devices of the bimetallic automatic reset type with the contacts in the control circuit.

5) Arrange the internal wiring in the operator so that the opening and closing coils cannot be energized simultaneously at any time, regardless of external wiring conditions.

k. Push Buttons and Selector Switches:

1) Where operators are 6 feet or closer to the floor and in an accessible location, mount OPEN-STOP-CLOSE push buttons or a selector switch.

2) Where the operators are located over 6 feet from the floor or in an inaccessible location, connect all internal control and indication wiring to a terminal block within the operator enclosure and provide a separate control station for remote mounting. Provide the remote control station with the same NEMA rating as the operator.

l. Limit and Torque Switches:

1) Provide the operator with limit and torque switches, either direct or gear driven.

2) Provide adjustable limit and torque switches with auxiliary contacts that are operative in either direction of travel.

3) Provide limit switches that are "in step" with torque switches at all times, whether in motor or manual operation.

4) Equip the operator with limit switches to stop movement in each direction and torque switches for protection against mechanical overload and to stop movement in either direction if an obstruction is encountered.

5) Provide the number, function and arrangement of limit switches as shown, specified or required.

m. Directional Valves:

1) Provide 2-way or 4-way solenoid operated, spring return, directional valves selected for satisfactory performance at the specified gate operating speed, taking into account pressure losses through the valves.

3. Appurtenances:

a. Operator Mounting:

1) All mounting brackets, structural supports and other accessories necessary for a complete installation of each actuator, control enclosure and push-button station shall be supplied by the actuator manufacturer.

2) The mounting bracket shall be fabricated of Type 316 stainless steel.

3) All welding shall be a continuous Type 316 stainless steel weld on both sides of the plates and shall have predrilled holes to match the holes on the base.

4) The brackets shall be secured to the base with Type 316 stainless steel through bolts, double nuts and oversized washers (two double nuts and two washers per bolt assembly).

5) All fasteners and hardware shall be stainless steel ASTM A276, Type 316 and ASTM A320, B8 or B8F.

b. Electrical Connections:

1) All field connections shall be made to a factory-installed external NEMA 4X terminal box suitable for accepting the conduit and conductor connections.

4. Controls:

a. Provide each operator with controls:

1) Electrical controls shall include all necessary disconnect switches, motor starter and circuit breakers plus control power transformer to provide a complete system requiring only a single input power connection.

2) A panel-mounted disconnect switch shall be provided.

a) The door of the enclosure shall be mechanically interlocked with the disconnect switch such that the door cannot be opened with the switch in the ON position without using a tool-operated defeater.

3) Each motor circuit shall be protected with:

a) A properly sized, adjustable, magnetically-tripped, three-pole motor circuit protector; and

b) A motor starter with manual reset thermal overload relay.

4) All indicating lights, push buttons, and other devices shall be of the heavy-duty, full-size, oil-tight type.

a) They shall be NEMA rated in conformance with the requirements pertaining to the location of the control as shown on the Contract Drawings or specified herein.

5) Each door-mounted device shall have its own lamicoid plastic legend plate custom engraved by the actuator manufacturer.

6) A means shall be provided to test all indicating lights either using Push-to-Test lights or via a single Lamp Test push button.

a) Testing of lights shall not interrupt or affect the control functions.

7) Each actuator shall also be equipped with a safeguard to shut off the actuator on failure of essential electrical or hydraulic components and shall be set for plus 25% of the normal operating time.

b. Control Circuits:

1) All ladder-logical controls shall be performed through the use of either relays and timers, or a programmable logic controller (PLC).

2) When a PLC is provided for logical control, a programming unit shall be provided with the controller for adjusting and revising timer and counter constants. It shall be possible to modify and monitor the control program using the programming unit. A means shall be available for back-up downloading and recovering the program.

3) Spare PLC inputs and outputs shall be provided and factory wired to terminals. The minimum number of spares shall be ten percent of each of the total inputs and outputs, but in no case shall there be less than three spare inputs and three spare outputs.

4) The PLC shall be supplied with two user's manuals which shall be shipped in the power unit control panel.

5) The actuator manufacturer shall be responsible for the programming of the PLC to accomplish all required control functions.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Seat/Seal:

1. All sealing surfaces shall be Type 316L stainless steel.

B. Seals:

1. All gates shall be provided with a self-adjusting seal system to restrict leakage in accordance with the requirements specified herein.

2. The gate leakage shall not exceed the following rates, when subjected to the design seating and unseating hydrostatic heads specified in Schedule 40 05 59.05-1, located after the "End of Section" designation:

a. For seating head conditions: ≤ 0.1 gpm/ft of seating perimeter.

b. For unseating head conditions (up to a maximum head as of 20 ft, measured for the purpose of this calculation from the gate invert): ≤ 0.1 gpm/ft of seating perimeter.

C. Operator:

1. Lifting Stem:

a. Provide thread contact surfaces with a minimum 63×10^{-6}-in. finish.

2. Mounting:

a. Mount operators on a structural yoke.

D. Anchorage Devices:

1. Provide anchorage devices in accordance with Section 05 05 23.02 - Miscellaneous 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. Anchor bolts for installation in new concrete shall be hooked 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.

E. Identification:

1. Provide in accordance with Section 40 05 97 - Identification for Process Equipment.

F. 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.

3. Motors shall be painted in accordance with Section 26 05 91 - Low Voltage Electric Motors.

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.

5. Stainless Steel: Do not paint stainless steel.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Shop tests shall be performed and certified at the factory for all stainless steel hydraulic gates in accordance with the requirements of the Contract Documents.

B. All slide gates shall be shop tested for leakage at the seating and unseating hydrostatic heads specified in Schedule 40 05 59.05-1, located after the "End of Section" designation.

C. Witnessing of shop tests:

1. Shop tests for the stainless steel hydraulic slide gates shall be witnessed in accordance with the requirements of the Contract Documents.

2. Quantity of shop tests that shall be witnessed:

a. Refer to Schedule 40 05 59.05-1, located after the “End of Section” Designation.

b. Should the leakage rates specified herein be exceeded for any one gate during a shop test, each and all gates of the same size and type shall be witness shop tested.

1) Gates that exceed the specified leakage rates shall be rejected.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Install equipment in complete accordance with the manufacturer's printed instructions and the approved shop drawings.

B. Floor and Bench Stands:

1. Accurately center floor and bench stands over the gate.

2. Solidly bolt stands to the floor or support structure, with through-bolts wherever possible.

3. Place approximately ¾-in. of non-shrink cement grout beneath stands mounted on concrete or similar construction to assure uniform support.

4. For stands installed within the area of a removable type floor, platform, or grating, securely mount them on their own support structure independent of the removable element, unless otherwise shown on the Contract Drawings or specified herein.

3.03 FIELD TESTING / QUALITY CONTROL

A. Furnish the services of a qualified manufacturer 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.

B. Preliminary Field Test:

1. The manufacturer representative shall inspect the installation of equipment, make any necessary adjustments, and field calibrate the equipment upon completion of the installation of each actuator and gate.

C. Final Field Tests:

1. Subject all stainless steel hydraulic slide gates to a field running test under actual operating conditions as required herein and in the Contract Documents.

2. Test slide gates for leakage, strength, and opening and closing against the maximum heads practicable to obtain under operating conditions.

a. Adjust and repair the seating and sealing surfaces as necessary to stop any noticeable leaks around the frames or gates.

b. Provide an installation for which the amount of seepage through any slide gate does not exceed the maximum allowable amounts specified herein for the seating and unseating conditions specified in Schedule 40 05 59.05-1, located after the "End of Section" designation.

3. Slide Gates and Operators:

a. Field test all slide gates and operators by having each operator open and close the gate through the full range of travel at least four times.

1) The field tests shall demonstrate that all equipment, controls and monitoring operate as specified and within the allowable leakage rates.

b. Field test all gates with associated operators.

1) For electro-operated gate, field test the gate separately from each local control panel, remote control panel or push-button station.

2) Field test the manual overrides for electro-operators to demonstrate that they can seat and unseat each gate by operating the gate through a travel of at least 12 inches.

4. Test slide gates for leakage, strength, and opening and closing against the maximum heads specified in Schedule 40 05 59.05-1, located after the "End of Section" designation, unless otherwise approved by the Engineer.

5. Each slide gate shall be operated through all modes of operation.

6. Repair any leaks around the frames and adjust the gate wedging devices as necessary to reduce leakage to within allowable limits.

a. Leakage around slides shall not exceed the maximum amount specified herein.

D. 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 refers to the total required services for the slide gates provided under this Section.

Visit:	Purpose:	No. of Visits:	Person-days per visit:
1	Installation Checkout	5	2
2	Field Testing	3	2

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 all 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 refers to the total required services for the slide gates provided under this Section.

Visit:	Purpose:	No. of Visits:	Person-days per visit:
3	Startup / Initial Operation	3	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 Section 09 91 00 - Painting.

END OF SECTION

SCHEDULE 40 05 59.05-1
STAINLESS STEEL SLIDE GATE SCHEDULE

Name:	CCT Influent Gate	Effluent Water System Influent Gate
Type:	Flange back, Wall-mounted, non-self-contained, upward opening	Flange back, Wall-mounted, non-self-contained, upward opening
Quantity:	4	1
Seal:	Flush -bottom- with a box-out in the concrete floor	Flush bottom without a box-out in the concrete floor
Size (W × H):	84-in. × 60-in.	36-in. × 36-in.
Design Seating Head:	15 ft	15 ft
Design Unseating Head:	N/A	15 ft
Operating Head:	11 ft	11 ft
Operator:	Floorstand Electric Motor Actuator	Floorstand Electric Motor Actuator
Area Classification:	NEMA 4	NEMA 4
Power:	480 V, 3 Ø, 60 Hz	480 V, 3 Ø, 60 Hz
Stem:	Rising	Rising
Minimum Quantity of Gates that shall be Witness Shop Tested:	All	All
Tag Numbers:	OB1.05.01.004.AD01.01/OB1.05.01.248.AD01.01, OB1.05.01.004.AD01.02/OB1.05.01.248.AD01.02, OB1.05.01.004.AD01.03/OB1.05.01.248.AD01.03, OB1.05.01.004.AD01.04/OB1.05.01.248.AD01.04	4304A0/4304AM

SECTION 40 05 59.16.01 – STOP LOGS (ALUMINUM)
CONTRACT OB-144A

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 aluminum stop log planks, guides, and stop log plank pullers, with all appurtenances and accessories, complete and operational.

B. The following index of this Section is presented for convenience:

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3.05	Adjusting / Protection / Cleanup	6

C. The following schedule, attached after the end of section designation, is a part of this Section:

1. Schedule 40 05 59.16 01-1, Stop Logs (Aluminum) 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 05 05 23.02 - Miscellaneous Metal Fastenings.

1.04 REFERENCES

A. Reference Standards:

1. ASTM A276 Stainless and Heat Resisting Steel Bars and Shapes.
2. ASTM B308 Aluminum-Alloy 6061-T6 Standard Structural Profiles.
3. ASTM D2000 Classification System for Rubber Products in Automotive Applications.

1.05 DESCRIPTION

A. The aluminum stop log planks shall be designed for flow in either direction and seals shall be provided for this condition.

B. Provide stop logs at 4 locations to fit into existing 8” wide by 4-1/4” deep stop log grooves at the locations indicated in Schedule 40 05 59.16 01-1, Stop Logs (Aluminum) Schedule.

C. Contractor shall verify the dimensions and conditions of existing grooves and shall provide repair if required.

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 Contractor 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. Detailed dimensional drawings.

b. Assembly and installation drawings.

c. Location and details of stop log plank storage facilities.

d. Records of Operational Tests and Load Tests.

2. Information Submittals:

a. Material certification and specifications.

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. Hydrogate, Denver, CO;

B. Whipps, Inc. Athol, MA;

C. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Materials:

1. Stop log planks shall be fabricated of aluminum plate reinforced with extruded or structural aluminum horizontal and vertical members.

2. Stop log planks, lifting lugs and appurtenances shall conform to the requirements of ASTM B308 and to aluminum alloy and temper AA-6061-T6 provided with a mill finish.

3. Lifting devices shall be of Type 316 stainless steel conforming to ASTM A276.

4. All component parts shall be protected from dissimilar metals.

5. Lip-type seals shall be extruded neoprene conforming to ASTM D2000, Grade 2BC515, Durometer 50 ± 5.

B. Details of Construction:

1. The stop log planks shall not deflect more than 1/360 of the span of the plank under the design head specified in Schedule 40 05 59.16 01-1, Stop Logs (Aluminum) Schedule, located after the "End of Section" designation of this Section.
2. End caps will not be allowed on the stop log planks. Planks will be of sufficient weight to be submerged under their own weight.
3. Two lifting lugs shall be provided for each stop log plank. Lifting lugs shall be capable of withstanding the lifting load necessary to remove the stop log plank under the field design head.
4. Lip-type Seals:
    a. Each stop log plank shall be provided with uninterrupted seals along the bottom of the plank and up both sides. The seals shall be attached to the plank with Type 304 stainless steel bars and fasteners.
    b. The shape of the seal shall provide a seating surface having a minimum width of 1 inch. The vertical face of the seal shall be in contact with the seating surface of the guide to provide a proper seal at the corners.
    c. As indicated on the Contract Drawings, the bottom of the plank shall seal flush with the invert of the finished concrete channel or the stainless steel guide.
    d. Maximum guaranteed leakage: 0.1 gpm/ft of seal length.
    e.
5. Lifting Device:
    a. One lifting device shall be provided to remove and install the stop log plank as specified herein and shown on the Contract Drawings. The lifters shall be extendible so that they will function with different stop log plank lengths.
    b. The lifting device shall be equipped with a suitable eye bolt for portable crane operation. The device shall be oriented in its position by the stop log plank guides and shall be capable of securing and releasing the stop logs with the use of a lanyard from the operating floor.
    c. Stop log pullers shall conform to the manufacturer's standard.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Stop Log Plank Storage:

1. The Contractor shall provide storage racks designed by stop log manufacturer with minimum overall dimensions..
2. Materials of storage racks shall be compatible with the stop log planks.

3. Two storage carts shall be provided by the stop log manufacturer

4. Location and details of storage facilities shall be submitted to the Engineer and DEP for approval prior to installation.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. The lifting devices shall comply with the marking requirements listed in ASME B30.20-1.2.1 Marking.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Examination of Stop Log Plank Locations:

1. Contractor shall examine the locations of the stop log planks to verify all pertinent dimensions prior to fabrication of the stop log planks.

2. Contractor shall have full responsibility for the proper fit of the furnished stop log planks at the locations designated on the Contract Drawings.

3.02 INSTALLATION

A. Number, size and location of stop log planks, guides and lifting devices shall be provided as shown on the Contract Drawings or called for in the Contract Documents.

B. The completely assembled stop log planks shall be tested for the manufacturer's guaranteed leakage criteria.

3.03 FIELD TESTING / QUALITY CONTROL

A. Testing of Stop Log Planks:

1. Contractor shall demonstrate, using a stop log puller and lifting device, the ease of installation, removal and the proper fit of the stop log planks at their locations of use in the presence of and to the satisfaction of the Engineer.

2. Stop log planks assembly shall be tested for conformance to manufacturer's maximum guaranteed leakage.

3. Any stop log planks that bind, do not fit, or do not meet leakage requirements shall be repaired and retested all at no additional cost to the City.

B. Testing of Lifting Devices:

1. Operational test in accordance with the requirements of ASME 30.20-1.3.8.2 Operational Test.

2. Load test in accordance with the requirements of ASME B30.20-1.3.8.2 Load Test.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Stop Log Plank Storage

1. Location and details of storage facilities shall be submitted to the Engineer for approval prior to installation.

B. Following successful completion of field tests, the Contractor shall store the stop log planks and stop log plank pullers at the locations designated by the Engineer.

END OF SECTION

SCHEDULE 40 05 59.16 01-1
STOP LOGS (ALUMINUM) SCHEDULE

Location:	Chan. Dimensions		Invert Elevation:	Water Surface Elevations:			
	Width	Height		Upstream Side:		Downstream Side:	
	(in.)	(in.)	(ft)	Min. (ft)	Max. (ft)	Min. (ft)	Max. (ft)
Seaside CCT OB1.05.08.027.AD01.01 upstream of Influent Gate OB1.05.01.004.AD01.01/OB1.05.01.248.AD01.01	103	154	1.84	12.00	12.92	1.84	1.84
Seaside CCT OB1.05.08.027.AD01.01 upstream of Influent Gate OB1.05.01.004.AD01.02/OB1.05.01.248.AD01.02	103	154	1.84	12.00	12.92	1.84	1.84
Landside CCT OB1.05.08.027.AD01.02 upstream of Influent Gate OB1.05.01.004.AD01.03/OB1.05.01.248.AD01.03	103	154	1.84	12.00	12.92	1.84	1.84
Landside CCT OB1.05.08.027.AD01.02 upstream of Influent Gate OB1.05.01.004.AD01.04/OB1.05.01.248.AD01.04	103	154	1.84	12.00	12.92	1.84	1.84

NO TEXT ON THIS PAGE

SECTION 40 05 97 – IDENTIFICATION FOR PROCESS EQUIPMENT
CONTRACT OB-144A

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

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.

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.

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 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 97-6 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. SLUDGE OR UTILITY GAS		
a. High Pressure	Black	Orange
b. Low Pressure	White	Orange
3. FUEL OIL	Orange	White
4. LUBRICATING OIL	Black	White
5. HYDRAULIC FLUID	Red	White
6. CHEMICALS		
a. Ferric Chloride	White	Blue
b. Glycerol	Brown	Yellow
c. Methanol	Black	Yellow
d. Polymer	Brown	Yellow
e. Sodium Bisulfite	Orange	Black
f. Sodium Hydroxide	Black	Yellow
g. Sodium Hypochlorite	Blue	Yellow
h. Other (Hazardous)	Black	Yellow
i. Other (Relatively Safe)	Brown	Yellow
7. OZONE	Black	Yellow
8. CHLORINE		
a. Gas	Black	Yellow
b. Liquefied	Red	Yellow
c. Solution	Blue	Yellow
9. LIQUIDS THICK IN SOLIDS		
a. Primary Sludge	White	Black
b. Digested Sludge		

Service Line:	Colors:	
	Letters:	Background:
c. Thickened Sludge		
10. LIQUIDS THINNER IN SOLIDS a. Secondary Sludge b. Return Sludge c. Mixed Liquor d. Grease, Scum, Grit	White	Brown
11. LIQUIDS WEAK IN SOLIDS a. Sewage b. Effluent c. Thickening Tank Drains, Vents, Overflow d. Digester Tank Drains, Vents, Overflow e. Concentration Tank Drains, Vents, Overflow f. Storage Tank Overflow, Drains g. Settling Tank Overflow, Drains h. Sump Drains	Black	Gray
12. STRAINED EFFLUENT a. Spray Water b. Flushing Water c. Plant Water	Yellow	Gray
13. NON-POTABLE WATER a. Seal Water b. Chilled Water c. Engine Cooling Water d. Sludge Heating Water e. Hydraulic Control Water	Yellow	Blue
14. CITY WATER	White	Blue

Service Line:	Colors:	
	Letters:	Background:
15. STEAM, DANGEROUSLY HOT WATER	Blue	Orange
16. ENGINE AIR		
a. Starting	Orange	Green
b. Intake	Yellow	Green
17. ENGINE EXHAUST	Yellow	Orange
18. VACUUM SERVICE	Black	Green
19. PLANT SERVICE (COMPRESSED) AIR	White	Green
20. PROCESS (BLOWER) AIR	Gray	Green
21. HIGH PRESSURE AIR	Orange	Green
22. HEATING, VENTILATING AND CONDITIONING AIR (Equipment And Ductwork)	Green	Charcoal

SCHEDULE 40 05 97-4
PIPE IDENTIFICATION SIGNS

Legend:	**Service:**	**Color Code:**	
		Lettering:	**Background:**
BLOWER LUBE	Blower lube oil	Black	White
BLOWOFF	Blowoff	*	*
CAUSTIC	Caustic soda (Sodium hydroxide)	Black	Yellow
CHILL SUPPLY	Chilled water supply	Yellow	Blue
CHILL RETURN	Chilled water return	Yellow	Blue
CHLORINE GAS	Chlorine gas	Black	Yellow
CHLOR. LIQ.	Liquefied chlorine	Red	Yellow
CHLOR. SOL.	Chlorine solution	Blue	Yellow
COMP. AIR	Compressed or plant service air	White	Green
CONDENSATE	Condensate	Yellow	Blue
DEFOAMANT	Defoamant or foam control	Brown	Yellow
DIESEL FUEL	Diesel fuel oil	Orange	White
DIGEST. SL.	Digested sludge	White	Black
DIG. O'FLOW	Digester overflow	Black	Gray
DISINFECT	Disinfectant	Brown	Yellow
DRAIN - *	Drain - *	*	*
EFFLUENT	Effluent water	Black	Gray
ENGINE AIR	Engine air intake	Yellow	Green
ENG. EXHAUST	Engine exhaust	Yellow	Orange
ENGINE LUBE	Engine lube oil	Black	White

Legend:	Service:	Color Code:	
		Lettering:	Background:
ENGINE VENT	Engine crankcase vent	Black	White
EXCESS SLUDGE	Excess sludge	White	Black
EXH. BLOWOFF	Exhaust silencer blowoff	Red	Blue
FERRIC	Ferric chloride	White	Blue
FIRE	Fire line	White	Red
FLUSH. WATER	Pump flushing water	Yellow	Gray
FLY ASH	Wet fly ash	White	Black
FUEL OIL	Fuel oil	Orange	White
FUEL FILL	Fuel oil fill	Orange	White
GAS – SLUDGE	Sludge gas	White	Orange
GAS – UTILITY	Utility gas	White	Orange
GAS – HP	Sludge or utility gas – high pressure	Black	Orange
GLY	Glycerol	Brown	Yellow
GREASE	Grease	White	Brown
GRIT	Grit	White	Brown
HI PRESS. AIR	High pressure air	Orange	Green
H.W. RETURN	Hot water return	Blue	Orange
H.W. SUPPLY	Hot water supply	Blue	Orange
HYDRAULIC	Hydraulic fluid	Red	White
HYPOCHLORITE	Sodium hypochlorite	Blue	Yellow
INSTR. AIR	Instrument air	White	Green
JACKET WATER	Engine jacket water	Yellow	Blue

Legend:	Service:	Color Code:	
		Lettering:	Background:
LUBE	Lubricating oil	Black	White
LUBE FILL	Lubricating oil fill	Black	White
METER - *	Metering - *	*	*
METHANOL	Methanol	Black	Yellow
MIXED LIQUOR	Mixed liquor	White	Brown
MIXED SLUDGE	Mixed sludge	White	Brown
MODIFIED SL.	Modified sludge	White	Brown
O'FLOW - *	Overflow - *	*	*
OZONE	Ozone	Black	Yellow
PLANT DRAIN	Plant drain	Black	Gray
PLANT WATER	Plant water	Yellow	Gray
POLYMER	Polymer	Brown	Yellow
PRIMARY SL.	Primary sludge	White	Black
PROCESS AIR	Process or blower air	Gray	Green
RECIRC. SL.	Recirculated sludge	White	Brown
RETURN SL.	Return sludge	White	Brown
SBS	Sodium bisulfite	Orange	Black
SCUM	Scum	White	Brown
SEAL WATER	Seal water	Yellow	Blue
SECOND. SL.	Secondary sludge	White	Brown
SEWAGE	Sewage	Black	Gray
SEW. SAMPLE	Sewage sampling	Black	Gray
SPRAY WATER	Spray water	Yellow	Gray

Legend:	Service:	Color Code:	
		Lettering:	Background:
STARTING AIR	Starting air	Orange	Green
STEAM	Steam	Blue	Orange
SUMP - *	Sump pump line - *	*	*
SUPERNATANT	Supernatant	Black	Gray
THICK. DR.	Thickener drain	Black	Gray
THICK. EFF.	Thickener effluent	Black	Gray
THICK. SL.	Thickened sludge	White	Black
TREAT. WATER	Chemically treated boiler feed water	Brown	Yellow
VACUUM	Vacuum line	Black	Green
VENT - *	Vent - *	*	*
WASTE GAS	Waste gas	White	Orange
WASTE OIL	Waste lubricating oil	Black	White
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:**
AIR BLOWER	**	White	Charcoal
AIR COMPRESSOR	**	White	Green
AIR HANDLING	UNIT **	White	Charcoal
AIR CONDITIONING	UNIT **	White	Charcoal
AUXILIARY ELECTRIC	GENERATOR **	Red	Green
AUXILIARY LUBE	OIL PUMP **	Black	White
BAR SCREEN	**	Black	Gray
BLOWER CONTROL	CABINET **	Gray	Green
BLOWER CONTROL AIR	RECEIVER **	White	Green
BLOWER LUBE OIL	AUX. PUMP **	Black	White
BLOWER LUBE OIL	COOLER **	Black	White
BLOWER LUBE OIL	RESERVOIR **	Black	White
BLOWER SILENCER	**	Gray	Green
BULK LUBE OIL	STORAGE **	Black	White
BYPASS OIL FILTER	**	Black	White
CHILLERS	**	White	Blue
CLEAN LUBE OIL	TANK **	Black	White
CONCENTRATION TANK	**	White	Black
CONDENSATE PUMP	**	Yellow	Blue
CONDENSATE RECEIVER	**	Yellow	Blue
CONDENSER	WATER COOLED **	Yellow*	Blue*
CONDENSER	AIR COOLED **	Yellow*	Blue*
CONE VALVE AIR	RECEIVER **	White	Green
DESCALER	**	Yellow	Blue
DIESEL TANK	**	Orange	White

Legend:		**Color Code:**	
First Line(1):	**Second Line(2):**	**Lettering:**	**Background:**
DIGESTION TANK	**	White	Black
DIRTY LUBE OIL	TANK **	Black	White
EFFLUENT-LUBE OIL	COOLER **	Yellow	Gray
EFFLUENT WATER	STRAINER **	Yellow	Gray
EFFLUENT WATER	PUMP **	Black	Gray
EFFLUENT WATER	TANK **	Yellow	Gray
ENGINE GENERATOR	**	Red	Green
ENGINE J.W.	MAKEUP	Yellow	Blue
ENGINE LUBE OIL	PURIFIER **	Black	White
ENGINE LUBE OIL	TANK **	Black	White
ENGINE OIL SUMP	TANK **	Black	White
EXHAUST FAN	**	White	Charcoal
EXCESS SLUDGE	DISTRIB. BOX **	White	Black
EXHAUST STEAM	CONVERTER **	Blue	Orange
FAN COIL UNITS	**	Blue*	Orange*
FLUSHING WATER	PUMP **	Yellow	Gray
FUEL OIL	PUMP **	Orange	White
FUEL OIL TANK	NO. 2 OIL **	Orange	White
FUEL OIL TANK	NO. 4 OIL **	Orange	White
FUEL OIL TANK	NO. 6 OIL **	Orange	White
FULL FLOW OIL	FILTER **	Black	White
GAS BOOSTER	**	Black	Orange
GASOLINE TANK	**	Orange	White
GAS COMPRESSOR	**	Black	Orange
GAS RECEIVER	**	Black	Orange
GAS SURGE TANK	**	White	Orange
HEAT EXCHANGER	OIL **	White	Orange
HEAT EXCHANGER	STEAM-WATER **	Blue	Orange

Legend:		**Color Code:**	
First Line(1):	**Second Line(2):**	**Lettering:**	**Background:**
HEAT EXCHANGER	WATER-WATER **	Blue	Orange
HEAT RECOVERY	SILENCER **	Yellow	Orange
HEAT. & VENT.	UNIT **	White	Charcoal
HIGH PRESSURE AIR	COMPRESSOR **	Orange	Green
HIGH PRESSURE AIR	DRYER **	Orange	Green
HIGH PRESSURE AIR	RECEIVER	Orange	Green
HOT WATER BOILER	**	Blue	Orange
HOT WATER CONVERTER	DOMESTIC **	Blue	Orange
HOT WATER HEATER	ELECTRIC **	Blue	Orange
HOT WATER GENERATOR	DOMESTIC **	Blue	Orange
HYDRO-PNEUMATIC	TANK **	White	Blue
INLET SLUICE GATE	CYLINDER **	Red	White
JACKET WATER CIRC.	PUMP **	Yellow	Blue
JACKET WATER	COOLER **	Yellow	Blue
JACKET WATER ENG.	OIL COOLER **	Yellow	Blue
LUBE OIL	PURIFIER **	Black	White
LUBE OIL STORAGE	PUMP **	Black	White
LUBE OIL STORAGE	TANK **	Black	White
LUBE OIL TRANSFER	PUMP **	Black	White
MIXED SLUDGE	PUMP **	White	Brown
OUTLET SLUICE GATE	CYLINDER **	Red	White
OZONATOR	**	Black	Yellow
PLANT AIR	AFTERCOOLER **	White	Green
PLANT AIR	COMPRESSOR **	White	Green
PLANT AIR	RECEIVER **	White	Green
PLANT WATER	MAKEUP **	Yellow	Gray
PLANT WATER	TANK **	Yellow	Gray

Legend:		**Color Code:**	
First Line(1):	**Second Line(2):**	**Lettering:**	**Background:**
PLANT WATER	PUMP **	Yellow	Gray
PUMP – CHILLED WATER	**	White	Blue
PUMP – CONDENSER WATER	**	Yellow	Blue
PUMP – DOMESTIC	HOT WATER **	White	Blue
PUMP – FEED WATER	**	Yellow	Blue
PUMP – FIRE	**	White	Red
RETURN FAN	**	White	Charcoal
RETURN SLUDGE	PUMP **	White	Brown
SCUM PIT	**	White	Brown
SEAL WATER	PUMP **	Yellow	Blue
SEWAGE EJECTOR	**	Black	Gray
SEWAGE FLOW	METER **	Black	Gray
SEWAGE PUMP	**	Black	Gray
SLUICE GATE CONT.	AIR CHAMBER **	White	Green
SLUICE GATE CONT.	AIR TANK **	White	Green
SLUICE GATE HYD.	FLUID PUMP **	Red	White
SLUDGE HEATER	**	White	Black
SLUDGE HEATING H.W.	CIRC. PUMP **	White	Orange
SLUDGE HEAT WATER	MAKEUP TANK **	Yellow	Blue
SLUDGE DOCK	PUMP **	White	Black
SLUDGE RECIRC.	PUMP **	White	Brown
SLUDGE STORAGE	TANK **	White	Black
SLUDGE TRANSFER	BOX **	White	Black
SLUDGE TRANSFER	PUMP **	White	Black
SPRAY WATER	PUMP **	Yellow	Gray
STANDBY GENERATOR	**	Red	Green
STARTING AIR	COMPRESSOR **	Orange	Green

Legend:		**Color Code:**	
First Line(1):	**Second Line(2):**	**Lettering:**	**Background:**
STARTING AIR	TANK **	Orange	Green
STEAM BOILER	**	Blue	Orange
SUMP PUMP	**	Black	Gray
SUMP PUMP – CONC.	TANK **	Black	Gray
SUMP PUMP – DIGEST.	TANK **	Black	Gray
SUMP PUMP – EFF.	VAULT **	Black	Gray
SUPPLY FAN	**	White	Charcoal
THICKENER	**	White	Black
TRASH RACK	**	Black	Gray
UNIT HEATER – STEAM	**	White*	Charcoal*
UNIT HEATER – WATER	**	White	Charcoal*
WASTE LUBE OIL	PUMP **	Black	White
WASTE LUBE OIL	TANK **	Black	White
WATER TREATMENT	PUMP **	Brown	Yellow
WATER TREATMENT	TANK **	Brown	Yellow

(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:**
AD	Aerator Drain	Gray 16187
APLM	Anionic Polymer	Green 14090
BLW	Balance Water	Blue 15193
BLO	Blower Lube Oil	White 17925
CPLM	Cationic Polymer	Green 14090
CSTC	Caustic (Sodium Hydroxide)	Orange 22544
CEN	Centrate	Gray 16492
CF	Centrifuge Feed	Black 14036
CHA	Channel Air	Green 14260
CHWR	Chill Water Return	Blue 17877
CHWS	Chill Water Supply	Blue 15450
CHEFF	Chlorinated Effluent	Gray 17875
CW	City Water	Blue 15200
CLD	Clarifier Drain	Gray 16187
CLWR	Cold Water Return	Blue 15187
CLWS	Cold Water Supply	Blue 15125
CA	Compressed Air (Plant Air)	Green 14449
CCSK	Concentrated Skimmings	Tan 17778
CSB	Concentrator Subnatant	Gray 16314
C	Condensate	Gray 16357
CTD	Contact Tank Drain	Gray 16187
DFM	Defoamant	Pink 11630
DGOF	Degrit Overflow	Gray 16250
DGS	Degritted Primary Sludge	Olive 14257
DWS	Dewatered Sludge	Navy 15044
DF	Diesel Fuel	Mustard 13275

Abbr.:	Process/Service Line:	Fed. Std. 595B Color:
DSD	Digested Sludge Disposal	Brown-black 10032
RCD	Digested Sludge Recirculation (mixing)	(See Note 1)
DSR	Digested Sludge Recycle	Black 14084
DSS	Digested Sludge to Storage	Black 17038
DST	Digested Sludge Transfer	Gray 16081
DSK	Dilute Skimmings	Tan 16405
ELF	Elutriation Feed	Black 15042
ECWR	Engine Cooling Water Return	Gray 15526
ECWS	Engine Cooling Water Supply	Navy 15045
EXH	Engine Exhaust	Stainless Steel Jacket
ELO	Engine Lube Oil	White 17925
FECL	Ferric Chloride	Blue 15095
FEF	Final Effluent	Gray 16492
FRS	Fire and Standpipe	Red 11350
FW	Flushing Water	Blue 15090
FF	Fuel Fill	Tan 10266
FO	Fuel Oil	Brown 16160
	Gasoline Fill Port – high octane	Red 11086
	Gasoline Fill Port – middle octane	Blue 15056
	Gasoline Fill Port – low octane	White 17925
	Gasoline Fill Port, unleaded – high octane	Red 11086 with white 17925 cross
	Gasoline Fill Port, unleaded – middle octane	Blue 15056 with white 17925 cross
	Gasoline Fill Port, unleaded – low octane	White 17925 with black 17038 cross
	Gasoline Vapor Recovery	Orange 12246
GRIT	Grit	Gray 14064
HPAR	High Pressure Air (Plant Air)	Green 14272
DG(H)	High Pressure Digester Gas	Orange 22510

Abbr.:	Process/Service Line:	Fed. Std. 595B Color:
HPUGS	High Pressure Utility Gas	Orange 22510
HWR	Hot Water Return (heating)	Orange 12215
HWS	Hot Water Supply (heating)	Orange 11400
HVACEX	HVAC Exhaust	Gray 14158
HVACR	HVAC Return	Gray 14077
HVACS	HVAC Supply	Gray 14056
HCW	Hydraulic Control Water	Blue 15107
HOR	Hydraulic Oil Return	Brown 10059
HOS	Hydraulic Oil Supply	Brown 10045
ITK	Intake (Engine Air)	Green 14672
JKWR	Jacket Water Return	Gray 15109
JKWS	Jacket Water Supply	Navy 15050
	Kerosene Fill Port	Brown 20100
LM	Lime	Tan 13740
DG(L)	Low Pressure Digester Gas	Orange 22510
LPUGS	Low Pressure Utility Gas	Orange 22510
LF	Lube Fill	White 17925
MH	Methanol	Brown 10233
MS	Mixed Sludge (heating)	(See Schedule 40 05 97-7)
ODCDW	Odor Control Draw	Green 14110
ODCVT	Odor Control Vent	Unpainted
O2	Oxygen	Red 11105
OZR	Ozone Recycle	Blue 15177
OZS	Ozone Supply	Blue 15080
OZVT	Ozone Vent	Blue 15180
PD	Plant Drain	Gray 16187
PW	Plant Water	Blue 15092

Abbr.:	Process/Service Line:	Fed. Std. 595B Color:
PTPM	Potassium Permanganate	Red 11140
PEFF	Primary Effluent	Gray 16251
PA	Process Air	Green 14115
RINF	Raw Influent	Gray 16293
RPS	Raw Primary Sludge	Olive 14151
RSC	Raw Screenings	Tan 16350
RAS	Return Activated Sludge	Tan 10260
SMP	Sampling Line	(Match to Service)
SLW	Seal Water	Blue 15182
SBP	Secondary Bypass	Gray 16473
SAR	Service Air (Plant Air)	Green 14193
SW	Service Water	Blue 15102
SHW	Sludge Heating Water	Orange 12473
NA2SO3	Sodium Bisulfite	Black 14084
NAOCL	Sodium Hypochlorite	Yellow 13591
SPW	Spray Water	Navy 15052
STA	Starting Air (Engine Air)	Green 14187
STMR	Steam Return (Condensate)	Tan 11670
STMS	Steam Supply	Orange 22356
STD	Storm Drain	Gray 16440
SULAD	Sulfuric Acid	Brown 10049
SD	Sump Drain	Gray 16376
SU	Supernatant	Gray 16307
TS	Thickened Sludge	Brown 10070
TD	Thickener Drain	Gray 16187
TO	Thickener Overflow	Gray 16329
VCS	Vacuum Service	Green 14062
WAS	Waste Activated Sludge	Tan 13596

Abbr.:	Process/Service Line:	Fed. Std. 595B Color:
WDGS	Waste Digester Gas	Orange 22510
WML	Waste Mixed Liquor	Tan 12648
WO	Waste Oil	White 17925
WSC	Washed/Compacted Screenings	Black 14084

SECTION 40 06 01 – SCHEDULE FOR EXPOSED PIPING
CONTRACT OB-144A

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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3.05	Adjusting / Protection / Cleanup	3

C. The following schedule, attached after the End of Section designation, is 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. 40 05 05 – Exposed Piping Installation

B. 40 05 06 – Couplings, Adapters, and Specials for Process Piping
C. 40 05 07 – Hangers and Supports for Process Piping
D. 40 05 19 – Ductile Iron Process Pipe
E. 40 05 31 – Thermoplastic Process Pipe
F. 40 42 13 – Process Piping Insulation

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 Name	Material	Wall Thickness/ Schedule/ Class	Type of Joint	Working Pressure (psig)	Test Type	Test Pressure (psig)	Interior Coating	Exterior Coatings, Treatments	Remarks
SAMP	CPVC	Schedule 80	SW	50	Hyd	150	-	I/P*	* Indoor – P / Outdoor - I
				##	##				--

B. The following service abbreviations are used in Schedule 40 06 01-1:

Service:	Abbrev:	Service:	Abbrev:
Sampling water for TRC analyzer	SAMP	--	--
--		--	--
--		--	--
--	--	--	--

C. The following pipe material abbreviations are used in Schedule 40 06 01-1:

Pipe Material:	Abbrev:	Pipe Material:	Abbrev:
Chlorinated PVC	CPVC		

D. The following joint type abbreviations are used in Schedule 40 06 01-1:

Joint Type:	Abbrev:	Joint Type:	Abbrev:
		Solvent Weld	SW

E. The following interior coating abbreviations are used in Schedule 40 06 01-1:

Interior Coating	Abbrev:	Interior Coating:	Abbrev:

F. The following exterior coating and treatment abbreviations are used in Schedule 40 06 01-1:

Exterior Coating, Treat.:	Abbrev:	Exterior Coating, Treat.:	Abbrev:
		Insulate	I
		Paint	P

G. The following testing abbreviations are used in Schedule 40 06 01-1:

Test Type:	Abbrev:	Exterior Coating, Treat.:	Abbrev:
Hydrostatic	Hyd	--	--

SECTION 40 42 13 – PROCESS PIPING INSULATION
CONTRACT OB-144A

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 test all insulation and jacketing for process piping systems, including piping, valves, and accessories, complete and operational.

B. The following index of this Section is presented for convenience:

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3.04	Startup / Demonstration	10
3.05	Adjusting / Protection / Cleanup	10

C. The following schedule(s), attached after the end of section designation, are a part of this Section:

1. Schedule 40 42 13-1, Process Piping Insulation and Jacketing 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 40 05 07 – Hangers and Supports for Process Piping.

C. Section 40 06 01 – Schedule for Exposed Piping.

1.04 REFERENCES

A. Referenced Standards:

1.	ANSI B16.9	Standard for Factory Made Wrought Steel Butt Welding Fittings.
2.	ASTM C240	Standard Test Methods of Testing Cellular Glass Insulation Block.
3.	ASTM C411	Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
4.	ASTM C534	Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
5.	ASTM C552	Standard Specification for Cellular Glass Thermal Insulation.
6.	ASTM C547	Standard Specification for Mineral Fiber Pipe Insulation
7.	ASTM C1136	Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
8.	ASTM D1056	Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber.
9.	ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials.
10.	ASTM E96	Standard Test Method for Water Vapor Transmission of Materials.
11.	NFPA255	Surface Burning Characteristics of Building Materials.

12. Building Code of the City of New York.

13. New York State Energy Conservation Code.

1.05 DESCRIPTION

A. This Section includes requirements for providing insulation and jacketing for process pipe, valves, and accessories in accordance with applicable standards and regulations. In addition:

1. This Section also includes requirements for providing insulation and jacketing for HVAC and Plumbing System piping.

2. Refer to Schedule 40 42 13-1, Process Piping Insulation and Jacketing Schedule, for the extent of piping insulation and jacketing.

1.06 QUALITY ASSURANCE

A. Qualifications of Manufacturers:

1. The manufacturer(s) shall have a minimum of five (5) years of experience in the manufacture of process piping insulation products of similar size and type to those specified herein, and shall show evidence of at least five (5) substantially similar installations in satisfactory operation.

B. Supply and Compatibility:

1. Qualifications of Installer:

a. Use a single firm with at least five (5) years of successful installation experience on projects with insulation similar to that required for this project.

2. The process pipe insulation and jacketing shall be fabricated and installed in accordance with the standards referenced herein.

3. The installer shall bear responsibility for the quality of all process pipe insulation and jacketing, regardless of the location of application.

4. The installer shall verify compatibility between the process pipe insulation and jacketing, and other Work.

C. Regulatory Requirements:

1. Process pipe insulation and jacketing shall conform to the New York City Building Code in respect to plumbing and other applications covered by these codes.

2. Flame/Smoke Ratings:

a. Piping insulation shall have a composite (insulation, jackets, coverings, sealers, mastics and adhesives) flame-spread index of 25 or less, fuel-contributed rating of 50 or less, and smoke-developed index of 50 or less, as tested by ASTM E84 (NFPA255) method.

b. Any treatments of jackets or facings to impart flame and smoke safety shall be permanent.

c. The use of water-soluble treatments shall be prohibited.

3. Building Code Compliance:

a. Process piping insulation and jacketing shall comply with the New York City Building Code and with the New York State Energy Conservation 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. Product Data: For each type of piping insulation (and related materials) that shall be installed as part of the Work, submit the following:
      1) Technical product data;
      2) Insulation materials;
      3) Densities;
      4) Fire ratings;
      5) Flame-spread ratings;
      6) Smoke-developed ratings;
      7) Fuel contributed ratings;
      8) Material safety data sheets; and
      9) Installation instructions.
   b. Schedule: For each individual piping system requiring insulation as specified in Schedule 40 42 13-1, Process Piping Insulation and Jacketing Schedule, submit a schedule including the following:
      1) Insulation type (e.g., Type A, etc.) as specified herein;
      2) Manufacturer name;
      3) Product number;
      4) K-value;
      5) Thickness; and
      6) Furnished accessories.
   c. Stainless Steel Jacketing:
      1) Submit the manufacturer technical data for all jacketing and related materials.
   d. Installation Drawings: for each individual piping system requiring insulation as per Schedule 40 42 13-1, Process Piping Insulation and Jacketing Schedule, submit complete installation drawings including:
      1) Assembly and installation details;
      2) Layout, including plan and section views;
      3) Details for installation at valves and appurtenances;
      4) All drawings and details shall have clearly marked dimensions, distances, offsets, and an arrow indicating north;

5) Callouts showing the type of installation as specified herein;

6) Callouts indicating stainless steel jacketing (if applicable);

7) Clear demarcation of the extents of insulation, as well as the extents of stainless steel jacketing (if applicable);

8) Critical clearance distances with insulation and jacketing installed. Clearances shall be to other, nearby and potentially conflicting pipelines, appurtenances, and structures, as shown on the Contract Drawings; and

9) Details for jointing insulation (and if applicable, stainless steel jacketing) butt joints and longitudinal seam.

2. Information Submittals:

a. Manufacturer instructions for handling, storing, installing, and adjusting of products.

b. Qualifications of process piping insulation installer.

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. Protect the insulation against dirt, water, and chemical and mechanical damage.

2. Remove damaged materials from the project site.

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. Style C Insulation:

1. Pittsburgh Corning Corp., Port Allegany, PA;

2. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Style "C" Insulation – Cellular Glass:

1. General:

a. The insulation shall meet the requirements of ASTM C552.

b. Where field-applied stainless steel jacketing is not required over the insulation, the insulation shall be provided with a factory-applied facing of aluminum foil laminated to glass fiber reinforced white vinyl facing.

c. Insulation shall be rated for use at temperatures from 0°F to 220°F, at a minimum.

d. Mechanical Properties:

1) Minimum density: 8.0 lbs/ft^3.

2) Compressive strength: 100 psi.

2. Materials and Construction:

a. The thermal conductivity shall not exceed the following:

1) 0.32 Btu/hr/ft^2/°F/in.-thickness at 75°F mean temperature.

b. Water absorption: Shall be less than 0.2% (as per ASTMC240).

c. Water vapor permeability: Shall not exceed 0.20 perms/in. in accordance with ASTM E96.

d. Joints and Seams:

1) Insulation joints shall be sealed with the insulation manufacturer's recommended vapor-resistant joint sealant.

2) Factory-applied facing shall have its longitudinal seams sealed with vapor-resistant adhesive and butt joints shall be wrapped with 3-in. width joint sealing tape, all as recommended by the insulation manufacturer and approved by the Engineer.

e. Fittings, flanges and valves:

1) Fittings, flanges and valves shall be insulated with preformed cellular glass insulation.

2) Fitted insulation segments shall be used on sizes for which preformed shapes are not manufactured, of the same material and thickness and applied in the same manner as for pipe insulation.

f. Coating:

1) Where indicated on the Contract Drawings or in the Contract Documents, the interior bore of the insulation shall be coated to prevent abrasion of the pipe.

2) For pipe operating near ambient temperature, the coating shall be a gypsum cement molding plaster.

B. Stainless Steel Jacketing:

1. General:

a. Provide stainless steel jacketing for insulated piping having an insulation outside diameter greater than 50-in. or if specified in Schedule 40 42 13-1, Process Piping Insulation and Jacketing.

1) Stainless steel jacketing shall have a modified Pittsburgh Z-lock on the longitudinal seam.

2. Materials and Construction:

a. Stainless steel jacketing shall be constructed of Type 316 stainless steel, not less than 0.016-in. thick.

b. Moisture Barrier:

1) Jacketing shall be provided with an integrally bonded moisture barrier.

c. Joints and Seams:

1) Adjacent sections shall butt together and shall be secured with a weather-proof butt strap.

d. Flanges, fittings, and valves:

1) All insulated fittings shall be finished in the same manner, using 0.024-in. thick type 316 stainless steel preformed fitting covers and fabricated covers made from the same material for valves, flanges, tees, in-line accessories, and other pipeline appurtenances.

2) Type 316 stainless steel end caps shall be provided at the ends of the pipelines.

C. Accessories:

1. Provide staples, bands, wires and cement as recommended by the insulation manufacturer and approved by the Engineer for the applications indicated.

2. Provide adhesives, sealers, and protective finishes as recommended by the insulation manufacturer and approved by the Engineer for the applications indicated.

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 areas and conditions under which piping insulation is to be installed.

B. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable for insulation installation, as determined by the Engineer.

C. Examine process pipe insulation and jacketing prior to installation. Do not install damaged or wet insulation.

3.02 INSTALLATION

A. General:

1. Install process piping insulation in complete accordance with the manufacturer's printed instructions and the approved shop drawings.. In addition:

a. Install piping insulation products in accordance with the Building Code of the City of New York.

b. Install all products in accordance with the recognized industry practices so that insulation serves its intended purpose.

c. Insulated thermal hangers shields shall be installed at all support points, except where otherwise indicated.

B. Installation of Process Piping Insulation:

1. Order of Installation:

a. Install insulation on pipe systems subsequent to the installation of heat tracing, painting, testing, and acceptance tests.

b. Piping shall be field tested and approved by the Engineer prior to installation of insulation.

2. Cleaning and Drying:

a. Pipe surfaces shall be cleaned and dried prior to insulating.

3. Insulation Surfaces:

a. Install the insulation materials with smooth, even and flush adjoining surfaces.

b. Butt insulation joints firmly together to form a complete and tight fit over the surfaces to be covered.

c. Insulate each continuous run of piping with full-length units of insulation, with a single cut piece to complete the run.

d. Do not use cut pieces or scraps abutting each other.

4. Vapor Barrier:

a. Maintain integrity of the vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage.

b. Vapor barrier materials shall be applied to form a complete, unbroken vapor seal over the entire insulated piping system.

5. Insulating Fittings:

a. Cover valves, fittings and similar items in each piping system with an equivalent thickness and composition of insulation as applied to the adjoining pipe run.

b. Install factory molded, precut or job fabricated units except where a specific form or type is indicated.

6. Installation through Walls, Floors, and Similar Piping Penetrations:

a. Unless indicated otherwise, piping insulation shall be extended without interruption through interior walls, floors and similar piping penetrations.

1) Annular spaces between pipe and pipe sleeves shall be thoroughly packed with fibrous glass blanket and caulked with mastic so as to be soundproof and vermin-tight.

2) Provide fibrous glass blanket with properties equivalent to the insulation Style installed on the piping.

b. Do not extend insulation through walls or floors that are fire rated or are required to be gas-tight.

7. Pipe Hangers:

a. Butt pipe insulation against pipe hanger insulation inserts.

b. For hot pipes, apply a 3-in. wide vapor barrier tape or band over the butt joints.

c. For cold piping apply a wet coat of the vapor barrier lap cement on butt joints and seal the joints with a 3-in. wide vapor barrier tape or band. Pipe hangers and supports shall be installed outside of the vapor seal.

8. Removable Items:

a. Install removable insulation sections on the following:

1) Devices that require access for maintenance of equipment

2) Items that can be removed, such as unions, screwed joints, flanges, strainers, etc.

C. Stainless Steel Jacketing:

1. Install jacketing in accordance with the manufacturer's recommendations and approved shop drawings.
2. Jacketing shall be secured with ¾-in. wide, 0.015-in. thick stainless steel bands at a maximum spacing of twelve inches.
3. All edges of strapping shall be factory deburred.

D. Pipe exposed to weather:

1. Pipe hangers and supports shall be on the outside of the stainless steel jackets, and shall not penetrate the jacketing.
2. Do not install thermal hanger shields on pipelines using cellular glass insulation.
    a. At each such location, a preformed Type 316 stainless steel insulation shield shall be provided.
    b. The insulation shield shall envelope at least the lower half of the insulated pipe and shall limit the compressive load on the insulation to 33 psig or less.

E. Sealing:

1. All jacket openings (such as at overlaps of jackets with thermal hanger shields, around valve stems and similar projections) shall be sealed with non-hardening, clear or white, waterproof sealing compound, so that upon completion the insulation is essentially watertight.

F. Painting:

1. Paint piping insulation in accordance with Section 09 91 00, Painting.

G. Cleaning:

1. Clean and remove all debris, waste materials, and loose foreign matter resulting from installation.

3.03 FIELD TESTING / QUALITY CONTROL

A. Not Used

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Protection and Replacement:

1. Protection:
    a. Insulation shall be protected against dirt, water, chemical or mechanical damage before, during and after installation.

b. Follow methods which are required for protection of the insulation work during the remainder of construction period, to avoid damage and deterioration.

2. Replacement:

a. Any insulation or covering damaged prior to final acceptance of the work shall be satisfactorily repaired or replaced, including units with vapor barrier damage and moisture saturated units.

3. Repair of Existing Insulation:

a. The Contractor shall repair sections of existing insulation as specified herein in the event Contractor damages sections of existing installation while performing the Work.

1) Use insulation of same thickness as the existing insulation.

2) Install a new jacket lapping and sealer over the existing insulation.

3) If existing insulation is painted, paint new insulation to match the existing surface color.

4) If existing insulation is jacketed, replace damaged jacketing with new jacket.

END OF SECTION

NO TEXT ON THIS PAGE

SCHEDULE 40 42 13-1
PROCESS PIPING INSULATION AND JACKETING SCHEDULE

A. General:

1. The Contractor shall provide piping insulation and jacketing for mechanical piping in accordance with the requirements of Schedule 40 42 13-1.

   a. Section 40 06 01, Schedule for Exposed Piping, identifies additional mechanical piping that requires insulation and jacketing, and is not referenced in this Schedule 40 42 13-1.

   b. For mechanical piping, in the event of a discrepancy between insulation requirements identified by this Schedule 40 42 13-1, and insulation requirements specified in Section 40 06 01, Schedule for Exposed Piping, the Contractor shall provide the more stringent of the requirements.

   c. For all piping, in the event of a discrepancy between insulation requirements identified by this Schedule 40 42 13-1, and insulation requirements shown on the Contract Drawings or specified elsewhere in the Contract Documents, the Contractor shall provide the more stringent of the requirements.

B. Mechanical Piping System Insulation Schedule:

1. General:

   a. In addition to the requirements specified in Section 40 42 13 - Process Piping Insulation, the Contractor shall provide piping insulation on the mechanical piping systems specified hereinafter.

2. Thickness: Where not indicated otherwise, the Contractor shall provide the following minimum insulation thicknesses:

   a. Insulation shall be 1-in. thick for pipe sizes up to and including 6 in. nominal diameter.

   b. Insulation shall be 1½-in. thick for pipe sizes greater than 6-in. nominal diameter.

3. Exterior Piping Systems:

   a. Style: Insulation shall be Style C.

   b. Thickness: Insulation shall be a minimum 2-in. thick.

   c. Install on the following:

      1) Exterior piping systems that are indicated on the Contract Drawings for freeze protection.

NO TEXT ON THIS PAGE

SECTION 40 61 13 – PMCS GENERAL REQUIREMENTS
CONTRACT OB-144A

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 and place in operation a complete 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 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 78 25 - Operations and maintenance Manuals
B. Section 01 78 39 - Final Record Documents
C. Section 26 05 27 - Grounding.
D. Section 26 05 53 - Identification for Electrical Systems.
E. Section 26 29 13 - Enclosed Controllers
F. Section 40 61 26 - PMCS Training
G. Section 40 61 93 - PMCS Input Output List
H. Section 40 61 94 - PMCS Instrument Index
I. Section 40 61 95 - PMCS Monitoring and Control Criteria
J. Section 40 61 96 - PMCS Control Strategies
K. Section 40 63 43 - PMCS Programmable Logic Controllers
L. Section 40 67 16 - PMCS Panels and Enclosures
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. 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. DEP BIT - DEP Bureau of Business Information Technology.
7. DI - Digital Input
8. Distributed I/O - Hardware specifically designed to function as Remote I/O.
9. Distributed Control System - A control system comprising Unit and Area 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.
10. DO - Digital Output
11. Fixed PLC - PLC whose hardware configuration comprises a fixed number of I/O, a CPU and power supply all in one enclosure.
12. HMI - Human Machine Interface are electronic displays and windows providing operator access to monitor access, and set parameters of a Unit Process control system.
13. I/O - Input/Output
14. 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.
15. OAD - Operational Availability Demonstration
16. OIT - Operator Interface Terminal; another name for HMI.
17. or 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
18. P&ID - Process and Instrumentation Diagrams or included in the Contract Documents.
19. Plant - Wastewater Resource Recovery Facility or or .

20.	PLC	-	Programmable Logic Controller
21.	PMCS	-	Plant Monitoring and Control System
22.	Remote I/O	-	Any I/O that functions physical remote from the location of the CPU and I/O located on its backplane.
23.	SFT	-	Start-up and Field Testing
24.	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.
25.	URT	-	Upset and Recovery Testing
26.	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	-	BWT Design Guideline, SCADA Software.
4.	ISA 5.1	-	Instrumentation Symbols and Identification
5.	ISA 5.2	-	Binary Logic Diagrams for Process Operations
6.	ISA 5.3	-	Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic and Computer Systems.
7.	ISA 5.4	-	Instrument Loop Diagrams.
8.	ISA 5.5	-	Graphic Symbols for Process Displays.
9.	ISA 18.1	-	Annunciator Sequences and Specifications.
10.	ISA 18.2	-	Management of Alarm Systems for Process Industries.
11.	ISA TR20.00.01	-	Specification Forms for Process Measurement and Control Instruments Part1: General 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.

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 60º F to 80º F

b) Extremes 40º F to 105º F.

2) Relative Humidity

a) Normal 80 percent

b) Maximum 95 percent

b. Indoor locations

1) Ambient Temperature 40º F to 120º F.

2) Relative Humidity 98 percent maximum.

c. Outdoor locations

1) Ambient Temperature -10º F to 120º 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 MIL-STD-1916.

C. Supplier's Qualifications

1. Shall be a financially sound firm having at least ten (10) 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 ten (10) 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 ten (10) 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 ten (10) 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 508A 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 discrete relay/ 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 ten (10) 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 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.

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 ten (10) years' experience in coordination, scheduling and delivery of instrumentation and control contracts under similar Plant Facilities as this Contract 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 ten (10) 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 forty-five (45) 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, and the Engineer. 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 Plant 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 four (4) 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. Detailed functional descriptions of application programs explaining control, display, logging and alarming features to be provided and functions to be performed.

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. Electrical control schematics in accordance with NFPA 79.

d. 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

8. 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 61 93 – PMCS Input Output List 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.

9. 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.

E. 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) Wiring, schematic and logic diagrams.

7) Safety considerations relating to operation and maintenance procedures.

F. 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.

G. 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. Revere Control Solutions, AL;
2. Optimum Controls Corp, Reading, PA;
3. Avantech, Inc., Columbia, SC;
4. 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 120-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 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.

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. 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.

9. Field-mounted devices shall be treated with an anti-fungus spray.

10. Field-mounted devices shall be protected from exposure to freezing temperatures.

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

1. Programmable Logic Controllers for the PMCS shall be as specified in Section 40 63 43 - PMCS Programmable Logic Controllers.

C. Panels and Enclosures

1. Panels and Enclosure for the PMCS shall be as specified in Section 40 67 16 - PMCS Server Computers.

D. 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

E. 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

SECTION 40 61 26 – PMCS TRAINING
CONTRACT OB-144A

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:

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	2
1.06	Quality Assurance	3
1.07	Submittals	4
1.08	Delivery, Storage, and Handling	4
1.09	Spare Parts, Special Tools, and Supplies	4
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PART 2	PRODUCTS	5
2.01	Manufacturers	5
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2.03	Fabrication / Assembling / Finishes	5
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PART 3	EXECUTION	5
3.01	Examination / Preparation	5
3.02	Choose an item.Application	5
3.03	Field Testing / Quality Control	5
3.04	Startup / Demonstration	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 01 75 10 - Preliminary and Final Field Tess

B. Section 01 79 05 - Equipment Startup and Training

C. Section 40 61 13 - PMCS General Requirements

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. On-Site Training

a. On-site training shall be within the Plant where the PMCS will be installed.

b. On-site training shall make extensive use of the installed PMCS to ensure Plantpersonnel 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.

3. 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.

4. 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.

5. The City will send the following personnel to attend training courses:

a. Operations Training – 4 persons

b. Maintenance Training - 4 persons

c. Supervisor Training - 2 persons

d. Engineer Training - 2 persons

6. All training shall be conducted during the hours of 8:00 AM to 3 PM until the conclusion of the training course.

7. 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 ten (10) 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 the 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. Within 90 days of the effective Notice to Proceed, 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 CHOOSE AN ITEM.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 a 4 hours 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. 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) Development of programs and control schemes.

4) Development and use of system displays.

2. Maintenance Training Course:

a. Provide 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.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 40 61 93 – PMCS INPUT OUTPUT LIST
CONTRACT OB-144A

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:

Article	Title	Section Page
PART 1	GENERAL	1
1.01	Summary	1
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1.03	Related Sections	1
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PART 2	PRODUCTS	4
2.01	Manufacturers	4
2.02	Materials / Equipment	4
2.03	Fabrication / Assembling / Finishes	4
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PART 3	EXECUTION	4
3.01	Examination / Preparation	4
3.02	Application	4
3.03	Field Testing / Quality Control	6
3.04	Startup / Demonstration	6
3.05	Adjusting / Protection / Cleanup	7

C. The I/O List information is provided in Table 1, attached after the End of Section designation.

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 80 81– PMCS Factory Testing.

C. Section 40 80 82 – PMCS Start up and Field Testing.

D. .

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

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1. LOOP NUMBER – Comprises of four-digit numbers and a letter. Each instrument within a loop has assigned to it the same loop number. An

instrument common to two or more loops should carry the identification of the loop which is considered predominant.

2. DESCRIPTION – is a description of the I/O point.
3. POINT 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.
4. SHEET – is the listing of the P&ID Drawing where the I/O point can be found.
5. LOCATION – Is the listing of the physical location of the instrument or device generating the I/O point.
6. RACK – Is the PLC Rack location for the I/O point.
7. SLOT – Is the PLC Slot location for the I/O point.
8. POINT – Is the PLC I/O point location

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 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. 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 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

END OF SECTION

NO TEXT ON THIS PAGE

40 61 93 - PCMS Input Output List

Loop Number	Description	Point Type	Sheet	Location	Rack	Slot	Point
	PLC POWER FAILED ALARM	DI	I-008.00	PLC-4200	0	1	0
4201A	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4201A RUNNING	DI	I-008.00	PLC-4200	0	1	1
4201A	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4201A VFD FAULT	DI	I-008.00	PLC-4200	0	1	2
4201A	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4201A IN REMOTE	DI	I-008.00	PLC-4200	0	1	3
4202A	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4202A RUNNING	DI	I-008.00	PLC-4200	0	1	4
4202A	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4202A VFD FAULT	DI	I-008.00	PLC-4200	0	1	5
4202A	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4202A IN REMOTE	DI	I-008.00	PLC-4200	0	1	6
4207A	EXISTING RAS HYPOCHLORITE PUMP 4207A RUNNING	DI	I-008.00	PLC-4200	0	1	7
4207A	EXISTING RAS HYPOCHLORITE PUMP 4207A VFD FAULT	DI	I-008.00	PLC-4200	0	1	8
4207A	EXISTING RAS HYPOCHLORITE PUMP 4207A IN REMOTE	DI	I-008.00	PLC-4200	0	1	9
4208A	EXISTING SPRAY HOODS HYPOCHLORITE PUMP 4208A RUNNING	DI	I-008.00	PLC-4200	0	1	10
4208A	EXISTING SPRAY HOODS HYPOCHLORITE PUMP 4208A VFD FAULT	DI	I-008.00	PLC-4200	0	1	11
4208A	EXISTING SPRAY HOODS HYPOCHLORITE PUMP 4208A IN REMOTE	DI	I-008.00	PLC-4200	0	1	12
4209A	EXISTING DILUTION WATER TO SPRAY HOODS PASS A AND B PUMP 4209A RUNNING	DI	I-008.00	PLC-4200	0	1	13
4209A	EXISTING DILUTION WATER TO SPRAY HOODS PASS A AND B PUMP 4209A VFD FAULT	DI	I-008.00	PLC-4200	0	1	14
	SPARE	DI	I-008.00	PLC-4200	0	1	15
4201B	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4201B RUNNING	DI	I-009.00	PLC-4200	0	2	0
4201B	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4201B VFD FAULT	DI	I-009.00	PLC-4200	0	2	1
4201B	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4201B IN REMOTE	DI	I-009.00	PLC-4200	0	2	2
4202B	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4202B RUNNING	DI	I-009.00	PLC-4200	0	2	3
4202B	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4202B VFD FAULT	DI	I-009.00	PLC-4200	0	2	4
4202B	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4202B IN REMOTE	DI	I-009.00	PLC-4200	0	2	5
4207B	EXISTING RAS HYPOCHLORITE PUMP 4207B RUNNING	DI	I-009.00	PLC-4200	0	2	6
4207B	EXISTING RAS HYPOCHLORITE PUMP 4207B VFD FAULT	DI	I-009.00	PLC-4200	0	2	7
4207B	EXISTING RAS HYPOCHLORITE PUMP 4207B IN REMOTE	DI	I-009.00	PLC-4200	0	2	8
4208B	EXISTING SPRAY HOODS HYPOCHLORITE PUMP 4208B RUNNING	DI	I-009.00	PLC-4200	0	2	9
4208B	EXISTING SPRAY HOODS HYPOCHLORITE PUMP 4208B VFD FAULT	DI	I-009.00	PLC-4200	0	2	10
4208B	EXISTING SPRAY HOODS HYPOCHLORITE PUMP 4208B IN REMOTE	DI	I-009.00	PLC-4200	0	2	11
4210A	EXISTING DILUTION WATER TO SPRAY HOODS PASS C AND D PUMP 4210A RUNNING	DI	I-009.00	PLC-4200	0	2	12
4210A	EXISTING DILUTION WATER TO SPRAY HOODS PASS C AND D PUMP 4210A VFD FAULT	DI	I-009.00	PLC-4200	0	2	13
4209B	EXISTING DILUTION WATER TO SPRAY HOODS PASS A AND B PUMP 4209B RUNNING	DI	I-009.00	PLC-4200	0	2	14
4209B	EXISTING DILUTION WATER TO SPRAY HOODS PASS A AND B PUMP 4209B VFD FAULT	DI	I-009.00	PLC-4200	0	2	15
4210B	EXISTING DILUTION WATER TO SPRAY HOODS PASS C AND D PUMP 4210B RUNNING	DI	I-010.00	PLC-4200	0	3	0
4210B	EXISTING DILUTION WATER TO SPRAY HOODS PASS C AND D PUMP 4210B VFD FAULT	DI	I-010.00	PLC-4200	0	3	1
4200	CE-4200 SCADA NETWORK FAILURE	DI	I-010.00	PLC-4200	0	3	2
4311B	INFLUENT TRC FLOW PRESENT	DI	I-010.00	PLC-4200	0	3	3

Loop Number	Description	Point Type	Sheet	Location	Rack	Slot	Point
4312B	EFFLUENT TRC FLOW PRESENT	DI	I-010.00	PLC-4200	0	3	4
	SPARE	DI	I-010.00	PLC-4200	0	3	5
	SPARE	DI	I-010.00	PLC-4200	0	3	6
	SPARE	DI	I-010.00	PLC-4200	0	3	7
	SPARE	DI	I-010.00	PLC-4200	0	3	8
	SPARE	DI	I-010.00	PLC-4200	0	3	9
	SPARE	DI	I-010.00	PLC-4200	0	3	10
	SPARE	DI	I-010.00	PLC-4200	0	3	11
	SPARE	DI	I-010.00	PLC-4200	0	3	12
	SPARE	DI	I-010.00	PLC-4200	0	3	13
	SPARE	DI	I-010.00	PLC-4200	0	3	14
	SPARE	DI	I-010.00	PLC-4200	0	3	15
4201A	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4201A RUN COMMAND	DO	I-011.00	PLC-4200	0	4	0
4201B	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4201B RUN COMMAND	DO	I-011.00	PLC-4200	0	4	1
4202A	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4202A RUN COMMAND	DO	I-011.00	PLC-4200	0	4	2
4202B	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4202B RUN COMMAND	DO	I-011.00	PLC-4200	0	4	3
4207A	EXISTING RAS HYPOCHLORITE PUMP 4207A RUN COMMAND	DO	I-011.00	PLC-4200	0	4	4
4207B	EXISTING RAS HYPOCHLORITE PUMP 4207B RUN COMMAND	DO	I-011.00	PLC-4200	0	4	5
4208A	EXISTING SPRAY HOODS HYPOCHLORITE PUMP 4208A RUN COMMAND	DO	I-011.00	PLC-4200	0	4	6
4208B	EXISTING SPRAY HOODS HYPOCHLORITE PUMP 4208B RUN COMMAND	DO	I-011.00	PLC-4200	0	4	7
	SPARE	DO	I-011.00	PLC-4200	0	4	8
	SPARE	DO	I-011.00	PLC-4200	0	4	9
	SPARE	DO	I-011.00	PLC-4200	0	4	10
	SPARE	DO	I-011.00	PLC-4200	0	4	11
	SPARE	DO	I-011.00	PLC-4200	0	4	12
	SPARE	DO	I-011.00	PLC-4200	0	4	13
	SPARE	DO	I-011.00	PLC-4200	0	4	14
	SPARE	DO	I-011.00	PLC-4200	0	4	15
4201A	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4201A SPEED INDICATOR	AI	I-012.00	PLC-4200	0	5	0
4202A	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4202A SPEED INDICATOR	AI	I-012.00	PLC-4200	0	5	1
4207A	EXISTING RAS HYPOCHLORITE PUMP 4207A SPEED INDICATOR	AI	I-012.00	PLC-4200	0	5	2
4208A	EXISTING SPRAY HOODS HYPOCHLORITE PUMP 4208A SPEED INDICATOR	AI	I-012.00	PLC-4200	0	5	3
4301D	CCT SEASIDE EFFLUENT TRC AMPEROMETRIC	AI	I-012.00	PLC-4200	0	5	4
4302D	CCT LANDSIDE EFFLUENT TRC AMPEROMETRIC	AI	I-012.00	PLC-4200	0	5	5

Loop Number	Description	Point Type	Sheet	Location	Rack	Slot	Point
4311B	CCT INFLUENT TRC COLORIMETRIC	AI	I-012.00	PLC-4200	0	5	6
	SPARE	AI	I-012.00	PLC-4200	0	5	7
4201B	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4201B SPEED INDICATOR	AI	I-013.00	PLC-4200	0	6	0
4202B	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4202B SPEED INDICATOR	AI	I-013.00	PLC-4200	0	6	1
4207B	EXISTING RAS HYPOCHLORITE PUMP 4207B SPEED INDICATOR	AI	I-013.00	PLC-4200	0	6	2
4208B	EXISTING SPRAY HOODS HYPOCHLORITE PUMP 4208B SPEED INDICATOR	AI	I-013.00	PLC-4200	0	6	3
42010	CHLORINE DISCHARGE HEADER FLOW TRANSMITTER	AI	I-013.00	PLC-4200	0	6	4
4301E	CCT SEASIDE INFLUENT TRC AMPEROMETRIC	AI	I-013.00	PLC-4200	0	6	5
4312B	CCT EFFLUENT TRC COLORIMETRIC	AI	I-013.00	PLC-4200	0	6	6
	SPARE	AI	I-013.00	PLC-4200	0	6	7
4301C	SEASIDE FLOW	AI	I-014.00	PLC-4200	0	7	0
4301C	SEASIDE LEVEL	AI	I-014.00	PLC-4200	0	7	1
4302C	LANDSIDE FLOW	AI	I-014.00	PLC-4200	0	7	2
4302C	LANDSIDE LEVEL	AI	I-014.00	PLC-4200	0	7	3
4311C	TOTAL SUSPENDED SOLIDS (INFLUENT CHANNEL)	AI	I-014.00	PLC-4200	0	7	4
4312C	TOTAL SUSPENDED SOLIDS (SEASIDE)	AI	I-014.00	PLC-4200	0	7	5
4313C	TOTAL SUSPENDED SOLIDS (LANDSIDE)	AI	I-014.00	PLC-4200	0	7	6
	SPARE	AI	I-014.00	PLC-4200	0	7	7
4201A	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4201A SPEED CONTROL	AO	I-015.00	PLC-4200	0	8	0
4202A	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4202A SPEED CONTROL	AO	I-015.00	PLC-4200	0	8	1
4207A	EXISTING RAS HYPOCHLORITE PUMP 4207A SPEED CONTROL	AO	I-015.00	PLC-4200	0	8	2
4208A	EXISTING SPRAY HOODS HYPOCHLORITE PUMP 4208A SPEED CONTROL	AO	I-015.00	PLC-4200	0	8	3
	SPARE	AO	I-015.00	PLC-4200	0	8	4
	SPARE	AO	I-015.00	PLC-4200	0	8	5
	SPARE	AO	I-015.00	PLC-4200	0	8	6
	SPARE	AO	I-015.00	PLC-4200	0	8	7
4201B	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4201B SPEED CONTROL	AO	I-016.00	PLC-4200	0	9	0
4202B	EXISTING SODIUM HYPOCHLORITE FEED PUMP 4202B SPEED CONTROL	AO	I-016.00	PLC-4200	0	9	1
4207B	EXISTING RAS HYPOCHLORITE PUMP 4207B SPEED CONTROL	AO	I-016.00	PLC-4200	0	9	2
4208B	EXISTING SPRAY HOODS HYPOCHLORITE PUMP 4208B SPEED CONTROL	AO	I-016.00	PLC-4200	0	9	3
	SPARE	AO	I-016.00	PLC-4200	0	9	4
	SPARE	AO	I-016.00	PLC-4200	0	9	5
	SPARE	AO	I-016.00	PLC-4200	0	9	6
	SPARE	AO	I-016.00	PLC-4200	0	9	7
	SPARE SLOT				0	10	

40 61 93 - PCMS Input Output List

Loop Number	Description	Point Type	Sheet	Location	Rack	Slot	Point
	SPARE SLOT				0	11	

SECTION 40 61 94 – PMCS INSTRUMENT INDEX
CONTRACT OB-144A

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 following index of this Section is presented for convenience:

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D. The Instrument Index is provided in Table 1, attached after the End of Section designation.

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 93 – PMCS Input Output List.

C. Section 40 67 16 – PMCS Panel Mounted Instruments and Devices

D. Section 40 79 91 – PMCS Field Instruments.

E. Section 40 80 81 – PMCS Factory Testing.

F. Section 40 80 82 – PMCS Start up 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. TAG – is an alpha numeric character string used to identify the instrument function and is defined in Section 40 61 83 – Input/Output Lists.
2. QTY – Is the quantity of instruments of this type

3. DESCRIPTION –Is the type of instrument
   a. TRC Analyzer
   b. TSS Analyzer
   c. Pressure Gauge
   d. Flow Transmitter
   e. Level Transmitter
4. FUNCTION – Describes the environment the instrument will be installed in
5. TYPE/ CRITERIA – Is additional instrument information
6.
7. SHEET – is the listing of the P&ID Drawing where the Instrument can be found.
8. RANGE/SETTING is the monitoring range of the Instrument in engineering units.
9. SPEC SECTION – Is the specification section where the instrument can be found

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

TAG	QTY	DESCRIPTION	FUNCTION	TYPE/	SHEET	RANGE/ SETTING	SPEC SECTION
PI-4311B0	1	Pressure Indicator	Influent Channel Sample Pump Pressure	Bourdon Tube Pressure Gauge with Threaded Diaphragm Seal and Shutoff Valve	I-001.00	0 – 30 PSI	40 79 91
PI-4312B0	1	Pressure Indicator	Effluent Channel Sample Pump Pressure	Bourdon Tube Pressure Gauge with Threaded Diaphragm Seal and Shutoff Valve	I-001.00	0 – 30 PSI	40 79 91
AE/AIT-4311BZ	1	Chlorine Analyzer/ Transmitter	Influent Channel Chlorine Analyzer	Colorimetric	I-001.00	0-10 PPM	40 79 91
AE/AIT-4312BZ	1	Chlorine Analyzer/ Transmitter	Effluent Channel Chlorine Analyzer	Colorimetric	I-001.00	0-10 PPM	40 79 91
FE/FIT/LIT-4301CZ	1	Flow/Level transmitter	Seaside Channel Flow and Level	Ultrasonic	I-001.00		40 79 91
FE/FIT/LIT-4302CZ	1	Flow/Level transmitter	Landside Channel Flow and Level	Ultrasonic	I-001.00		40 79 91
AE/AIT-4311CZ	1	Total Suspended Solids	Influent Channel TSS Analyzer	Total Suspended Solids	I-001.00		40 79 91
AE/AIT-4312CZ	1	Total Suspended Solids	Effluent Channel TSS Analyzer	Total Suspended Solids	I-001.00		40 79 91
FSH-4311BZ	1	Flow Switch	Influent TRC Flow Switch	Flow Switch	I-001.00		40 79 91
FSH-4312BZ	1	Flow Switch	Effluent TRC Flow Switch	Flow Switch	I-001.00		40 79 91

NO TEXT ON THIS PAGE

SECTION 40 61 95 – PMCS MONITORING AND CONTROL CRITERIA
CONTRACT OB-144A

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 67 16 – PMCS Panel Mounted Instruments and Devices

C. Section 40 79 91 – PMCS Field Instruments

D. Section 40 80 81 – PMCS Factory Testing

E. Section 40 80 82 – PMCS Startup and Field Testing

1.04 REFERENCES

A. Definitions

1. HMI – Human Machine Interface
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. Workstation(s) and OIT Operating Systems.
    b. Workstation(s), and OIT Networking Software.
    c. Workstation(s), and OIT Data Management Applications (Spreadsheets, Databases, Word Processing, etc.).
    d. Workstation(s), and OIT Utility Programs (Virus scan, remote communication, etc.).
    e. PLC Ladder Logic Development and Documentation Software.
    f. PLC Ladder Logic Application Software.
    g. PLC Specialty Software and Programming Languages.
    h. 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 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

D. Submittals shall be made at least 60days 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. HMI visualization software shall be as manufactured by:

1. Wonderware, Lake Forest, CA;

2. Or approved equal.

C. OIT Visualization Software shall be manufactured by:

1. Rockwell Automation Allen Bradley, WI

a. Allen Bradley Panel View Plus 7 OIT shall be provided for LCP-4200 Chlorine Building Control Panel. Minimum size 15". Refer to section 40 78 90 for OIT requirements.

b. Or approved equal.

D. PMCS software shall be as manufactured by:

1. Wonderware, Lake Forest, CA;

2. Or approved equal.

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 . A single software package that has been approved by the City shall be used for all workstations, HMIs and OITs in this Contract.

2. The Contractor shall furnish the City, the appropriate number and type of software packages as required 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 to the City.

4. It shall be the responsibility of the Contractor to maintain all items entrusted to 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 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. Local workstations 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. PLCProgramming Conventions

1. General

a. All logic, sequencing, interlocking, safety and critical alarm and control, shall be implemented at the PLClocal level in the respective PLCusing 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 workstation, 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 workstation 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 workstation.

h. Once entered, the valid data shall remain stored in the PLCuntil 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 workstations, HMIs and 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 "CONSOLE" on a blue background when control is at the workstation and read "FIELD" 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.

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.

7. Historical Data Management

a. The PMCS shall contain a Historical Data Base Utility which provides for long term storage of data collected from remote processors or manually entered from the keyboard.

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. The software shall allow for historical data to be manually entered from the keyboard to facilitate entry of lab data or other information to be used in generating historical plant performance calculations.

e. Signal values from the Historical Data Base shall be available for graphic displays, reports and trending.

f. The size of the Historical Data Base shall be limited only by available disk space which at minimum shall be capable of holding 6 months of data.

g. The Historical Data Management software shall provide utility routines to archive data to long term storage devices on demand, or automatically based on a user configurable time schedule.

h. The Historical Data Base shall be organized as a series of Time Classes, each of which stores sampled or calculated values over a specified time interval.

i. Up to 63 time classes shall be configurable, and each time class shall accommodate over 13,000 values.

8. Reports

a. Software shall support printing of any screen created by the PMCS Supplier, whether or not it is the current active screen used by the operator.

b. Software shall allow 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. The process report generation software shall provide the means to process, store, and print data for historical records.

e. Configuration shall be flexible so that contents of the reports can be easily modified.

f. 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.

g. Equipment Run Times shall be monitored, calculated and reported for all major process equipment items in the system.

h. Report data developed shall include year-to-date and month-to-date run times and starts for each item.

i. As a maximum, report data shall be collected and stored at ten minute intervals.

j. Each log report page shall have the capability to contain information for ten log points as a minimum.

k. Periodic log reports shall be printed automatically at the end of the time period.

l. A calculation extension capability shall be provided to perform calculations on data that has been accumulated for report generation.

    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.

m. 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.

n. Software shall be provided for generation of special event, hourly, daily, monthly and annual 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 PLCwhile being set and monitored from a workstation

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. Return Sludge Pump 1 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 number of starts for each motor.

3) Include totalized values for all flows.

11. Security

a. System Protection from unauthorized access to the PMCS interfaces shall be provided by means of software and hardware interlocks.

b. Provide eight (8) levels of security.

c. Software interlocks shall provide a minimum of two levels of security, Operator and Process/System Engineer.

d. 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.

e. 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.

f. Program editing access shall require entry of a minimum eight character entry code assigned within the controller program.

g. All PMCS users shall be required to log on to the LAN network and PMCS Software interface with a predefined user name and password before access to operate or modify the system can be obtained.

h. All defined user names shall be associated with a set security level.

i. Each display shall be assigned a security level required to access it.

j. 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.

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 OB-144A

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.

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 26 05 53 – Identification for Electrical Systems.

B. Section 26 29 13 – Enclosed Controllers.

C. Section 40 61 13 – PMCS General Requirements.

D. Section 40 61 95 – PMCS Monitoring and Control Criteria.

E. Section 40 63 43 – Programmable Logic Controllers

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

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

Y is the value in engineering units.

H is the high value of span, expressed in engineering units

L is the low value of span, expressed in engineering units.

D is the digitized scaled input value in counts.

DH is the full scale digitized value in counts

d. Manual Control

1) It shall be possible for operatororplant engineer to interrupt any sequence, loop or automatic operation and operate the same manually through operator workstation.

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.

I. Control Strategy Displays

1. Control Strategy displays shall be submitted for review.

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. Plant equipment controlled by the PLC shall be programmed to automatically reset upon failure.

K. Restart

1. All equipment and motors shall be automatically restarted after power failure by the control system in an orderly fashion approved by the Engineer.

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. Control Strategy OB144A CS 01

1. TITLE: Hypochlorite Metering Feed Pumps
2. DRAWING: I-002
3. DESCRIPTION: The metering pumps will be monitored and controlled from the PLC/HMI

4. INTERLOCKS AND ANNUNCIATION
   a. Hardwired Interlocks: None.
   b. Software Interlocks:
      1) Sodium Hypochlorite Feed Pump 4202A Fault Alarm
      2) Sodium Hypochlorite Feed Pump 4202B Fault Alarm
      3) Sodium Hypochlorite Feed Pump 4201A Fault Alarm
      4) Sodium Hypochlorite Feed Pump 4201B Fault Alarm

5) RAS Hypochlorite Pumps 4207A Fault Alarm
6) RAS Hypochlorite Pumps 4207B Fault Alarm
7) RAS Hypochlorite Pumps 4208A Fault Alarm
8) RAS Hypochlorite Pumps 4208B Fault Alarm
9) Spray Hoods Hypochlorite Pumps 4208A Fault Alarm
10) Spray Hoods Hypochlorite Pumps 4208B Fault Alarm
11) Dilution Water to Spray Hoods 4209A Alarm
12) Dilution Water to Spray Hoods 4209B Alarm
13) Dilution Water to Spray Hoods 4210A Alarm
14) Dilution Water to Spray Hoods 4210B Alarm
15) Influent TRC Flow Present Alarm
16) Effluent TRC Flow Present Alarm

5. FUNCTIONAL DESCRIPTIONS

a. Local Manual Operation from Local Control Panel (LCP-4201 and LCP-4202)

1) When the Local/Off/ Remote selector switch is set "Local" in the LCP, each metering pump shall be be started and stopped, and its speed shall be controlled at the pump via the integral display.

2) When the Local/Off/ Remote selector switch.is in the "Off" position, the pump shall be stopped.

3) When the Local/Off/ Remote selector switch is in the "Remote" position, the controls is transferred to the PLC OIT/SCADA HMI.

.

b. Local Auto Operation from Local Control Panel (LCP):

1) Manual control

a) When the Pump is in remote mode and the Auto/ Manual selector at the PLC OIT/ SCADA HMI is in manual mode, the pump shall be started and stopped from the start and stop buttons at the PLC OIT/ SCADA HMI.

2) Auto Control

a) When the Pump is in remote mode, and the auto/manual selector at the PLC OIT/ SCADA HMI is in Automatic mode, the pump will be manually

started from the start and stop buttons at the PLC OIT/ SCADA HMI, and its speed will be automatically controlled per the following automatic control strategy.

Automatic Speed Control: Metering pumps 4201A, 4201B, 4202A and 4202B all pump to the chlorine tanks. Automatic control of the hypochlorite metering pumps will follow one of three automatic flow control sequence.

(1) Fully Automatic Flow Pacing with Single Residual Feedback: The operator can select which TRC probe to use. The options shall be: Influent Colorimetric, Effluent colorimetric, Influent amperometric, Effluent amperometric (either the CCT influent probe located immediately upstream of the landside and seaside effluent weirs or the CCT influent probe before chlorination)Additionally, if the effluent amperometric analyzer is selected, the operator can select which tank's amperometric TRC probe to use (the landside CCT, the seaside CCT, or an average of the two).

The speed of the sodium hypochlorite pumps shall be controlled using a flow pacing formula with a chlorine residual trim on the feed rate signal (Compound loop control).

The flow pacing formula (below) shall be used in conjunction with a residual trim calculation that consists of a PID controller with a bias output that can be both positive or negative. The PID controller shall utilize the CCT Influent TRC signal as the process variable and an operator-entered chlorine residual set point. The output of the PID controller will be used to bias the speed of the associated metering pumps (based on the CCT selections) as described below. The flow pacing formula is as follows:

$$Sodium\ Hypochlorite\ flow\ (gph)$$
$$= \left(\text{Hypochlorite Dosage SP } \left(\frac{mg}{L}\right) + \text{ PID Output Bias } \left(\frac{mg}{l}\right)\right)$$
$$\times \text{CCT Effluent Flow (MGD)}$$
$$\times \left(8.34 \left(\frac{lb}{MG \cdot \frac{mg}{L}}\right) \div \text{ChemicalStrength } \left(\frac{lb}{gal}\right)\right) \times \left(\frac{1\ DAY}{24hr}\right)$$

The Hypochlorite Dosage SP and the Chemical Strength shall be adjustable from the HMI.

The PID controller output bias shall be in milligrams-per-liter and shall be added to the Hypo Dosage Setpoint to provide an adjusted feed rate.

Lag Time Factors:

To avoid windup of the PID controller, the PID controller shall only be active at periodic time intervals. This allows the system to remain stable despite lag times in the system response. The lag time shall be factored into the equation as follows: The operator shall enter the lag response time (in seconds) associated with each analyzer (to accommodate for the analyzers response time) and the travel time (in seconds) to each analyzer from each hypochlorite dosing point. The control strategy shall use the valve limit switches to determine which lag time setpoints to use. The sum of these two setpoints shall be the lag time for the respective analyzer and shall be used in the control strategy above and in the fully automatic feedback control strategy below.

An HMI adjustable “Maximum Change SP” (initially set at 2.0 PPM) shall be provided. The bias adjustments shall not change the feed rate by more than this setpoint. The feed rate calculation is not affected by the lag time or the maximum change setpoint- only the bias is affected.

The gallons-per-hour (GPH) for each pump shall be calculated based on the total GPH calculated above divided by the number of metering pumps feeding the contact tanks that are running in automatic mode.

The average of the last 10 minutes (operator adjustable) of TRC readings and the average flow over the last 10 minutes (operator adjustable) will be used in the formula, in order to reduce dosing variation.

(2) Partially Automatic Feed Forward Control:

The following are three additional automatic speed control options. In these scenarios, the pump speed is still calculated based on the flow pacing with single residual feedback formula above; however, the TRC and/or effluent flow are manually entered by the operator. The buttons to enable/disable this mode of control and the setpoints described below shall be accessible by the operators and not require administrative privileges.

The speed of the metering pump is controlled by setting effluent flow rate manually in the PLC and using the TRC signal in the CCT. Dosing is then performed automatically using the formula above.

The speed of the metering pump is controlled by the automatic flow rate reading from the effluent flow meter, and the TRC is set manually in the PLC. Dosing is then performed automatically using the formula above.

The speed of the metering pump is controlled by setting both the effluent flow rate and the TRC manually in the PLC. Dosing is then performed automatically using the formula above.

If the effluent flowmeter signal fails, an alarm will be generated, and the associated dosing control strategy will use the last good flow signal (before the failure) as the pacing signal.

If the TRC signal fails, an alarm will be generated, and the associated dosing control strategy will use the CCT Average TRC reading (before the failure) as the pacing signal.

An HMI adjustable setpoint will allow the operator to enter the hypochlorite pump capacity in gallons per hour. The pump speed output shall be calculated as follows:

$$Pump\ Speed\ Output(\%) = \frac{Calculated\ Feed\ Rate\left(\frac{gal}{hr}\right)}{Pump\ Capacity\left(\frac{gal}{hr}\right)} \bullet 100$$

If the calculated feed rate is greater than the pump capacity of the active pump, or if the active pump fails, then an alarm shall be generated at the HMI alerting the operator that an additional metering pump is required.

The operator must manually start the next metering pump at the HMI.

c. Alarms / Monitoring (SCADA PLC/HMI):

(1) High CCT influent TRC shall alarm only (no interlock)

(2) Low CCT influent TRC shall alarm only (no interlock)

(3) High CCT effluent TRC from the CCT Effluent. TRC Analyzer shall alarm only (no interlock)

(4) Low CCT effluent TRC from the CCT Effluent. TRC Analyzer shall alarm only (no interlock)

(5) Speed Feedback (%)

(6) Remote Status

(7) Run Status

(8) Fault Status

(9) Influent TRC Flow Present

(10) Effluent TRC Flow Present

B. Control Strategy OB144A CS 02

1. TITLE: Sodium Hypochlorite Metering Pumps Feed Flow
2. DRAWING: I-002
3. DESCRIPTION: Metering pumps feed flow into the contact tanks are measured using a magnetic flowmeter located in the Chlorination Building.
4. INTERLOCKS AND ANNUNCIATION
   a. Hardwired Interlocks: None.
   b. Software Interlocks: None.

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.

B. 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 62 16.01.01 – PMCS NETWORK EQUIPMENT
CONTRACT OB-144A

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, configure, test, adjust, startup, and place into satisfactory operation PMCS Network Equipment as described herein and as indicated 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 27 13 23 – Fiber Optic Cables

B. Section 40 61 13 – PMCS General Requirements.

C. Section 40 67 16 – PMCS Panels and Enclosures

D. Section 40 80 81 – PMCS Factory Testing

E. Section 40 80 82 – PMCS Startup and Field Testing

1.04 REFERENCES

A. Definitions

B. Section 40 61 13 – PMCS General Requirements defines the terms and abbreviations used in this Section and the PMCS.

C. Reference Standards

1. Section 40 61 13 – PMCS General Requirements lists the standards applicable to this Section and the PMCS.

1.05 DESCRIPTION

A. Network Equipment supplied under this Section shall be provided with all associated services and accessory equipment.

B. Network Equipment supplied under this Section shall generally comprise the following minimum equipment installed in cabinets to permit NYC DEP personnel to view, modify, change parameters, respond to alarms and revise set points of the PMCS:

1. Managed Ethernet switch.

C. The Contractor shall provide all additional components, wiring, accessories, services, labor, etc. required to complete the communication network connected to the Ethernet switch being installed under this Contract.

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 equipment specified or required under this Section.

2. 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 network equipment.

C. Manufacturers

1. Network equipment of the named manufacturers shall be furnished.

2. Network equipment that are specified in this Section have been selected to establish the standard of quality and performance of the equipment to be supplied.

3. Manufacturers shall have produced the required Network equipment for a minimum of 10 years

4. Where there is more than one item of similar network equipment required under the Contract, all such similar equipment shall be the product of one manufacturer.

D. Where applicable Network equipment components 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 Network equipment data for the approval of the Engineer.

C. The Contractor is solely responsible for the timing of submittals to enable approval by the Engineer and subsequent use by the PMCS Supplier.

D. Submittals shall be approved at least 180 days in advance of any proposed use by the PMCS Supplier.

E. The manufacturer's calculations, assumptions and application details, and recommendations shall be submitted to the Engineer for review and approval.

F. O & M Manuals

1. O&M Manuals shall be submitted for each component supplied.

2. O&M Manuals shall comply with Section 40 61 13 – PMCS General Requirements.

G. Submit inventory and product data on special tools.

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. None

C. Special Tools

1. Special tools, other than those normally found in a Service Technician's tool box, required to test, diagnose, calibrate, install, wire, connect, disconnect, assemble and disassemble any Network equipment, 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 Network equipment under this Contract.

1.10 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 design, materials, abnormal aging, and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiber Optic Ethernet Switches Din-Rail mounted style for Control Panels
   1. Furnish ethernet switches by the same manufacturer for the project, regardless of type. Manufacturers and their products are subject to compliance with requirements. Provide industrial managed ethernet switches from the following manufacturer: Catalyst IE3300 Rugged Series as manufactured by Cisco Systems, San Jose, CA or approved equal.

B. Category 6 Rack Mounted Patch Panel style for 19" Inch Rack Enclosures
   1. Tripp Lite
   2. Belden
   3. Panduit
   4. Or Approved Equal

C. Fiber Optic Patch Panels Din-Rail mounted style for Control Panel
   1. Black Box
   2. Corning Cable Systems
   3. Or Approved Equal.

2.02 MATERIALS / EQUIPMENT

A. Not Used

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Fiber Optic Ethernet Switches for 19" Inch Rack Enclosures
   1. General:

a. Provide a modular, rack-mountable, managed Ethernet switch for connection to the control network as shown in the system architecture drawings and specified herein.

2. Physical Features:
   a. Modular 19” rack-mountable enclosure
   b. Modular construction such that additional copper and fiber ports can be added and removed
   c. Minimum fiber uplinks: 4 x 100/1000 SFP ports
   d. Minimum fiber SFP modules: Four (4) Gigabit Ethernet SFP modules shall be provided and shall be hot pluggable into the SFP uplink. Ports shall be duplex LC for use with multi-mode fiber optic cable. Dust caps shall be provided for SFP modules not in use.
   e. Minimum copper ports: 16 x 10/100/1000 T(X) RJ45 ports
3. Operating temperature: 0 to 130 °F
4. Power: 120VAC redundant power supplies
5. Enclosure: Metal case
6. Network Features:
   a. Fault tolerant for use in a ring topology. The switch shall be able to detect a blocked port and redirect data flow in the opposite direction within 30ms.
   b. Full duplex on all port
   c. Auto negotiation and manual configurable speed and duplex
   d. Wire speed switching fabric
   e. IEEE 802.1w Rapid Spanning Tree Protocol
   f. IGMP snooping
   g. IGMP filtering
   h. Configuration password protected
   i. Configuration backup capability required
   j. SNMP V3
   k. 802.1Q VLAN
   l. Port-Based VLAN
   m. MAC filtering for blocking unauthorized access based on MAC address.
7. Additional Features:

a. Provide a dry contact rated for 120 VAC 5A to be used for common trouble alarm. The alarm shall be programmable. If the contact cannot use 120 VAC 5A, provide the necessary 24 VDC power from the PLC panel and provide interposing relays in the PLC panel.

B. Category 6 Rack Mounted Patch Panel for 19" Inch Rack Enclosures

1. Features:

a. 19-Inch Rackmount, 1U

b. 24 RJ-45 Ports

c. Conform to EIA/TIA 568A and 568B

C. Fiber Optic Patch Panels

1. General:

a. Fiber optic patch panels (FOPPs) shall be provided as indicated on the Contract Drawings.

b. Patch panels shall be suitable for rack or enclosure/panel mounting as specified below, comprised of internal mounting plate, cable holders, slack cable take up/organizer blocks, patch adapter panels with connectors, and ground lugs as indicated. Panels shall be NEMA 12 for indoor use. Patch panels shall be compatible with the connector type used on the project. The patch panels shall be sized to handle the number of fibers as required. All fibers shall be tested and terminated in the patch panel.

c. Where shown on the plans or in the related specification sections, the fiber optic cable shall terminate on a termination patch panel inside a communication enclosure (CE).

d. All fiber cables within the exposed buffer tube shall be terminated at patch panels with fan-out kits with pre-connected pigtails. The patch panel shall have a fiber capacity equal to the total number of fibers (connected and spare) for all cables to be connected.

e. Patch panels shall be designed for either rack mounting on a standard equipment rack or housed in an enclosure for direct rack mounting. All unused couplings shall have protective dust covers.

f. The termination patch panel shall be equipped with a suitable means for routing and securing of cables, and shall provide a suitable means of protection for the mounted fiber connectors to prevent damage to fibers and connectors during all regular operation and maintenance functions. All cables shall be provided with strain relief. Bend diameters on cable fibers and jumpers must be greater than four inches at all times to ensure optical and mechanical integrity of the optical fibers.

2. Rack-Mount Fiber Optic Patch Panel (for existing CE-9100 Communication Enclosure):

   a. Communication Enclosures (CEs) shall house 19" rack-mountable fiber optic patch panels (FOPPs) capable of 24 snap-in adapter panels. Each FOPP interior shall include cable ties and spool rings to hold and store cable. The FOPP shall include an inner tray that pulls out for access to the adapter panels. The FOPP shall include a removable rear cover for accessing patch cords and pigtails; and lockable plastic front cover to protect and view connections.

   b. Adapter panels shall be provided to connect fiber to/from the panel or enclosure to patch cords required to interface to fiber networking equipment. Each fiber pair entering the enclosure shall be terminated within the FOPP. Adapter panels shall support 12 LC pairs each. Provide adapter panels required to have a minimum of 50 percent expansion. Blank adapter panels shall be provided for unused adapter slots.

   c. The front shall be swing open construction with keyed latch mechanism.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Network equipment shall confirm to the requirements of Section 40 80 81 – PMCS Factory Testing.

B. Network equipment 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 network equipment 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 PMCS equipment supplied under this Section.

D. Network Mounting and Support

   1. Install in control panels per manufacturers guidelines

E. All software required for the Network equipment shall be loaded, configured and fully tested as part of this Contract.

F. Contractor shall configure the Network equipment using function keys and instructional prompts so that operators can operate equipment, modify set points and presets and monitor the Network equipment without any special training or knowledge of the controllers with which the Network equipment interfaces.

G. Identification Tags

1. All Network equipment shall have an identification tag.

3.03 FIELD TESTING / QUALITY CONTROL

A. Network equipment Field Testing shall conform to the requirements of Section 40 80 82 – PMCS Startup and Field Testing.

B. The Engineer, or his designated representative(s), reserve the right to witness any test, inspection, calibration or start-up activity.

C. 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.

D. 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.

E. Any network equipment 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.

F. 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.

G. Configuration Reports

1. The PMCS Supplier shall provide a written configuration report to the Engineer for each EQUIPMENT, certifying that it has been configured per manufacturer’s requirements.

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 Network equipment.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 40 63 43 – PMCS PROGRAMMABLE LOGIC CONTROLLERS
CONTRACT OB-144A

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 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 95 – PMCS Monitoring and Control Criteria.

C. Section 40 61 96 – PMCS Control Strategies.

D. Section 40 80 81 – PMCS Factory Testing.

E. Section 40 80 82 – PMCS Start up 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.	PPU	–	Portable Programming Unit
4.	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

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:

1. Allen Bradley, Milwaukee, WI.
2. Or approved equal.

B. PMCS PLC OITs/HMIs shall be as manufactured by:

1. Allen Bradley, Milwaukie, WI.
2. Or approved equal.

C. PPUs shall be as manufactured by:

1. Azonix, Houston, TX;
2. Or approved equal.

D. Fiber connectors and accessories for PPUs shall be as manufactured by:

1. Corning, Corning, NY;
2. 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 [Plant].

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) Discrete Inputs:

a) 24 V in common circuit types.

4) Discrete Outputs:

a) VDC.

5) Remote I/O

a) Remote I/O shall be provided where shown on the Contract Drawings or the PMCS Block Diagrams or where recommended by the manufacturer to reduce the level and quantity physical wiring at the PLC location.

b) Remote I/O shall be either PLC rack type I/O or intelligent field modules, as manufactured by the PLC manufacturer.

c) Remote I/O processor or communication modules shall be modular and individually replaceable.

d) Remote I/O shall communicate with PLC CPU using the PLC manufacturer’s communication bus for remote I/O.

e) All required cabling shall be furnished under this Contract for use in/with the conduit system as indicated on the Contract Drawings.

(1) Provide adequate lengths.

(2) Cabling will be installed under the Electrical Contract.

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 ^{0}F to 140 ^{0}F.

12. Storage Temperature

    a. Minus 40 ^{0}F to 160 ^{0}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. 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. PLC OITs/HMIs

    a. OITs/HMIs shall comply with Section 40 61 95 – PMCS Monitoring and Control Criteria.

C. Portable Programming Units

1. The Contractor shall provide industrially hardened portable programming units (PPU) for all PLCs furnished for loading the control program into the processor memory and monitoring the data table.
2. The PPU shall be able to interface with the PLC during operation.
3. The PPU shall be furnished with the latest Windows Operating System at the time of bid, communication interfaces and a dust, drip and rain proof fully sealed case.
4. The PPU shall have comply with the following requirements:

    a. Section 40 61 95 – PMCS Monitoring and Control Criteria.

5. The PPU shall be capable of programming the PMCS PLCs through the use of a ladder logic instruction set.
6. It shall also be possible to observe the I/O status and the register values.
7. Overriding of inputs and outputs shall also be possible.
8. The PPU shall be capable of basic programming functions which shall include normally-open, normally-closed contacts, latch relays, one shots, timers, and up-down counters.
9. The PPU shall contain an available field of nine (9) contacts and one (1) coil across by seven (7) contacts down, for each rung of the program.
10. The PPU shall be capable of modifying the program element by element or rung by rung.
11. The PPU shall also be capable of complete program documentation.
12. The PPU shall have the following three modes of operation, on-line, off-line, and monitor.
13. The PPU shall be capable of displaying the status of contacts, coils, timers, counters, and registers while in the monitor mode.
14. The PPU shall be capable of normal programming in the off-line mode.
15. The PPU shall be capable of editing, and modifying the running program while in the on-line mode.

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

NO TEXT ON THIS PAGE

SECTION 40 67 16 – PMCS PANELS AND ENCLOSURES
CONTRACT OB-144A

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 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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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 26 05 27 – Grounding.

C. Section 26 05 53 – Identification for Electrical Systems.

D. Section 26 29 13 – Enclosed Controllers.

E. Section 40 61 13 – PMCS General Requirements.

F. Section 40 80 81 – PMCS Factory Testing.

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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.

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. Or approved equal.

B. NEMA 7 panels and enclosures shall be as manufactured by:
   1. Adalet, Cardington, OH;
   2. Crouse-Hinds, Syracuse, NY;
   3. Or approved equal.

C. Fiberglass or polycarbonate panels and enclosures shall be as manufactured by:
   1. Adalet, Cardington, OH;
   2. Crouse-Hinds, Syracuse, NY;
   3. Or approved equal.

D. Wire troughs and wire management shall be as manufactured by
   1. Panduit, Lockport, IL;
   2. Or approved equal.

E. Circuit breakers shall be as manufactured by:
   1. Siemens Industry, Inc., Washington, DC;
   2. Allen Bradley (Cat No 1492, 1492-GH);
   3. Or approved equal.

F. Terminal blocks shall be as manufactured by:
   1. Entrelec, Montgomery AL;

2. Or approved equal.

G. Fused Terminal blocks shall be as manufactured by:

1. Allen-Bradley;
2. Phoenix Contact, Middletown, PA;
3. Or approved equal.

H. Panel or enclosure heaters shall be as manufactured by:

1. Hoffman (DAH8001B), Anoka, MN;
2. Or approved equal.

I. Panel or enclosure corrosion inhibitors shall be as manufactured by:

1. Hoffman (HCI series), Anoka, MN;
2. Or approved equal.

J. 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. The service light with switch and duplex receptacle shall have their own circuit breaker.

    d. 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.

    e. 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.

    f. Annunciators or alarm message display devices shall be mounted up to 84 inches above the operating floor.

    g. 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.

    h. 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.

    i. Free standing enclosures shall be mounted on concrete base pad.

    j. 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) Many areas of the facility within the scope of this Contract are classified as NYCEC Class I, Division I or II hazardous and all construction shall meet those requirements.
      2) 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 surfaces.

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.

aa. When required by area classification or Contract Documents, NEMA 7 panels and devices shall be provided.

1) Panels and enclosures, to be installed in areas classified as hazardous (Class I, Div. I or II), per Contract Documents or Codes, shall be constructed to NEMA 7 and Class I, Division I, Group D requirements.

2) In damp or corrosive areas, these panels shall have an "O" ring seal on the door, to prevent entry of corrosive atmospheres.

3) These panels shall be manufactured with all necessary tapped openings to accept devices and conduit entry.

4) Ten (10) percent (minimum of one (1) spare, plugged, tapped, openings shall be provided for each size furnished.

5) Field tapping is not permitted.

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.

1) Panel heaters shall be thermostatically controlled, fan-driven heaters, with all components mounted in an anodized aluminum housing for sub-panel mounting.

2) 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.

1) Heat exchangers and air conditioners shall be of a dual loop design to isolate panel interior air from exterior air.

2) The units shall be thermostatically controlled and shall be powered at 120 VAC from a dedicated circuit breaker and separate panel power feed.

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, gas detection, 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 NYCEC.

   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.

3. 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. 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.

   f. 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.

   g. No more than two wires shall be terminated at any single screw.

   h. 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.

   i. All terminal blocks shall be labeled with permanently affixed numeric identifiers on each block.

   j. Identifiers shall be self-stick plastic strips with permanent, machine printed numbers.

   k. 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.

   l. 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.

   m. 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).

   n. Terminal blocks shall be copper-nickel alloy terminal strips and screws.

o. Terminal blocks shall have minimum clearance of 5 inch on each side of each strip.

4. 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.

5. 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.

6. 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.

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 NYCEC 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. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 40 70 01 – MEASUREMENT
CONTRACT OB-144A

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

1.04 REFERENCES

A. Abbreviations and Acronyms:

1. w.g. Water Gauge (Water Column)

2. PTFE Polytetrafluoroethylene

B. Definitions:

1. 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 an 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. Dial-indicating helical bourdon tube type gages shall be as manufactured by:

a. 3D Instruments, LP, Anaheim, CA.

b. Perma-Cal Industries, Inc., Minden, NV.

c. Or approved equal.

B. Diaphragm Seals:

1. Diaphragm seals for diaphragm protected gages shall be as manufactured by:
    a. 3D Instruments, LP, Anaheim, CA.
    b. Ametek®, Inc., Berwyn, PA.
    c. Ashcroft, Inc., Stratford, CT.
    d. Or approved equal.

C. Accessories:

1. Brass Coil Pipe Siphons:
    a. No. 1098 as manufactured by Ashcroft, Inc., Stratford, CT.
    b. 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 fumeproof 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 or approved equal

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 shall have one of the standard scale readings listed in Table 40 70 01-1, below.

Table 40 70 01-1 Standard Pressure Gage Ranges: (0 to psig)
0 to 15
0 to 30
0 to 60
0 to 100
0 to 160
0 to 300
0 to 400
0 to 600
0 to 800
0 to 1000

c. Compound gages shall have one of the standard scale readings listed in Table 40 70 01-2, below.

Table 40 70 01-2 Standard Vacuum & Compound Gage Ranges: (in. Hg to 0 to psig*)
30 to 0
30 to 0 to 15
30 to 0 to 30
30 to 0 to 60
30 to 0 to 100
34 to 0 to 34 *

* graduated in feet of water to feet of water only

E. Diaphragm Protected Gages:

1. General:

a. The Contractor shall provide diaphragm seals or chemical gages where 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: ¼-in. NPT

3) Process Connection: ½-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: ¼-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:
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:
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:
NaOCl	Fluorolube®
All Other	Silicone

F. Gage Protection:

1. Pressure gages shall have underpressure protection and vacuum gages shall have overpressure protection.
    a. For helical roller type pressure gages, the gage shall have a left-hand movement for underpressure protection; for all other gages, underpressure 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 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 ¼-in. 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

NO TEXT ON THIS PAGE

SECTION 40 78 90 – PMCS PANEL MOUNTED INSTRUMENTS AND DEVICES
CONTRACT OB-144A

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 40 61 13 – PMCS General Requirements

B. Section 40 67 16 – PMCS Panels and Enclosures

C. 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. Operator Interface Terminal (OIT)
   1. Allen-Bradley ,WI
   2. Or approved equal.

B. Signal Loop Isolators shall be as manufactured by:
   1. Moore Industries, North Hill, CA;
   2. Phoenix Contact, Harrisburg, PA;
   3. Acromag Inc., Wixom, MI;
   4. 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. Or approved equal.

E. Intrinsic Safety Barriers
   1. Pepperls + Fuchs, Twinsburg, OH

2. R. Stahl, Houston, Texas
3. Or approved equal.

F. Surge Protection for Control Systems
1. Manufacturers and their products are subject to compliance with requirements. Provide surge protection devices from acceptable manufacturers listed with each device listed under materials/ equipment.

G. 24 VDC Power Supplies
1. Allen Bradley Milwaukee, WI;
2. Phoenix Contact, Harrisburg, PA
3. PULS, Aurora, IL
4. IDEC, Sunnyvale, CA
5. Or approved equal.

H. Uninterruptible Power Supplies (UPS)
1. Eaton Corp, OH;
2. APC by Schneider Electric, RI
3. Vertiv Liebert, OH
4. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Operator Interface Terminal (OIT)
1. General
a. OIT shall be Allen Bradley Panelview (or approved equal) plus 7. OIT shall be 15” Minimum size
b. OITs are standalone devices with an integrated hardware platform to monitor/ control a process through an interactive display.
2. Features:
a. Software
1) OITS shall be pre-packaged with all configuration and programming software necessary to perform functions as shown on drawings and within specifications. One license of the programming software shall be provided and registered to the owner.
2) Integrated OIT software shall have the flowing features:

a) Trending

b) Data Logging

c) Alarms

d) Graphic Symbols

e) Animations

3) Data Logging requirements:

a) OIT must be capable of storing a minimum of 30-Days of data.

3. Communications

a. Ports

1) Minimum of 15" Viewable as measured diagonally across screen.

4. Display

a. Color Shall support touch screen input.

b. Color active matrix, TFT

c. Display shall support touch screen input.

d. Minimum resolution 1024X 768

5. Environmental

a. Rating OIT shall be rated to maintain the rating of the control panel it will be mounted on and meet the area classification.

b. Temperature: Operating temperature range of the OIT shall range 0-50 C.

B. Signal Loop Isolator

1. Design:

a. Provide the necessary quantity to perform all monitoring and control functions as specified and shown on the Contract Drawing.

b. Type: Isolator type signal converter/transmitter/transducer that accepts any standard or many non-standard input signals and produces a 4-20 mA output or another standard process current or voltage signal with three-way isolation (power, signal input, and signal output all isolated from each other).

2. Construction and Required Features:

a. Span Adjustment: 22-turn front panel potentiometer.

b. Zero Adjustment: 22-turn front panel potentiometer.

c. Housing: General purpose enclosure designed for internal panel mounting.

d. Power Supply Input: 117 VAC, 50/60 Hz.

e. Interference Protection: Built-in RFI/EMI protection.

3. Performance Requirements:

a. Calibration Capability: 0.2 percent of span.

b. Ambient Temperature:

1) Range: + 32 F to +158 F.

2) Effect: ± 0.02 percent per Deg F over the entire range.

c. Frequency Response: 5 Hz.

d. Input Current: 4-20 mA into 50 Ohms nominal.

e. Input Voltage: 1-5 Volts.

f. Output Current: 4-20 mA into 0-1200 Ohm load.

g. Output Voltage: 1-5 VDC at 0.25 mA DC max.

h. Span Adjustment: 100 percent ± 25 percent of span, with full scale input.

i. Zero Adjustment: 0 percent ± 10 percent of span, with minimum input.

j. Load Effect: ± 0.02 percent of the span from 0 to maximum load resistance.

C. Control Relay (General Purpose)

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) Lense colors shall be as follows:

a) Run or Open: Red

b) Off or Closed: Green

c) Fault: Yellow

E. Intrinsic Safety Barriers

1. Type:

a. Barriers shall be of the solid-state electronic type in which the energy level of the sensing or actuation circuit is low enough area as indicated in the design documents.

b. Barriers shall be of the active type. Zener passive type barriers are not allowed.

2. Options required:

a. Barriers shall match power supply provided.

b. Barriers shall be located in non-hazardous areas.

F. Surge Protection for Control Systems

1. General:

a. Surge protection shall be provided to protect the electronic instrumentation system from induced surges propagating along the signal and power supply lines from lightning, utility, or the plant

electrical system. The protection systems shall be such that the protective level shall not interfere with normal operation but shall be lower than the instrument surge withstand level. Protection shall be maintenance free and self-restoring. Devices shall have a response time of less than 50 nanoseconds and be capable of handling a discharge surge current (at an 8x20µs impulse waveform) of at least 8 kA. Ground wires for all instrumentation device surge protectors shall be connected to a low resistance ground in accordance with Specification 16061 - Grounding.

2. Provide protection of all analog signal (4-20 mA) circuits where any part of the circuit is outside of the building envelope. Circuits shall be protected at both the transmitter and the control system end of the circuit. Protection devices located near the transmitter shall be mounted in a separate NEMA 4X stainless steel enclosure (plastic is not acceptable) or conduit mounted, and shall be Phoenix Contact PT Series, MTL Surge Technologies (Telematic) TP48, Citel TSP-10 series, or equal. Substitution of a single device to protect both 120 VAC and 4-20 mA wires to an instrument is acceptable. Protection devices in control panels shall be:
   a. Eaton MTL Surge Technologies (Telematic) SD Series,
   b. Phoenix Contact PT Series,
   c. Citel DLA series,
   d. Or approved equal.
3. Provide protection of all 120 VAC power feeds into control panels, instruments, and control room equipment. Surge arresters shall be:
   a. Transtector ACP-100BW Series,
   b. Phoenix Contact "Mains-PlugTrab",
   c. MCG Surge Protection 400 Series,
   d. Citel DS40 series,
   e. Or approved equal.
4. Non-Fiber Based Data Highway or Communications Circuits: Provide protection on all communication and data highway circuits that leave a building or are routed external to a building. Provide circuit protection at both ends of the line. Surge protection devices shall be:
   a. Phoenix Contact PlugTrab Series,
   b. Transtector FSP Series,
   c. MTL Surge Technologies (Telematic) NP Series,
   d. Citel DLA series
   e. MJ8 series,

f. Or approved equal.

5. Inductive Loads: Provide coil surge suppression devices, such as varistors or interposing relays, on all process controller outputs or switches rated 120 VA or less that drive solenoid, coil, or motor loads.

G. 24 VDC Power Supplies

1. In each control panel, provide redundant 24 VDC power supplies to power field instruments, panel devices, etc., as required. Equip the power supply with a power on/off circuit breaker. The redundant power supplies shall operate in parallel with an independent redundancy module.

2. The redundant 24 VDC power supply shall meet the following requirements:

a. Redundant 24 VDC Power supplies shall be provided with redundancy module.

b. Input power: 120 VAC, plus or minus 10 percent, 60 Hz.

c. Output voltage: 24 VDC.

d. Output voltage adjustment: 5 percent.

e. Line regulation: 0.05 percent for 10 volt line change.

f. Load regulation: 0.15 percent no load to full load.

g. Ripple: 3 mV RMS.

h. Operating temperature: 32 to 140 degrees Fahrenheit.

3. Size the 24 VDC power supply to accommodate the design load plus a minimum 25 percent spare capacity.

4. 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.

5. Mount the 24 VDC power supply such that dissipated heat does not adversely affect other panel components.

H. Uninterruptible Power Supplies (UPS)

1. In each control panel containing PLC, provide a UPS as required. Equip the power supply with a power on/off circuit breaker.

2. The UPS shall meet the following requirements:

a. Double Conversion, True online type only (Line Interactive ot other type of UPS topology is not permitted)

b. Mini Tower type Format. Rack mounted style is not permitted.

c. Wave From: Pure sine wave AC output.

d. Power Factor correction.

e. Minimum 30 Minutes power ride through 100 percent of connected load without incoming power.

1) Provide extended batteries as necessary to achieve the specified battery run time.

f. For UPS and related components located within a server rack, install UPS and battery components at bottom of cabinet.

g. Frequency range: 45-65 Hz.

h. Input protection:

1) Fuse or circuit breaker.

i. Output voltage regulation:

1) ±1% online.

2) ±2% on battery mode.

j. Battery: Sealed, lead-acid; maintenance free.

k. Three stage battery charging for prolonged battery life.

l. Battery over discharge protection.

m. Input power cord.

n. Output receptacles.

o. Efficiency:

1) Normal mode, minimum: 89%.

2) Efficiency mode, minimum: 95%.

3) Battery mode, minimum: 83%.

p. Operating temperature: 32 to 104 DEGF.

q. Relative humidity: 5-95% non-condensing.

r. Integral bypass to automatically bypass UPS on selected fault conditions.

s. Front panel indication of UPS status and alarm conditions.

1) UPS Fault.

2) UPS on battery.

3) UPS is online and operating normally.

4) Battery low.

5) UPS in bypass.

t. Utilize Ethernet communication module (Modbus/ TCP required) to enable remote annunciation of the following conditions:

1) UPS Low Battery

2) UPS on battery.

3) UPS Common Fault

u. Accessories:

1) Communications Modules

a) Provide an Ethernet communications module for network connectivity.

2) For Control panel applications, the UPS shall include a UPS shelf and shall be mounted inside control panel.

a) The UPS shall be mechanically attached to the UPS shelf.

b) If UPS is mounted on bottom of enclosure, then UPS shelf shall include stand-offs to allow conduit entrance wiring spacing.

c) UPS shall not block control panel subplate equipment, control panel wiring or terminal blocks behind the UPS.

d) Rack mounted UPS style is not permitted inside control panel.

3) Provide external maintenance bypass switch for control panels containing PLC equipment.

v. Agency Approvals:

1) Safety: UL 1778.

2) Emissions: FCC Part 15 (Class A).

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

SECTION 40 79 91 – PMCS FIELD INSTRUMENTS
CONTRACT OB-144A

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 40 61 13 – PMCS General Requirements.

B. Section 40 67 16 – PMCS Panels and Enclosures

C. Section 40 80 81 - PMCS Factory Testing.

D. 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.

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 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.

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 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 tool box, 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) 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.

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

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.

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. Chlorine Residual Analyzer - Colorimetric

1. HACH – CL17sc with SC4500 Controller.
2. Or Approved Equal.

E. Total Suspended Solids (TSS) Analyzer

1. HACH SOLITAX Sensor with SC200 Controller.
2. Endress and Hauser Turbimax and liquiline Series Transmitter.
3. Or approved equal.

F. Dial-indicating helical bourdon tube type gages shall be as manufactured by:

1. 3D Instruments, LP, Anaheim, CA.
2. Perma-Cal Industries, Inc., Minden, NV.
3. Or approved equal.

G. Dial-indicating geared movement bourdon tube type gages shall be as manufactured by:

1. Ashcroft or Dresser Industries, Inc., Stratford, CT.
2. Or approved equal.

H. U.S. Solfrunt Gauges shall be as manufactured by:

1. Ametek, Inc. Berwyn, PA.
2. Or approved equal.

I. Ultrasonic Level Meters

1. Endress & Hauser.
2. Siemens Automation Technology; Siemens AG Industry Sector.
3. Or approved equal.

J. Vane Actuated Flow Switches

1. Magnetrol – F50 and F10.
2. Dwyer – Flotec Series.
3. Or approved equal.

K. Not Used

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 120 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. Chlorine Residual Analyzer - Colorimetric

1. Type:

a. Online chlorine analyzer for continuous measurement of free or total residual chlorine in water.

b. Colorimetric analyzer using N, N-diethyl-p-phenylenediamine (DPD) method.

2. Function/Performance:

a. Range: 0 to 10 mg/l.

b. Accuracy:

1) Below 5mg/l: Plus or minus 5 percent of reading or 0.04 mg/l, whichever is greater.

2) Between 5mg/l and 10mg/l: Plus or minus 10 percent of reading.

c. Resolution: 0.01 mg/l.

d. Precision: Plus or minus 5 percent of reading or 0.01 mg/l, whichever is greater.

e. Repeatability: Plus or minus 5 percent of reading or 0.01 mg/l, whichever is greater.

f. Lower Limit of Detection (LOD): 0.03 mg/l.

g. Cycle Time: 2.5 minutes

3. Physical:
    a. Housed in IP66 rated enclosure, suitable for wall mounting.
    b. Power Requirements: 12VDC, supplied by transmitter.
    c. Internal peristaltic pump to control sample draw and reagent usage.
    d. LED light source operating at 510nm wavelength.
    e. Operational Criteria:
        1) Sample Flow Rate: 60 to 200 ml/minute
        2) Sample Filtration: Y-strainer with 40-mesh screen or higher.
        3) Inlet Pressure (Y-strainer): 4.5 to 75 PSIG
        4) Inlet Pressure (analyzer): 1.5 to 5 PSIG
        5) Sample Temperature: 41 to 104 degrees F.
        6) Ambient Temperature: 41 to 104 degrees F.
        7) Operating Humidity: 0 to 90 percent, non-condensing.
4. Analyzers shall be installed and housed in a Weather-Controlled Enclosure. The enclosure shall meet the following requirements:
    a. General:
        1) Analyzers and enclosure shall be supplied by single supplier and shall be installed as shown on Contract Drawings
    b. Fiberglass insulated, 60”x60”x74” (H), gasketed door (38.5” wide x 68.5” tall) with fixed window.
    c. Door hardware with three 3”x3” stainless steel hinges and three-point latch with lockable “T” type handle.
    d. Provide two screened, fixed louver vent covers over two vents opening at both the right and left side of the unit. The right side vent will be located at the top, center of the wall. The left side vent will be located at the base, center of the wall.
    e. The unit will be fabricated with an integral fiberglass floor that is 3/8” thick with slip resident gray finish. The floor will be integral to the wall sections to provide full spill containment.
    f. 1" Polyurethane Insulation core (R=7).
    g. Continues 3" wide fiberglass exterior mounting flange with the same finish as the balance of the unit.
    h. Equipment mounting boards to be laminated to the left and right interior side walls to allow for equipment mounting approximately 4-feet from the floor of the enclosure. The Influent Hach analyzer and transmitter shall be mounted to the left mounted board, and the

Effluent Hach analyzer and transmitter shall be mounted to the right mounting board, each approximately 4 feet from the enclosure floor.

i. 120 volt, 60-watt incandescent light with switch mounted on the left sidewall near the door handle.

j. Ventilation Fan (110 Volt, 60 CFM) with remote thermostat.

k. Base Board, 120 volt, 500-watt electric heater with integral thermostat.

l. Two (2) 120 volt, 20 amp GFI protected Duplex Outlets standard 15 amp duplex.

m. Receptacles shall be powered from same circuit.

1) All wire will be run through 1/2 flexible sealed PVC flexible conduit.

n. All wiring will be completed with #12 solid copper.

5. Accessories:

a. Provide sensor connection cable and plug between the transmitter and the analyzer sensor for rapid attachment and exchange of sensor.

b. Stand-pipe installation kit.

c. Provide one year's supply of manufacturer recommended consumables including, but not limited to, electrolytes, calibration reagents, cell cleaning kits, and annual maintenance kits.

6. Manufacturer Start-up and Training services:

a. Provide one (1) day total of manufacturer’s start-up and training services. Manufacturer’s services consist of certification of instrument performance and operational training.

F. Total Suspended Solids Analyzer (TSS)

1. Sensor:

a. Insitu Probe with single light source and minimum of two sensors.

1) TSS Sensors shall be included with built-in Self-cleaning wipers. External cleaning wiper-based equipment is not acceptable.

b. Range:0-300G/L

c. Accuracy: Less than 5% of reading.

d. Repeatability: Less than 3% of reading.

e. Sample Pressure: 6 bar (87 Psi) maximum.

f. Sample temperature:32 to 104 deg F (0 to 40 deg C)

2. Transmitter:

a. Compatibility sensor.

b. Display: 3-1/2 digit minimum LCD display

c. Relays: 4 SPDT (From C) contacts.

d. Outputs: Two isolated 4-20 mA dc.

e. Communication: HART

f. Accuracy: Less than 1% of FS.

g. Enclosure: IP66/IP67, tightness and corrosion resistance in accordance with NEMA TYPE 4X.

h. Power: 120 VAC

i. Operating temperature: -20 to 104 deg F (-20 to 40 deg C)

j. Operating Humidity: 10 to 95% non-condensing.

k. Accessories Required:

1) Provide a spare sensor.

l. Manufacturer Start-up and Training services:

1) Provide manufacturer's start-up and training services as specified in the start-up and training services article.

G. Gauges:

1. Construction:

a. Pressure, vacuum and compound gages shall be of the indicating dial type utilizing a Bourdon tube for confining the pressure medium. 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. Dials shall be 4-1/2 inches in nominal diameter.

2. General Requirements: Gages shall be weatherproof, designed and constructed to meet all requirements for satisfactory operation.

3. Materials: 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. Unless otherwise shown on the Contract Drawings or specified in the Detailed Specifications, gages shall be constructed of the following materials:

a. Case - Phenolic or high impact polypropylene

b. Connection - 1/4 inch National Pipe Thread (NPT) male thread

c. Dial - White laminated plastic

d. Glass - Clear, blemish free, shatter-proof

e. Bourdon tube

1) Helical Type - Inconel X-750

2) Geared Type - Phosphor bronze or Type 316 stainless steel

f. Socket - Brass forging

g. Movement - Stainless steel

4. Gage Cases: The gage cases shall be of the blow-out protected type where the rear plate is removable. The gage cases shall be of an approved plastic material free from warpage, checks and other defects with surfaces smooth and free from chips, cracks and blisters.

5. Dials and Appurtenances: Dials shall be 4-1/2 inches nominal diameter unless specified otherwise in the Specifications and shall be white laminated plastic with standard graduations and numbers permanently marked on the dials in black. Scale shall extend over an arc not less than 270 degrees. Subdivisions of the scale shall conform to the requirements of ANSI/ASME B40.1 for Grade 2A gages, unless approved otherwise by the Engineer. Units of measure shall be distinctly and permanently marked on the dial or on laminated plastic nameplates cemented to the dial.

a. Glass windows shall be 1/8 inch thick clear glass tightly seated on durable gasket material so as to be fireproof and waterproof.

b. 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.

c. Socket stem shall extend at least 1-1/4 inches below the gage case and shall have large wrench flats.

d. 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. Adjustment: Gages shall have provision for adjustment of the zero reading. All calibration adjusting screws must be accessible from the rear without having to dismantle the gage.

7. Scale Readings: Vacuum and compound gages shall have minimum scale readings of 30 inches of mercury unless otherwise shown on the Contract

Drawings or specified in the Specifications. Compound gages on plunger pump suctions shall have a range of not less than 30 inches of mercury to zero to 30 psi.

H. 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 or Instrument Device Schedule. 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

(1) 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 the installation indicated on the Drawings.

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 or percent as indicated on the Drawings or in the Instrument Device Schedule.

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.

3) A/C power will be as specified in Section 40 XX XX.

c. Accessories Required

d. Hand-held programmer where required for configuration and calibration of the instrument.

I. Vane Actuated Flow Switches

1. Type:

a. Vane- or disc-actuated flow switch.

b. Switch magnetically linked to vane- or disc-actuated mechanism.

2. Function/Performance:

a. Output: Form 2C (DPDT) snap action, hermetically sealed switch, rated for 10 A, 125/250 VAC.

3. Physical:

a. Provide flow body for switches for process pipe sizes of 3/4 to 1-1/2 inches (19 to 40 mm). Mount switches directly on process pipe for pipe sizes greater than 1-1/2 inch (40 mm). Provide mounting assembly for pipe.

b. Provide Type 316 stainless steel flow body and all wetted parts.

c. Switch housing: NEMA 4X (IP65) and where installed in hazardous areas, approved for Class I, Division 1, Groups C and D (EEx d IIc T6).

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 pipe, 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 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.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SECTION 40 80 81 – PMCS FACTORY TESTING
CONTRACT OB-144A

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 systems 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 40 61 13 – PMCS General Requirements

C. 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 60days 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 60 days months in advance of any scheduled testing and shall include dates of scheduled tests.

D. The procedures for WFATs detailed in this Section shall be submitted for approval by the Engineer.

E. The details of simulation panel or simulation software which will be used in conjunction with the PMCS equipment shall submitted for to the Engineer for approval.

F. 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.

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 inputs and outputs 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.

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

E. Demonstration of communication between PLC's or to remote I/O's shall be included in the Test Procedure where applicable.

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 80 82 – PMCS STARTUP AND FIELD TESTING
CONTRACT OB-144A

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 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.

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 60 days in advance of any scheduled testing and shall include dates of scheduled tests.

D. The details of simulation panel or simulation software which will be used in conjunction with the PMCS equipment shall submitted for 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 placing the various processes and equipment 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.

   c. Where future operational functions are included in this work, they shall be included in the check-out.

   d. 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 softwareis operating properly as a fully integrated system, and that the intended monitoring and control functions are fully implemented and operational.

2. Any defects or problems found during the test shall be corrected by the Contractor and then re-tested to demonstrate proper operation.

3. The PMCS including field sensors/transducers and instruments shall be running and fully operational for a continuous 72 hour period.

4. 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, gates, 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. tripping pumps
    c. emergency stops
    d. set point changes
    e. simulated scenarios
    f. the system bypasses, etc
    g. Multiple failure scenarios shall also be tried.
    h. Full manual and semiautomatic back up modes shall also be tested

i. 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.

j. Workstations, servers, controllers and software shall be stopped; portions of and 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 be 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

SECTION 43 05 21 – COMMON WORK RESULTS FOR PUMPING UNITS
CONTRACT OB-144A

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 19 – Ductile Iron Process Pipe

G. Section 40 05 56 – Process Valves, Smaller than Four-Inch Diameter

H. Section 40 05 97 – Identification for Process Equipment

I. 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.

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.

E. Pre-fabricated Machine Guards:

1. Uniguard™, as manufactured by Uniguard Machine Guards, Greensboro, NC.
2. 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.

2. Harnessed flexible pipe couplings (or their approved equivalent) shall be provided along the inlet and discharge piping to each pump, with the exception of fire pumps.

a. The Contractor shall install the harnessed flexible couplings in such a manner that the pump will be free from forces of consequential magnitude transmitted by the piping.

b. The Contractor shall provide the harnessed flexible couplings even if not shown on the Contract Documents.

c. The harnessed flexible couplings shall conform to the requirements of Section 40 05 06 – Couplings, Adapters, and Specials for Process Piping.

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 specifications, 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. Exposed, non-concealed drainage piping shall be copper.

3. Drainage piping embedded in floors, concrete, or otherwise concealed shall be red brass.

4. Drainage piping shall be of the minimum size specified and shall be provided with approved cleanout plugs.

5. 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. Oil Drip Piping:

1. All oil pumps, except those incorporated in fuel oil burners, shall be provided with approved means to catch oil drippings from the pumps.

2. Means of collecting oil drip shall be integral with the pumps, such as a raised lip on base-plate.

3. Piping shall be provided to conduct such drippings to an approved oil sump or can.

4. Piping shall be at least ½-in. Schedule 40 galvanized steel pipe

a. In the event such piping passes through concrete floors, tinned red brass pipe shall be used instead of steel.

5. Piping shall have with a sufficient number of cleanout plugs in the fittings.

H. 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.

I. 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 19 – Ductile Iron Process Pipe

c. Section 40 05 56 – Process Valves, Smaller than Four-Inch

C. Machine Guards:

1. General:

a. All exposed shaft and couplings located within 6 ft. of any floor platform or landing shall be protected with an approved machine guard.

1) The machine guard may be:

a) Pre-fabricated.

b) Removable.

c) Custom manufactured for the specific application.

b. Pumping Units where the shaft coupling is not exposed (i.e., close-coupled Pumping Units), do not require a machine guard for the shaft coupling.

c. All machine guards must comply with the following requirements:

1) OSHA 1910.219

2) ANSI B11.19

3) ANSI Z535

2. Custom-Manufactured Machine Guards:

a. Guards for couplings shall be of a rigid construction of reinforced heavy gage sheet or expanded metal.

b. All components of the machine guard shall be of Type 304 stainless steel, including (but not limited to): the heavy gage sheet or expanded metal, hinges, snap catches, and bolting.

c. Full details shall be submitted for approval by the Engineer.

3. Pre-fabricated machine guards:

a. Shall be constructed of suitable material capable of withstanding 250 lb. load.

b. Maximum opening: 0.250-in.

c. Shall only be removable using hand tools (cannot be disassembled and removed from the Pumping Unit without the use of hand tools).

d. Hinged or sliding covers to provide lubrication at the points necessary.

e. The materials of construction shall be resistant to corrosion and compatible with the fluid pumped.

f. Pre-fabricated machine guard(s) shall be suitable for use in the area in which it is installed.

D. Painting:

1. All work shall be painted in conformity with the requirements of Section 09 91 00 – Painting.

E. 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. Oil Drip Collection Installation

1. The Contractor shall provide two (2), 2½-gallon galvanized steel pails with handles and spouts for each oil pump furnished, unless otherwise shown or specified for specific Pumping Unit(s).

a. Pails shall be supported and protected from accidental upsetting by at least two (2) ¼-inch × 2-inch bands bolted to the concrete pump foundation and formed in the shape of a U; concrete pump foundations shall be built sufficiently high from the floor to permit installation of the bands.

2. In addition, all concrete bases shall be provided with blind floor gutters entirely surrounding each base with a gutter size 1-inch deep at the base and tapering upward and out from the base for at least 6-inch.

F. 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.

G. 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 startup 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

NO TEXT ON THIS PAGE

SECTION 43 23 15 – MAGNETIC DRIVEN CENTRIFUGAL TRANSFER PUMPING UNITS
CONTRACT OB-144A

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 magnetic driven centrifugal transfer pumping units and appurtenances, complete and operational. This Section describes the specific requirements for magnetic driven centrifugal transfer Pumping Units (for concentrated sodium hypochlorite service) and supplements Section 43 05 21 – Common Work Results for Pumping Units. Pumping Units shall be as specified herein and as shown on the Contract Drawings.

B. The following index of this Specification 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 23 15-1, Magnetic Driven Centrifugal Transfer Pumping Units 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 43 05 21 - Common Work Results for Pumping Units.

B. Section 09 91 00 - Painting

C. Section 40 05 31 - Thermoplastic Process Pipe

D. Section 26 05 91 - Low-Voltage Electric Motors

1.04 REFERENCES

A. Definitions:

1. Pumping Unit: When the term pumping unit is used hereinafter, it shall be deemed to mean a pump complete with, but not limited to, drive motor, connecting shafting, bearings, gear units, couplings, accessories, appurtenances and all associated equipment. Unless otherwise specified in the Specifications, the pump manufacturers shall furnish each pumping unit complete with drive motor and all other components and shall be held entirely responsible for the compatibility in all respects of all components furnished.

B. Reference Standards:

1. ASTM A29 - Steel Bars, Carbon and Alloy, Hot-Wrought and Cold Finished, General Requirements for

2. ASTM A536 - Ductile Iron Castings

3. ASTM A743 - Castings, Iron - Chromium, Iron - Chromium - Nickel, Corrosion Resistant, for General Application

4. ASTM B505 - Copper - Base Alloy Continuous Castings

5. ASTM A781 - Standard Specification for Castings, Steel and Alloy Common Requirements, for General Industrial Use

6. ANSI/ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings

7. ANSI/ABMA 10 - Load Ratings and Fatigue Life for Roller Bearings

8. American Bearing Manufacturers Association (ABMA)

9. American Iron and Steel Institute (AISI)

1.05 DESCRIPTION

A. Pumping units, Emergency Tanks Return Pumps, in the Meter Building will be used for pumping sodium hypochlorite from emergency sodium hypochlorite storage tanks (OB-4205-10 and OB-4206-10) in the Chlorine Contact Tanks to the bulk sodium hypochlorite storage tanks in the Chlorine Building.

B. Pump Type: Single stage, magnetic driven, end suction volute, seal-less, centrifugal type, close coupled, center line, self-venting suitable for services as described in Schedule 43 23 15-1.

C. Pump Drive Unit: Totally enclosed, horizontal, squirrel cage, grease lubricated bearings, single speed motor, magnetic driven.

D. Pump ID number: OB1.05.18.011.BQ01.01/OB1.05.18.037.BQ01.01, OB1.05.18.011.BQ01.02/ OB1.05.18.037.BQ01.02

1.06 QUALITY ASSURANCE

A. Shop inspections may be made by NYC DEP representatives. The Contractor shall give ample notice to the Engineer prior to the beginning of any work so that inspection may be performed. Shop quality assurance inspections will be performed in accordance with the Section 01 43 10 – Quality Assurance Inspection.

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:

1. Computations on shaft and bearing design shall be submitted for approval.

2. Computations on the pump bearing selection and details of loading shall be submitted for approval.

B. Submittals shall be forwarded to the Engineer for approval.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling for all magnetic driven centrifugal transfer 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. 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 foregoing pumps given in the following list.

B. Spare parts list:

1. One (1) complete set of interchangeable front and rear thrust bearings, for each five (5) pumps or less of the same type, size and service.
2. One (1) shaft sleeve bearing for each five (5) pumps or less of the same type, size and service.
3. One (1) impeller with keys and bolts for each five (5) pumps or less of the same type, size and service.
4. One (1) complete set of O-ring for every pump furnished.
5. One (1) complete set of spare parts recommended by manufacturer for two years of use for every pump furnished.
6. Spare parts for motors as covered by the 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. All materials shall be of a quality to withstand the hostile environment and stresses to which the pumping units and components may be subjected. All materials in contact with the fluid shall be of corrosion resistant non-metallic construction for optimal strength and corrosion resistance.

B. The requirements for the individual components common to the pumping units are specified in Article 2.02.

C. Manufacturers:

1. Ansimag Pump K+1516 as manufactured by Sundyne, LLC., Arvada, CO
2. or approved equal

2.02 MATERIALS / EQUIPMENT

A. Design Criteria:

1. Refer to Schedule 43 23 15-1, located after the "End of Section" designation.
2. Pumping Units shall be capable of pumping against a closed valve (shut off head) for 2 min without damage to any part of the Pumping Unit or its mechanical seals.

B. Pumping Unit Components

1. General:

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.

b. All castings shall conform to the requirements of Section 05 56 00 - Metal Castings.

2. Impellers:

a. Impellers shall be of the enclosed single stage, end suction centrifugal type.

b. Impeller shall be with a separate replaceable inner magnet assembly to reduce maintenance costs. Magnets shall be high strength neodymium iron boron. Magnets shall be completely encapsulated for added protection.

3. Shafts:

a. Pump shafts shall be sufficiently large in diameter to safely transmit the maximum torque developed by the drive unit.

b. Pump shafts shall be of such design as to provide a rigid support for the impellers and to prevent excessive vibration at all operating speeds.

c. Shaft shall be made of sintered silicon carbide for optimum corrosion resistance. It shall be of a stationary self-aligning design and it shall be supported by the containment.

d. This front end shaft support shall provide an integral SiC surface to absorb net forward thrust of the impeller.

4. Casing:

a. Casing shall be of one-piece construction with integral raised face flanges dimensioned according to ASME/ANSI B16.5 Class 150. Casing shall be constructed of ductile iron lined ETFE, PFA or fiberglass-reinforced Derakane vinyl ester resin utilizing continuous-strand fiberglass reinforcement, for maximum strength and corrosion resistance. Casing drain will be flanged with option of NPT connection.

b. Casings shall be mounted from the pump frame or the pump motor frame and shall be provided with an end suction nozzle either

integral with the casing for pumps having nozzles three (3) inches and smaller or incorporated in a separate casing suction plate.

c. Casing attachment to the pump frame and/or to the end plates shall be flanged, machined shouldered and bolted.

d. Casings shall be tapped for vent, drain and gage connections, unless the gage tappings are provided on the connected piping.

5. Bearings:

a. Sleeve bearings shall be made of sintered silicon carbide with a spiral groove and face grooves for lubrication and self-purging of contaminants. Thrust bearings shall be silicon carbide. Front and real bearings shall be interchangeable and keyed to prevent rotation.

b. Computations on bearing selection shall be submitted for approval and shall show details of loading. A dynamic factor of at least 1.0 shall be applied to loading.

c. Bearings shall be accessible and designed for convenient repair and replacement.

6. Frames:

a. Pump Frames: Pump frames shall be of the same material as the pump casing and shall be fitted to the casing with shouldered machined faced joints and shall be bolted and dowelled to the casing or casing end plate. The design shall be heavy and rigid, so as to safely resist, without undue distortion, all imposed forces.

7. Baseplates:

a. Baseplates shall have a sloped center collection drain under the pump with tapped drain hole, and suitable for grouting, with a grout hole in the center of the base. Baseplates shall be constructed utilizing polymer concrete, 304SS or fiberglass-reinforced Derakane vinyl ester resin utilizing continuous-strand reinforcement for maximum strength and stiffness. Baseplate wall thickness shall be sufficient to permit drilling and tapping for pump and motor mounting bolts.

8. Pump Drive Units:

a. Pump drive units shall be of sufficient capacity to operate the pumps from shutoff to the maximum rate of flow specified, without loading beyond their approved rating.

b. The drive unit will generally be a totally enclosed, NEMA C-faced, single speed, squirrel-cage electric motor with grease lubricated

bearings. Electric motors shall comply with the requirements of Section 26 05 91 – Low-Voltage Electric Motors. Motors shall be of sufficient capacity to operate the pumps from shutoff to the maximum rate of flow specified without loading beyond their rated nameplate current or power.

c. Adaptor shall be cast iron with an epoxy primer - Ameron 370/400 or equal - for external corrosion resistance. All bolting shall be 303 stainless steel.

9. Inner Magnets:

a. Inner magnet ring shall be a replaceable assembly and it shall be separate from impeller.

b. Magnets shall be high strength neodymium iron boron. Magnets shall be completely encapsulated in fiberglass for added protection.

10. Outer Magnets:

a. Outer magnets shall be high strength neodymium iron boron. Outer magnet assembly shall be dynamically balanced and it shall have jack screws for easy removal.

11. Cover/Containment Shell:

a. Cover/containment shell shall be one piece and it shall be constructed of the same materials in the wetted area of the pump casing. Containment shell shall be non-metallic and it shall have a thickness of 3/16 inch or greater. There shall be only one O-ring between the cover/containment shell and the casing.

12. Pressure Gages:

a. Suction gages shall be of the compound type and discharge gages shall be of the pressure type, unless otherwise specified in the Specifications and in the Details on the Contract Drawings.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Provide identification, painting, and appurtenances in accordance with the requirements of Section 43 05 21 - Common Work Results for Pumping Units.

B. After assembly of shaft, sleeve and impeller, the rotor assembly shall be statically and dynamically balanced.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. The tests to be performed under Section 43 05 21 – Common Work Results for Pumping Units

B. The Contractor shall be responsible for expediting all required tests by the manufacturer and the independent testing laboratory.

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 and manufacturer recommendations.

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	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.

3.03 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. Measure the bearing temperature.

2. Point to point wiring verification.

3. Utility power verification.

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

3.04 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	1	1
No. 4	Training	1	1

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

SCHEDULE 43 23 15-1

MAGNETIC DRIVEN CENTRIFUGAL TRANSFER PUMPING UNITS
CHARACTERISTICS

Process Fluid:	
• Fluid Pumped:	12.5% Sodium Hypochlorite Transfer
• Free passage (minimum, as sphere):	N/A
• Area of impeller eye:	N/A
• Perpendicular area in casing at cutwater:	N/A
• Temperature (max.)	105° F
Pump Characteristics (Each Pump):	
• Pump Type:	Magnetic Driven Centrifugal
• Suction Diameter:	1.5 in.
• Discharge Diameter:	1.0 in.
• Casing thickness:	N/A.
Duty Point:	
• Flow:	20 gpm
• Head:	35 ft TDH
• Pump efficiency:	≥ 30%
• Overall efficiency:(1)	N/A
• Pump speed:	1,750 rpm
Second Duty Point:	
• Flow:	75 gpm
• Head:	14 ft TDH
• Pump efficiency:	≥ 30%
• Overall efficiency:(1)	N/A
• Pump speed:	1,750 rpm

Satisfactory Operating Range:	
• Avg. suction well level, relative to pump ℄:	19.0 ft.
• Max. suction well level, relative to pump ℄:	24.5 ft.
• Min. suction well level, relative to the pump ℄:	14.0 ft.
Shutoff Point:	
• Shut off head:	36 ft TDH
Runout Point:	
• Flow:	75 gpm.
• Discharge pressure:	14 ft TDH
Number Pumps:	
• Operating Pumps	1
• Standby Pumps	1
• Spare Pumps	0
Motor:	
• Power:	1.5 hp
• Speed:	1,750 rpm
• Electrical supply:	480 V, 3 phase, 60 Hz
• Area Classification:	Unclassified

Notes:
1) Refer to ANSI/HI 14.6 for definitions of efficiency.

NO TEXT ON THIS PAGE

SECTION 43 23 32 – SAMPLE PUMP
CONTRACT OB-144A

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, incidentals, as shown, specified and required, to furnish portable submersible sample pumps and appurtenances, complete and operational. This Section describes the specific requirements for sample pump and supplements Section 43 05 21 – Common Work Results for Pumping Units. Pumping Units shall be as specified herein and as shown on the Contract Drawings.

B. The following index of this Specification 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 23 32-1, Portable Submersible Sample Pump 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 43 05 21 - Common Work Results for Pumping Units.

1.04 REFERENCES

A. Definitions:

1. Pumping Unit: When the term pumping unit is used hereinafter, it shall be deemed to mean a pump complete with, but not limited to, drive motor, shafting, seal, bearings, accessories, appurtenances and all associated equipment. Unless otherwise specified in the Specifications, the pump manufacturers shall furnish each pumping unit complete with drive motor and all other components and shall be held entirely responsible for the compatibility in all respects of all components furnished.

B. Reference Standards:

1. ASTM A29 - Steel Bars, Carbon and Alloy, Hot-Wrought and Cold Finished, General Requirements for

2. ASTM A781 - Standard Specification for Castings, Steel and Alloy Common Requirements, for General Industrial Use

3. American Iron and Steel Institute (AISI)

1.05 DESCRIPTION

A. Portable submersible sample pumps will be used for pumping chlorinated Chlorine Contact Tank influent and effluent to total residual chlorine (TRC) analyzer for TRC reading.

B. Pump ID numbers: OB1.22.99.015.AD01.01/OB1.22.99.037.AD01.01 in Chlorine Contact Tank influent common channel, OB1.22.99.015.AD01.02 / OB1.22.99.037.AD01.02, in CCT effluent common channel

C. Pump Type: Portable, vertical, submersible, single stage, recess vortex impeller, centrifugal type, suitable for services as described in Schedule 43 23 15-1.

1.06 QUALITY ASSURANCE

A. Not Used

1.07 SUBMITTALS

A. The submittals to be made under Section 43 05 21 – Common Work Results For Pumping Units.

B. Submittals shall be forwarded to the Engineer for approval.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling for all portable submersible sample pumps 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. 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 foregoing pumps given in the following list.

B. Spare parts list:

1. Four (4) complete pumps.

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. All materials shall be of a quality to withstand the hostile environment and stresses to which the pumping units and components may be subjected. All materials in contact with the fluid shall be of corrosion resistant construction for optimal strength and corrosion resistance.

B. The requirements for the individual components common to the pumping units are specified in Article 2.02.

C. Manufacturers:

1. Ebara EPD-7MS1., Rock Hill, SC

2. Grundfos Unilift Model AP12, Brookshire, TX

3. or approved equal

2.02 MATERIALS / EQUIPMENT

A. Design Criteria:

1. Refer to Schedule 43 23 15-1, located after the "End of Section" designation.

B. Pumping Unit Components

1. General:

a. Major pump components shall be of series 304 SS with smooth surface devoid of blowholes or other irregularities. Sealing shall be accomplished by metal to metal contact between machined surfaces. Where watertight sealing is required surfaces shall be machined fitted with Viton (or approved equal) Flouro-Carbon o-rings and gaskets. No secondary sealing compounds or other devices shall be used. The pump shall be equipped with built-in carry handle.

b. Materials of Construction

1) Pump casing: Stainless steel, AISI 304L

2) Impeller: Stainless steel, AISI 304L

3) Shaft: Stainless steel, AISI 303

4) Strainer: Stainless steel, AISI 304L

5) Motor housing: Stainless steel, AISI 304L

6) All the materials except specified herein shall be compatible with chlorinated secondary effluent water.

2. Impellers:

a. The impeller shall be of 304 SS dynamically balanced, recessed vortex design to allow for solids passage without clogging, capable of passing 3/8 inch solids.

3. Shafts:

a. Shaft shall be constructed for maximum conductivity, tensile strength and corrosion resistance.

4. Bearings:

a. Pump shaft shall rotate on two bearings. Motor bearings shall be permanently sealed and fitted with high temperature grease guaranteed for a B-10 life of 60,000 hours of operation.

5. Mechanical Seals:

a. Each pump shall be provided with a tandem mechanical shaft seal system consisting of an upper and a lower seals. The upper seal consists of carbon rotating part, ceramic stationary part, and Buna elastomers. The lower seal consists of silicon carbide rotating and stationary parts and FPM elastomers. Seals shall run in and oil chamber located between the volute and motor. The seals shall require neither maintenance nor adjustment and shall be easily replaceable. The pump shall be equipped with a seal leak detector for auto cutout in the event of seal failure.

6. Cable Entry:

   a. The cable entry shall be designed to prevent ingress of water into the motor chamber as follows:

      1) Each cable lead shall be stripped, soldered and epoxy sealed to prevent any capillary action past the cable entry.

      2) The compression cable entry shall be made of Viton with epoxy potting.

7. Motor:

   a. Motor shall be induction type with a squirrel cage rotor, shell type design, house in and air-filled watertight chamber. The stator windings and leads shall be insulated with moisture resistant class F insulation which will resist a temperature of 311°F. The motor shall be designed for continuous duty and capable of up to 12 starts per hour and a maximum pumped media temperature of 104°F. Stator shall be heatshrink fitted into the stator housing. The use of fastening devices requiring penetration of the stator housing is not acceptable. Pump shall be equipped with built-in automatic thermal overload protection connected in series with the motor stator so that if the thermal sensor is tripped the overload opens. The thermal sensor shall be sized to open at 266°F and automatically reset at 68-77°F differential.

8. Accessories:

   a. Accessories are to be provided by pump manufacturer along with the pump system, including all the piping and fittings. A third party supplier of the accessories is acceptable.

   b. Provide following accessories as minimum for each pump supplied

      1) One (1) 40-foot long electric cable with maleplug.

      2) One (1) 15-foot long Type 316 stainless steel chains with heavy duty carabiners to hold the pump and basket on handrail.

      3) One (1) 15-foot long 1-1/2 inch diameter discharge hose with male pipe hex (NPT) end connecting to pump outlet and female quick connect coupling at other end connecting to male quick connect coupling at installed 1-1/2” CPVC pipes.

   c. Hose shall be made of PTFE liner and polypropylene braid cover as manufactured by Proflex or approved equal. Coupling shall be made of polypropylene body, EPDM gasket, dust cap, Type 316 stainless steel cam arm, chain and lock.

d. Four (4) total (2 installed, 2 spare) 10"x10"x12" (H) open-top SS316 basket w/1"x1" meshes at 3 sides and bottom, and the 4th side of basket that is facing the flow shall be a SS316 plate. The basket shall be equipped with a guiderail holder used to slide basket up and down the rails. The basket is used to contain the pump.

e. Four (4) total (2 installed, 2 spare) two-pipe Type 316 stainless steel guiderail with upper and lower brackets and a stopper to position the basket.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Provide identification, painting, and appurtenances in accordance with the requirements of Section 43 05 21 - Common Work Results for Pumping Units.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. The tests to be performed under Section 43 05 21 – Common Work Results for Pumping Units

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 and manufacturer recommendations.

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 43 23 32-1
PORTABLE SUBMERSIBLE SAMPLE PUMP CHARACTERISTICS

Process Fluid:	
• Fluid Pumped:	Chlorinated Chlorine Contact Tank influent and effluent
• Free passage (minimum, as sphere):	3/8 inch
• Area of impeller eye:	N/A
• Perpendicular area in casing at cutwater:	N/A
• Temperature (max.)	105° F
Pump Characteristics (Each Pump):	
• Pump Type:	Submersible centrifugal
• Suction Diameter:	N/A.
• Discharge Diameter:	1.5 in.
• Casing thickness:	N/A.
Duty Point:	
• Flow:	10 gpm
• Head:	40 ft TDH
• Pump efficiency:	N/A.
• Overall efficiency:(1)	N/A
• Pump speed:	3,440 rpm
Second Duty Point:	
• Flow:	N/A.
• Head:	N/A.
• Pump efficiency:	N/A.
• Overall efficiency:(1)	N/A
• Pump speed:	N/A.

Satisfactory Operating Range:	
• Avg. suction well level, relative to pump ℄:	11.0 ft.

• Max. suction well level, relative to pump ℄:	11.5 ft.
• Min. suction well level, relative to the pump ℄:	0.5 ft.
Shutoff Point:	
• Shut off head:	50 ft TDH
Runout Point:	
• Flow:	75 gpm.
• Discharge pressure:	12 ft TDH
Number Pumps:	
• Operating Pumps	2
• Standby Pumps	0
• Spare Pumps	4
Motor:	
• Power:	3/4 hp
• Speed:	3,440 rpm
• Electrical supply:	115 V, 1 phase, 60 Hz
• Area Classification:	N/A.

Notes:
1) Refer to ANSI/HI 14.6 for definitions of efficiency.

SECTION 43 23 33 – CHEMICAL SUMP PUMPS
CONTRACT OB-144A

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 submersible Pumping Units and appurtenances, complete and operational. This Section describes the specific requirements for submersible Pumping Units for wet pit services, and supplements Section 43 05 21 – Common Work Results for Pumping Units. 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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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 75 10 – Preliminary and Final Field Tests

C. Section 01 78 25 – Operations and Maintenance Manuals

D. Section 26 05 20 – Low Voltage Wires, Cables and Accessories

E. Section 26 05 91 – Low Voltage Electric Motors

F. Section 40 61 13 – Process Monitoring and Control System

G. Section 40 61 94 – PMCS Instrument Index

H. Section 40 67 16 – PMCS Panels and Enclosures

I. Section 40 78 90 – PMCS Panel Mounted Instruments and Devices

J. Section 40 79 91 – PMCS Field Instruments

K. Section 43 05 21 – Common Work Results for Pumping Units

1.04 REFERENCES

A. ASTM A48 – Standard Specification for Gray Iron Castings

B. ASTM D570 – Test Method for Water Absorption of Plastics

C. ASTM D638 - Test Method for Tensile Properties of Plastics

D. ASTM D695 - Test Method for Compression Properties of Rigid Plastics

E. ASTM D696 - Test Method for Coefficient of Linear Thermal Expansion of Plastics

F. ASTM D790 - Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

G. ASTM D792 - Test Method for Specific Gravity (Relative Density) and Density of Plastics by Displacement

H. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials

I. ASTM F593 - Stainless Steel Bolts, Hex Cap Screws, and Studs

J. ASTM F594 - Stainless Steel Nuts

1.05 DESCRIPTION

A. Service Description

1. The Pumping Units will be used for sump pump service in the sodium hypochlorite containment area.

a. Pumps for sump pump service may be used occasionally or continuously, in an on-off operation.

b. Pump service: Pumps shall be used for service on 15% neat sodium hypochlorite or washdown water.

B. Pump Description

1. Pump Types

a. Chemical compatible, vertical, cantilever bearingless design sump pump with closed type keyed impeller.

C. Pump Installation and Support

1. Pump and discharge pipe shall be supported by a cover and the cover plate shall be supported by a FRP support system as shown on the Contract Drawing.
2. Cover plate and the FRP support system shall be provided by the pump manufacturer.

D. Drive Units: The electric drive motors shall be located above the top of sump pit.

E. Design Requirements

1. Location: Metering Building
2. Installed Quantity: 1
3. Asset IDs: OB3.19.53.017.BQ01.01 / OB319.53.53.037.BQ01.01
4. Rate of flow at design point: 30 GPM
5. Total head at design point: 20 FT
6. Minimum efficiency at design point: 30%
7. Rate of flow at runout point, approximate: 65 GPM
8. Total head at runout point, approximate: 13 FT
9. Shut-off head, approximate: 24 FT
10. Discharge connection dia. In inches: 1.5
11. Min. Dia. of sphere that will pass through pump in inches: 0.5
12. Fluid pumped: 15% sodium hypochlorite and washdown
13. Motor horsepower, minimum: 1.0 HP
14. Motor speed, maximum: 1800 RPM
15. Power supply: 460V, 3 pH, 60 Hz
16. Drive type: constant speed
17. All pumping units furnished shall comply with the service requirements set forth in the Section 43 05 21 – Common Work Results for Pumping Units

1.06 QUALITY ASSURANCE

A. The manufacturer shall be experienced in the design and fabrication of the Chemical Sump Pump specified.

B. Verification of Performance: The Chemical Sump Pump manufacturer shall submit results of factory tests of equipment. Testing shall include motor amp draw and maximum vacuum produced

1.07 SUBMITTALS

A. Refer to the submittals to be made under Section 43 05 21 – Common Work Results for Pumping Units,

1. Operation and Maintenance Manuals: Operation and Maintenance (O&M) Manuals shall be submitted in accordance with Section 01 78 25 – Operations and Maintenance Manuals.

2. Submit an installation detail for Engineer and City review.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 43 05 21 – Common Work Results for Pumping Units for requirements.

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. In addition to the spare parts, special tools and supplies required in Section 43 05 21 - Common Work Results for Pumping Units, the Contractor shall furnish and deliver to the Engineer, at the Site location and at end of construction, the following spare parts:

1. One (1) complete spare sump pump

2. One (1) complete set of impeller and casing

3. Three (3) shaft sleeves with 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. Design Basis:

1. Design shall be based on use of products manufactured by Vanton Pump and Equipment Corporation, model Sump Guard Model SGK-CV300B. The model number and references are given only as an indication of quality of materials and workmanship to be used in this Section. Equal products by other companies approved by the Engineer shall be acceptable in accordance with the Contract Documents.

B. Chemical Sump Pumps shall be as manufactured by one of the following:

1. Vanton Pump and Equipment Corporation, Hillside, New Jersey;

2. Or approved equal.

2.02 MATERIALS / EQUIPMENT

A. Materials

1. Casing and casing cover: Polypropylene (PP)
2. Impeller: Polypropylene (PP)
3. Shaft: 316 stainless steel sleeved with Polypropylene (PP)
4. Pump column: Polypropylene (PP)
5. Cover plate: Thermoplastic
6. Bearing: No sleeve bearings in solution
7. Suction strainer: CPVC
8. Motor Mounting Bracket: ASTM A48 cast iron with a two-part chemical (15% sodium hypochlorite) resistant epoxy resin or similar resistant coating material
9. All exposed nuts and bolts shall be type 316 stainless steel.

B. Pumping Unit Components

1. Pump shall be vertical, cantilevered sump pump with dynamically balanced, threaded, closed type keyed impeller.
2. Pump shall be based on the cantilevered bearingless design that will allow dry run capability.
3. All materials shall be of a quality to withstand the hostile environment and stresses to which the Pumping Units and components may be subjected.
4. Each pump shall be capable of continuous operation at full load with the motor exposed, without cavitation, overheating of the motor, damaging vibration in accordance with ANSI/HI Standards with a minimum operating water level as shown on Contract Drawings or at the centerline of the pump volute, whichever is lower.
5. All pumps of same size shall be identical.
6. Contractor and manufacture shall coordinate and verify that the installation will allow the pumps to be positioned so they can be lifted directly straight up and through the clear openings above the pumps with hoist.

C. Casing and casing cover

1. Casing and casing cover shall be made of injection molded homogeneous thermoplastic material selected for compatibility with the fluids being pumped. Material selected shall be solid, not lined, components.

D. Impellers

1. Impeller shall be made of thermoplastic material injection molded with an embedded dynamically balanced stainless steel insert with radial vanes. It

shall be close vane design to provide run dry capability and shall have a keyway for mounting on the shaft to assure positive drive.

E. Cantilevered Shafts

1. Shaft shall be made of alloy steel shaft sleeved with thermoplastic material to isolate it from the fluid. Shaft shall be supported above the coverplate by heavy-duty external ball bearings and be machined at the drive end to fit a flexible coupling.

F. Vertical Support Column and Discharge Pipe

1. It shall be fabricated of heavy-sectioned thermoplastic. The upper portion of the column to be fitted with a nonmetallic vapor seal to protect motor and ball bearings in mounting bracket

G. Cover Plate:

1. It shall be sized and shaped to fit the sump and shall be furnished in the same or compatible thermoplastic material as the pump. All hardware below the cover plate to be nonmetallic.

H. Motor Mounting Bracket

1. It shall be precision-machined mounting surfaces for a rabbet fit to automatically align pump and motor coupling. The assembly shall be designed to house regreasable ball bearing(s) for positioning and locking the shaft into position and to allow adjustable impeller clearance without removing the pump from installation.

I. Suction Strainer

1. Strainer basket shall be provided in the same material as the hydraulic head.

J. Motor

1. Pump to be powered by a standard NEMA Design C, totally enclosed motor.
2. Motor to be of sufficient capacity to operate the pump under all specified or required load and operating conditions without exceeding its rated nameplate current or power ratings, or its specified temperature limit.
3. Motor to have a 1.15 service factor.
4. Motor to be rated for high efficiency.
5. Motor to operate on 460 volt, 60 hz, three phase electric power.
6. Motor thrust bearings to be high thrust capacity. Bearings to have a minimum B-10 life of 20,000 hours. Ball bearings to be supplied in motor.

K. Controls: Pumps shall be furnished with the following accessories and controls:

1. Use existing Start/Stop Pushbutton controls

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Refer to Section 43 05 21 Common Work Results for Pumping Units for requirements.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. Refer to Section 43 05 21 – Common Work Results for Pumping Units for requirements.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Each pump shall be fitted with a lifting handle.

3.02 INSTALLATION

A. Pump Installation and Support

1. Discharge connection fitting shall be flanged fitting.
2. Pump shall be removable for inspection and servicing.
3. Pump shall be fitted with a lifting handle and lifting chain.

B. Tolerances for alignment, installation requirements for equipment and piping, and piping and equipment identification shall be in accordance with Section 43 05 21 – Common Work Results for Pumping Units, Part 3- Execution.

C. Location and orientation of pressure gages shall be coordinated with the piping and equipment installation so that gages are easily read and easily accessed for maintenance, as close to the pump as practicable.

3.03 FIELD TESTING / QUALITY CONTROL

A. Perform hydraulic performance, hydrostatic pressure, mechanical, vibration, and electrical acceptance tests as required by ANSI/HI 11.6.

B. Refer to Section 43 05 21 – Common Work Results for Pumping Units for additional requirements.

3.04 STARTUP / DEMONSTRATION

A. Not Used.

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Not Used

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 43 28 01 – INDUCTION MIXER
CONTRACT OB-144A

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 submersible chemical induction unit (CIU) and appurtenances, complete and operational. This Section describes the specific requirements for CIUs for submersible services. CIUs 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. Section 01 75 10 – Preliminary and Final Field Tests

B. Section 01 78 25 – Operations and Maintenance Manuals

C. Section 26 05 20 – Low Voltage Wires, Cables and Accessories

D. Section 26 05 91 – Low Voltage Electric Motors

E. Section 40 61 13 – Process Monitoring and Control System

F. Section 40 61 94 – PMCS Instrument Index

G. Section 40 67 16 – PMCS Panels and Enclosures

H. Section 40 78 90 – PMCS Panel Mounted Instruments and Devices

I. Section 40 79 91 – PMCS Field Instruments

1.04 REFERENCES

A. Comply with the latest applicable ASTM, NEC, NEMA, IEEE, ANSI, OSHA and ISA standards and all applicable Federal, State and municipal codes.

1.05 DESCRIPTION

A. CIU shall be installed in the common influent channel of the Chlorine Contact Tanks as shown on Contract Drawings to replace the existing mixer, its supporting system and its lifting device.

B. Two (2) CIUs shall be supplied. One installed and one uninstalled spare unit.

C. Each CIU shall be of a submersible design and shall be suitable for mixing 15% neat sodium hypochlorite into wastewater.

D. CIU shall be non-vacuum and distributor type.

E. CIUs shall be provided with integral electric motors and control panels.

F. All supplies, hardware and appurtenances required for a complete functional system.

G. The manufacturer shall coordinate the length of the power cable, hoist cables, mounting system, tubing and all other pertinent items with the elevations as shown on the Contract Drawings.

1.06 QUALITY ASSURANCE

A. 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
2. Contractor shall submit the following information pertaining to the manufacturer(s):
    a. List of five-(5) similar installations arranged to show name of project, phone numbers, contacts, unit capacity (list equipment, material or system name) etc., and date of completed installations.
    b. Complete literature, performance and technical data describing the proposed equipment and listing of items made by the manufacturer.
    c. Location of closest service office from which this equipment shall be serviced.

d. Location of closest parts inventory for item installation.

B. Tests:

1. Each unit shall be operated, tested and adjusted at the shop to ensure proper assembly and operation.
2. Shop test reports of the results of testing, including motor amp draw, shall be submitted for approval prior to delivering equipment to the site.

1.07 SUBMITTALS

A. Shop Drawings:

1. See Section 01 33 00 - Submittal Procedures for requirements for the mechanics and administration of the submittal process.

B. Submit the following:

1. Manufacturer's specifications and other data required to demonstrate compliance with the specific requirements.
2. A completed materials list showing all items to be furnished and installed under this Section.
3. Complete shop drawings of all work of this Section, showing dimensions and locations of all items including supporting structures and clearance requirements.
4. Certified performance curves for equipment and shop test reports.
5. Elementary electrical control schematic diagrams, P&IDs, interconnecting wiring diagrams, and motor data sheets.
6. The manufacturer shall certify that the materials of construction of the equipment furnished are suitable for the specified service conditions.
7. Operating, maintenance, programming, and wiring instructions

C. Operation and Maintenance Manuals:

1. See Section 01 78 25 – Operation and Maintenance Manuals for:
   a. The mechanics and administration of the submittal process.
   b. The content of Operation and Maintenance Manuals.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Not Used

1.09 SPARE PARTS, SPECIAL TOOLS, AND SUPPLIES

A. Provide followings spare parts:

1. Two (2) complete spare mixers.
2. Two (2) propellers/non-vacuum style distributors.
3. Four (4) hoses

4. Four (4) quick disconnect seals
5. Lubricants required for initial start-up and operation
6. One (1) Spare motor protection module
7. Four (4) spare fuses of each type
8. Four (4) spare bulbs of each type
9. Two (2) spare relays of each type
10. One (1) spare transformer of each type
11. 10% spare terminal strips
12. One (1) spare surge arrester
13. Special tools required for maintenance and repair.

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. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:

1. Gas Mastrrr as manufactured by The Mastrrr Company, Friendswood, TX
2. Or approved equal

2.02 MATERIALS / EQUIPMENT

A. All chemical induction unit components, accessories, and spare parts shall be provided by the same manufacturer.

B. Components

1. Housing/Feed Port: shall be made of UHMW Polyethylene..
2. Distributor/Mixing Element: shall be made of UHMW Polyethylene. Propeller shall not be acceptable.
3. Shaft: The motor and CIU shall have a close-coupled shaft constructed of Grade 5 (Ti-6Al-4V) titanium case hardened for superior wear resistance.
4. Hardware: shall be made of Type 316 Stainless Steel.
5. Motor:

a. The motor shall be all 316 stainless steel construction, 460 volt, 3 phase, 60 Hz, Class F insulation, with a hermetically sealed, externally water cooled enclosure.

b. The motor shall have a mechanical seal using silicon carbide seal faces.

c. The motor windings shall be hermetically sealed and resin-filled in an all welded 316 stainless steel shell for moisture resistance.

d. Electrical cable connection shall be through a removable water-block lead connector that is field replaceable.

e. The motor thrust bearing shall be designed for a minimum of 3500 lbs.

f. Each motor shall be provided with a microprocessor based submersible motor protection system. The submersible motor protection system shall be:

1) Designed to shut the CIU down.

2) Capable of automatically restarting the CIU after a recovery period. If after restart the same condition exists, the CIU shall be automatically shut down an additional two times with timed intervals between restarts. After third shut down occurs, the submersible motor protection system shall require a manual reset.

3) Designed to have a lighted display identifying motor status, high temperature, overload, underload, and alarm conditions.

g. Induction mixers shall be 10 hp

6. Power Cables

a. The CIU shall be furnished complete with power cable.

b. Cable shall have UL and/or CSA approved insulation.

c. The cable shall be four conductor.

C. Accessories:

1. Mounting System. The CIU manufacturer shall supply:

a. Type 316 stainless steel guide rail system and support frame for the mixer, designed by the manufacturer and sealed by a NYS licensed Professional Engineer, of sufficient length to reach between the operating floor slab and channel bottom slab. The guide rail system shall allow the induction mixer to pivot to a horizontal position for routine operation. The effluent channel cannot be taken out of service to install the mixer. The support frame shall be designed to be installed underwater from the operating slab level above. The Contractor shall

field verify all existing dimensions before the support frame is fabricated.

b. Type 316 stainless steel lifting device shall be a hand operated winch. The winch shall include a manual stop device and free-fall brake. The lifting device and winch shall be rated for at least two times the weight of the CIU. The lifting device shall be replaced the existing lifting device at the same location.

c. Type 316 stainless steel cable for lifting the CIU as recommended by the CIU manufacturer. Cable shall be rated for lifting at least two times the weight of the CIU

2. Mounting Bolts

a. Provide Type 316 stainless steel mounting bolts of the size as recommended by the manufacturer.

b. Washers and nuts shall be Type 316 stainless steel.

3. Hose Kit

a. Chemical feed tubing shall be a minimum 1½" diameter flexible PVC hose suitable for the chemical service conditions specified and shall have OPW Kamlok or equal fittings on each end.

b. Hose shall have smooth inside bore with helically wound reinforcement.

c. Manufacturer shall provide both the hose shank couplers on all hose and the male adapters which will be connected to the chemical feed piping including a ball check valve or backpressure valve designed for the particular application.

D. Pre-Wired Motor Control Panel: Provide a control panel in accordance with the CIU manufacturer's standard specification. Each CIU shall be provided with a prewired control panel with a submersible motor protection system as recommended by the manufacturer. The control panel shall be sized to match the voltage and horsepower of the motor to be controlled. The control panel shall include motor starter and have a hand-off-automatic control switch, hour meter and status indicating pilot lights for run and stop.

1. Control Functions:

a. Under normal operating conditions the control panel shall function to control the start and stop action of the CIU, either locally or remotely.

b. The control panel shall function to monitor the CIU for overcurrent, undercurrent, high temperature, rapid cycling and shall respond by tripping the starter/contactor off line whenever a fault occurs.

c. Each motor shall be provided with a microprocessor based submersible motor protection system. The submersible motor protection system shall be:

1) Designed to shut the CIU down.

2) Capable of automatically restarting the CIU after a recovery period. If after restart the same condition exists, the CIU shall be automatically shut down an additional two times with timed intervals between restarts. After third shut down occurs, the submersible motor protection system shall require a manual reset.

3) Designed to have a lighted display identifying motor status, high temperature, overload, underload, and alarm conditions.

d. The control panel shall have a non-resetable hour meter of the mechanical type. Battery operated LCD type will not be acceptable. The hour meter shall record hours of operation while the motor is running up to 99,999.0 hours before automatically resetting to zero.

e. The control panel shall be provided with a three phase fused, lockable disconnect switch. The disconnect operator shall indicate status and not allow the inner panel door to be opened while the switch is in the on position.

f. The control panel shall provide a contact brought to field terminals for alarm condition to be monitored remotely.

g. The control panel shall be provided with contacts brought to field terminals for remote alarm monitoring of run and stop status.

h. The panel shall be provided with a surge arrestor which exceeds ANSI/IEEE standard C62.11.

2. Construction Features:

a. The 316 SS panel enclosure shall be fabricated to meet NEMA 4X standards.

b. Doors shall have continuous heavy-duty piano hinge with stainless steel hinge pins.

c. Doors shall have a foamed polyurethane gasket with tongue and groove labyrinth at all seal points.

d. All operator usable functions shall be located behind the main door on a separate hinged control panel. The main door shall have a window large enough to view all operation functions and diagnostics.

e. The main door shall have non-locking stainless steel latches.

f. All non-operator maintained parts and devices shall be located directly behind the control panel on a metallic back panel. All parts shall have easy access.

g. All exposed metallic hardware components of the panel shall have grounding bonds to the main field grounding connection.

h. The enclosure shall have integral wall mounting flanges.

i. All wiring shall be color coded and plainly marked at all terminations

1) Black wire for all live power conductors.

2) White wire for all neutral conductors.

3) Green wire for all ground conductors.

4) Red wire for all control circuits.

5) Yellow wire for all circuits not de-energized when the panel disconnect is opened.

j. Wires shall be routed within wireway as much as possible.

k. Terminal blocks shall be rail mountable type. All terminal blocks shall be consecutively numbered.

l. Provide spare terminal blocks.

m. No mounting or fastening hardware other than conduit penetration shall penetrate the enclosure other than that supplied by the enclosure manufacturer.

n. A warning label shall be provided in plain sight to alert maintenance personnel of potential live circuits even when the main disconnect is open.

3. Electrical Specification

a. Supply power shall be 460 volt, 3 phase, 60 HZ.

b. Disconnect shall be rated for 600 volt.

c. Wiring shall be rated for 600 volt, 105 degrees C.

d. Terminal blocks shall be rated for 600 volt on motor power circuits and 300 volt for control circuits.

e. Fuses shall be rated 600 volt.

2.03 FABRICATION / ASSEMBLING / FINISHES

A. Shop assemble each CIU as a completed assembly for testing.

2.04 SOURCE QUALITY CONTROL / SHOP TESTS

A. The manufacturer shall be experienced in the design and fabrication of the CIUs specified.

B. Tests: Shop operate, test and adjust each CIU to ensure proper assembly and operation.

C. Verification of Performance: The CIU manufacturer shall submit results of factory tests of equipment. Testing shall include motor amp draw and maximum vacuum produced.

PART 3 EXECUTION

3.01 EXAMINATION / PREPARATION

A. Not Used

3.02 INSTALLATION

A. Contractor shall install items in accordance with manufacturer's printed instructions and as indicated and 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

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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:

OB-144A

TRC Optimization at the Oakwood Beach Wastewater Resource Recovery Facility

Volume 3 of 3
Contract Terms and Specifications
(with separate Bid Booklet)

August 2026